Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22ME401 – Kinematics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between Kutzbach equation and Grubler's equation.
2. Define the terms i) Hooke's joint and ii) Toggle mechanisms.
3. Define Rubbing Velocity.
4. What are the different methods of analyzing a mechanism?
5. Which motion of follower is used for low and moderate cam speed applications? Why?
6. What is dwell period in cam mechanism?
7. Define conjugate action in gears.
8. Differentiate between involute tooth profile and cycloidal tooth profile.
9. What is meant by Lap angle?
10. Why shall self locking screw have lesser efficiency?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) In a Whitworth quick return motion mechanism, the distance between the fixed centers is 50 mm and the length of the driving crank is 75 mm. The length of the slotted lever is 150 mm and the length of the connecting rod is 135 mm. Find the ratio of the time of cutting stroke to the time of return stroke and also the effective stroke. (16)

(OR)

b) Sketch and explain any three kinematic inversion of a single slider crank chain. (16)

12. a) In a slider crank mechanism, the length of crank OB and connecting rod AB are 125 mm and 150 mm respectively. The centre of gravity of the connecting rod is 250 mm from the slider A. The crank speed is 600 rpm clockwise. When the crank has turned 45° from the inner dead centre position, determine 1. Linear velocity and acceleration of the mid-point of the connecting rod and 2. Angular velocity and angular acceleration of the connecting rod. (16)

(OR)

b) In the toggle mechanism shown in Figure.1, the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter-clockwise direction at a speed of 180 r.p.m. increasing at the rate of 50 rad/s^2. The dimensions of the various links are as follows: OA = 180 mm; CB = 240 mm; AB = 360 mm; and BD = 540 mm. For the given configuration, find (16)

1) Velocity of slider D and angular velocity of BD and
2) Acceleration of slider D and angular acceleration of BD.

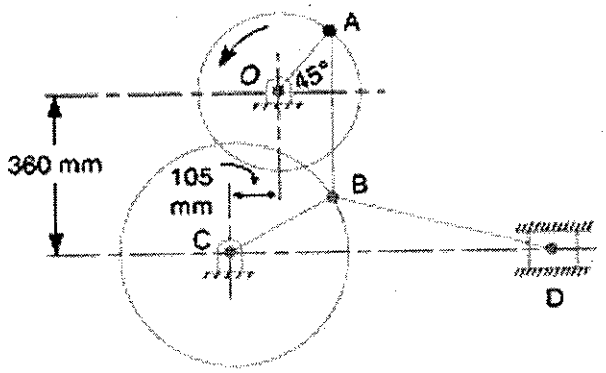

Figure.1

13. a) A disc cam is to give uniform motion to a knife edge follower during outstroke of 50 mm during the first half of the cam revolution. The follower again returns to its original position with uniform motion during the next half of the revolution. The minimum radius of cam is 50 mm and the diameter of the can shaft is 35 mm. draw the profile of the cam when (16)

1) The axis of follower passes through the axis of the cam shaft
2) The axis of the follower is offset by 20 mm from the axis of the cam shaft.

(OR)

b) Draw the profile of the cam when the follower moves with cycloidal motion as given below. (16)

1) Outstroke with maximum displacement of 44 mm during 180° of cam rotation.
2) Return stroke for the next 150° of cam rotation.
3) Dwell for the remaining 30°of cam rotation.

The minimum radius of the cam is 20 mm and the diameter of the roller is 10 mm. the axis of the roller follower passes through the cam shaft axis.

14. a) In an epicyclic gear train annular wheel A having 54 teeth meshes with a planet wheel B which gear with a sun wheel C, the wheels A and C being coaxial. The wheel B is carried on a pin fixed on one end of arm P which rotates about the axis of the wheels A and C. If the wheel A makes 20 rpm in a clockwise sense and the arm rotates at 100 rpm in a anticlockwise direction and the wheel C has 24 teeth. Determine the speed and the sense of rotation of wheel C. (16)

(OR)

b) Number of teeth on spur gears A, B, C, D and E are 30,15,45,20 and 75 respectively. The shaft with Gear A is input and the shaft with gear E is output and the gears have to mesh with the same order as mentioned above. Neatly sketch them as a) Simple Gear Train and b) a Non reverted Gear Train with gears C and D on a single shaft and find the output speeds of each gear train with sense of rotation when the input shaft rotates 100 rpm in counter clockwise direction (16)

15. a) i) An effort of 1500 N is required to just move a certain body up an inclined plane of angle 12 degree, force acting parallel to the plane. If the angle of inclination is increases to 15 degree then the effort required is 1720 N. find the weight of the body and the co efficient of friction. (8)

ii) A single plate clutch with both sides effective has outer and inner radius 150 mm and 100 mm respectively. The maximum pressure intensity at the any point is not exceeds to 0.1 N/mm^2. The co efficient of friction is 0.3. Determine the power transmitted by the clutch at a speed of 2500 rpm for both uniform wear and uniform pressure theory. (8)

(OR)

b) A band and block brake, having 14 blocks each of which subtends an angle of 15° at the center, is applied to a drum of 1 m effective diameter. The drum and flywheel mounted on the same shaft has a mass of 2000 kg and a combined radius of gyration of 500 mm. The two ends of the band are attached to pins on opposite sides of the brake lever at distances of 30 mm and 120 mm from the fulcrum. If a force of 200 N is applied at a distance of 750 mm from the fulcrum, find: (16)

1) Maximum braking torque
2) Angular retardation of the drum and
3) Time taken by the system to come to rest from the rated speed of 360 r.p.m.

The coefficient of friction between blocks and drum may be taken as 0.25.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME201 – Kinematics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down the Kutzbach criteria for a spatial mechanism.
2. Mention any two examples of higher pairs.
3. What will be the rubbing velocity at pin joint that connects one sliding member and other turning member?
4. List the types of instantaneous center.
5. Name the three customary tasks of kinematic synthesis.
6. Write down the Freudenstein's Equation.
7. How will you reduce the wear and side thrust in a cam and follower?
8. State the assumption considered while drawing the profile of a cam.
9. Determine the minimum number of teeth required on a pinion, in order to avoid interference which is to gear with a wheel to give a gear ratio of 3 to 1.
10. Mention the condition for no wheel is lifted off the ground while the vehicle takes a turn.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Apply Kutzbach criterion for given planar mechanisms and state the type of mechanism. Figure.1 (10)

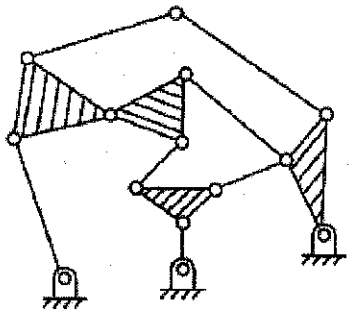

Figure.1.

ii) Briefly explain various types of constrained motions. (6)

(OR)

b) i) Explain the working of any two inversions of a slider-crank chain with neat sketches. (10)

ii) The length of the fixed link of a crank and slotted lever mechanism is 250 mm and that of crank is 100 mm. Determine the (6)

1) Inclination of the slotted lever with the vertical in the extreme position.
2) Ratio of the time of cutting stroke to the time of return stroke.

12. a) The dimensions of the various links of a mechanism, as shown in Figure.2 are as follows: OA = 80 mm; AC = CB = CD = 120 mm If the crank OA rotates at 150 r.p.m. in the anticlockwise direction, find, for the given configuration: (16)

1) velocity and acceleration of B and D;
2) rubbing velocity on the pin at C, if its diameter is 20 mm and
3) Angular acceleration of the links AB and CD.

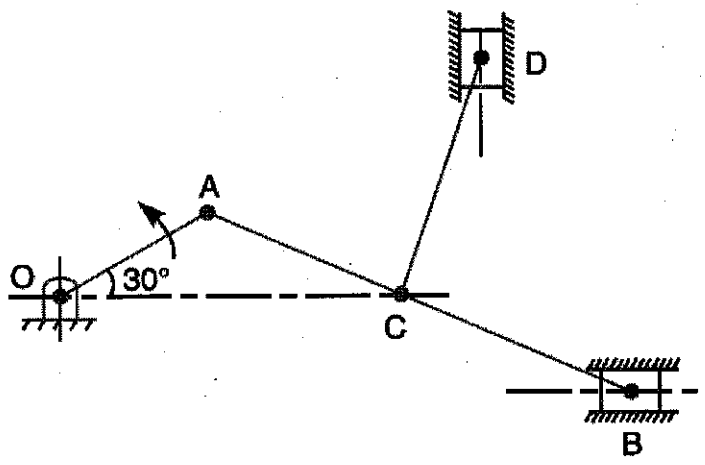

Figure.2.

(OR)

b) A mechanism, as shown in Figure.3 has the following dimensions: O1 A = 60 mm; A B = 180 mm; O2 B = 100 mm; O2 C = 180 mm and CD = 270 mm. The crank O1 A rotates clockwise at a uniform speed of 120 r.p.m. The block D moves in vertical guides. Find, by instantaneous center method, the velocity of D and the angular velocity of CD. (16)

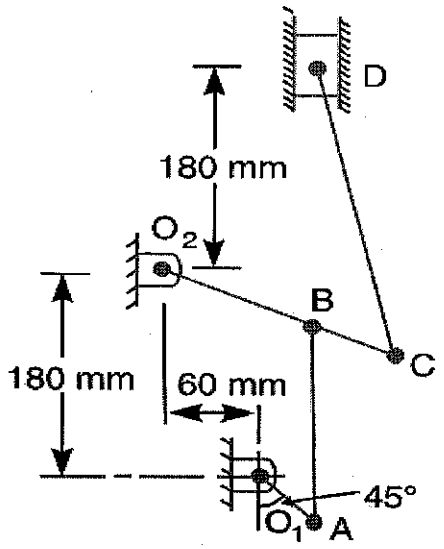

Figure.3.

13. a) Synthesis a four-bar mechanism using the function generator $y=\frac{1}{x}; 1 \leq x \leq 2; \theta_S = 30°; \varphi_S = 240°; \Delta\theta = 90°; \Delta\varphi = 90°$ (16)

(OR)

b) Design a four bar Grashof crank rocker for 90° of output rocker motion with no quick return. Build a scale model and determine the minimum transmission angle from the model. (16)

14. a) Construct the profile of a cam to suit the following specifications: Cam shaft diameter = 40 mm; Least radius of cam = 25 mm; Diameter of roller = 25 mm; Angle of lift = 120°; Angle of fall = 150°; Lift of the follower = 40 mm; Number of pauses are two of equal interval between motions. During the lift, the motion is S.H.M. During the fall the motion is uniform acceleration and deceleration. The speed of the cam shaft is uniform. The line of stroke of the follower is off-set 12.5 mm from the center of the cam. (16)

(OR)

b) Design a cam to raise a valve with simple harmonic motion through 50 mm in 1/3 of a revolution, keep if fully raised through 1/12 revolution and to lower it with harmonic motion in 1/6 revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is 20 mm and the minimum radius of the cam is 25 mm. The diameter of the camshaft is 25 mm. The axis of the valve rod passes through the axis of the camshaft. If the camshaft rotates at uniform speed of 100 r.p.m; find the maximum velocity and acceleration of a valve during raising and lowering. (16)

15. a) Two mating involute spur gear of 20° pressure angle have a gear ratio of 2. The number of teeth on the pinion is 20 and its speed is 250 r.p.m. The module pitch of the teeth is 12 mm. If the addendum on each wheel is such that the path of approach and the path of recess on each side are half the maximum possible length, find; (16)

1) the addendum for pinion and gear wheel
2) the length of the arc of contact and
3) the maximum velocity of sliding during approach and recess.

Assume pinion to be the driver.

(OR)

b) A ship is propelled by a turbine rotor having a mass of 6 tonnes and a speed of 2400 rpm. The direction of rotation of the rotor is clockwise when viewed from the stern. The radius of gyration of the rotor is 450 mm. Determine the gyroscopic effect when the i) ship steers to the left in a curve of 60 m radius at a speed of 18 knots ii) ship pitches 7.5° above and 7.5° below the normal position and the bow is descending with its maximum velocity; the pitching motion is simple harmonic with a periodic time of 18 seconds iii) ship rolls and at the instant, its angular velocity is 0.035 rad/s counter clockwise when viewed from the stern. Also, find the maximum angular acceleration during pitching. (16)

Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

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MECHANICAL ENGINEERING

22PTME202 – Thermal Engineering

(Steam table, Mollier chart, Refrigerant property table and Psychrometric chart to be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Which cycle is more efficient for the same compression ratio and heat addition among Otto and Diesel cycles? Justify.
2. Define cut of ratio for a diesel cycle.
3. Justify the need of octane rating in an IC engine.
4. What is the significance of stoichiometric air fuel ratio in an IC engine?
5. What is meant by supersaturated flow of nozzle?
6. Why compounding is necessary in turbines?
7. Differentiate reciprocating air compressor and centrifugal air compressor.
8. Define free air delivery in a reciprocating air compressor.
9. State tone of refrigeration.
10. Define specific humidity.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The stroke and cylinder diameter of a compression ignition engine are 250 mm and 150 mm respectively. If the clearance volume is 0.0004 m^3 and fuel injection takes place at constant pressure for 5 per cent of the stroke, determine the efficiency of the engine. Assume the engine working on the diesel cycle. (16)

(OR)

b) Derive the expression for mean effective pressure and air standard efficiency for a Diesel cycle. (16)

12. a) Explain the IC engine cooling systems with suitable sketches. (16)

(OR)

b) The power output of an I.C. engine is measured by a rope brake dynamometer. The diameter of the brake pulley is 700 mm and the rope diameter is 25 mm. The load on the light side of the rope is 50 kg mass and spring balance reads 50 N. The engine running at 900 rpm. consumes fuel of calorific value of 44000 kJ/kg, at a rate of 4 kg/h. Assume g = 9.81 m/s^2. Calculate: i) Brake specific fuel consumption ii) Brake thermal efficiency iii) Mechanical Efficiency. (16)

13. a) Derive an expression for maximum discharge through convergent - divergent nozzle for steam. (16)

(OR)

b) Why governing is necessary in turbines? Explain any one type of governing method with suitable sketch. (16)

14. a) Derive the expression for minimum power required for a reciprocating air compressor. (16)

(OR)

b) A single-stage double-acting air compressor is required to deliver 14 m^3 of air per minute measured at 1.013 bar and 15°C. The delivery pressure is 7 bar and the speed 300 rpm. Take the clearance volume as 5 % of the swept volume with the compression and expansion index of n = 1.3. Calculate: (16)

i) Swept volume of the cylinder

ii) The delivery temperature and

iii) Indicated power.

15. a) Explain the working principle of a vapour compression refrigeration system with suitable diagram. (16)

(OR)

b) Explain with suitable sketch about central air-conditioning system and compare air-conditioning and refrigeration. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22ME402 - Thermal Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the port timing diagram of a petrol engine.
2. For a given compression ratio and heat addition explain why Otto cycle is more efficient than Diesel cycle?
3. What are the effects of friction on the flow through a steam nozzle?
4. Explain the need of compounding in steam turbines.
5. How does inter cooling reduce the work input of compressor?
6. Define the terms free air delivery and volumetric efficiency.
7. Define Wet bulb depression.
8. Define degree of saturation and specific humidity.
9. Sketch the T-s and p-h diagrams for the vapour compression cycle when the vapour after compression is dry saturated.
10. How does the sub cooling influence the refrigerating effect of a vapour compression refrigerator?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the working principle of a four stroke petrol engine. Also compare between petrol and diesel engine. (16)

(OR)

b) An air standard diesel cycle has a compression ratio of 18 and the heat transferred to the working fluid per cycle is 1800 kJ/kg. At the beginning of the compression process the pressure is 0.1 MPa and the temperature is 15°C. Determine (16)

(i) The pressure and temperature at each point in the cycle.

(ii) The thermal efficiency.

(iii) The mean effective pressure.

12. a) Derive expressions for the exit velocity, mass flow rate and critical pressure ratio of a steam nozzle. (16)

(OR)

b) In an impulse turbine (with a single row wheel) the mean diameter of the blades is 1.05 m and the speed is 3000 rpm. The nozzle angle is 18°, the ratio of blade speed to steam speed is 0.42 and the ratio of the relative velocity at outlet from the blades to that of at inlet is 0.84. The outlet angle of the blade is to be made 3° less than the inlet angle. The steam flow is 10 kg/s. Draw the velocity triangle diagram for the blades and derive the following: (16)

(i) Tangential thrust on the blades;

(ii) Axial thrust on the blades;

(iii) Resultant thrust on the blades;

(iv) Power developed in the blades;

(v) Blading efficiency.

13. a) A multistage air compressor is to be designed to evaluate the pressure from 1bar to 120 bar, such that the single stage pressure ratio not to be exceeded 4. Find (16)

(a) Number of stages

(b) Exact stage pressure ratio

(c) Intermediate pressure.

(OR)

b) A single stage reciprocating air compressor takes $1m^3$ of air per minute at 1bar and 15 °C and delivers it at 7 bar. The law of compression is $pV^{1.3}$ = constant. Neglect clearance calculate the indicated power. If the speed of compressor is 300 rpm and the stroke to bore ratio is 1.5, calculate the cylinder dimensions. Find the power required if the mechanical efficiency of compressor is 85% and motor transmission efficiency is 90%. (16)

14. a) Atmospheric air at 1.0132 bar has a DBT of 32°C and a WBT of 26°C. Compute (16)

(a) the partial pressure of water vapour,

(b) the specific humidity,

(c) the dew point temperature,

(d) the relative humidity,

(e) the degree of saturation,

(f) the density of the air in the mixture,

(g) the density of the vapour in the mixture, and

(h) the enthalpy of the mixture.

(OR)

b) A restaurant with a capacity of 100 persons is to be air-conditioned with the following conditions : (16)

Outside conditions = 30°C, 70% RH

Desired inside conditions = 23°C, 55% RH

Quantity of air supplied = 0.5 m^3 /min/person

The desired conditions are achieved by cooling, dehumidifying and then heating. Determine :

(i) Capacity of the cooling coils in tones of refrigeration

(ii) Capacity of the heating coil and

(iii) Amount of water removed by the dehumidifier.

15. a) With the help of a suitable sketch, explain the working of lithium bromide-water vapour absorption system. Also list the advantages and disadvantages of vapour absorption systems. (16)

(OR)

b) A refrigerator works between -7°C and 27°C. The vapour is dry at the end of adiabatic compression. Assuming that there is no under cooling, determine (16)

i) The C.O.P

ii) Power of the compressor to remove a heat load of 12140 kJ/hr.

The properties of refrigerant are given in table:

T°C	Sensible heat of liquid h_f (kJ/kgK)	Latent heat of vapour h_{fg}(kJ/kgK)	Entropy of liquid S_f (kJ/kgK)	Entropy of vapour S_g (kJ/kgK)
-7	-29.3	1297.9	-0.109	4.748
27	117.23	1172.3	0.427	4.333

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B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME303 – Refrigeration and Air Conditioning

(Psychometric chart, steam tables and Refrigeration tables to be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the difference between Refrigeration & Air Conditioning?
2. Define reversed Carnot cycle.
3. Recall how compression is achieved in scroll compressor?
4. Mention the advantages of multi stage compressor.
5. Distinguish steam jet and ejector refrigeration.
6. Name the refrigerants and absorbents used in Li-Br and Aqua Ammonia Vapor absorption systems.
7. List psychometric properties of air.
8. What is the function of a humidifier?
9. Inspect the importance of internal load calculation in cooling load conditions.
10. Infer fresh air load in terms of air conditioning.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain reversed carnot cycle process related to thermodynamics of refrigeration. (8)

ii) Explain in detail about heat pump with pV and Ts diagram. (8)

(OR)

b) Define refrigerant. Classify and explain desirable properties of an ideal refrigerant with examples. How are refrigerants classified? (16)

12. a) i) In a vapour compression refrigerator, the working fluid is superheated at the end of compression and is under cooled in the condenser before throttling. Sketch a working cycle on temperature entropy diagram and show how theoretical coefficient of performance may be calculated from this diagram. (8)

ii) Illustrate sub cooling and super heating process in a vapour compression system. (8)

(OR)

b) i) List the different types of compressors? And explain each type usage in refrigeration systems giving proper reasons. (8)

ii) With the help of a neat sketch, show the working of an evaporative condenser. (8)

13. a) Construct the working principles of vapour absorbtion refrigeration system and adsorption cooling systems. (16)

(OR)

b) Explain vortex and pulse refrigeration systems with illustrations and the related applications. (16)

14. a) Categorize psychometric chart and with the same explain the following processes. (16)

a) Heating and humidification

b) Cooling and dehumidification.

c) Cooling and humidification.

d) Sensible cooling and sensible heating.

(OR)

b) Air is pre-heated from -5°C dry bulb and 85 % saturation to 23°C dry bulb. It is then passes through an air washer having a humidifying efficiency of 85 % and using re-circulated spray water. (16)

Examine the following:

i) The relative humidity of the air leaving the washer

ii) The cold water make-up to the washer in kg/s, given that the air flow rate leaving the washer is 2.5 m^3/s

iii) The duty of the pre-heater in kW

iv) The temperature of the air supplied to the conditioned space if the sensible heat losses from it are 24 kW and 20°C dry bulb maintained there

v) The relative humidity maintained in the room if the latent heat gains therein are 5 kW.

15. a) i) Define the term "effective temperature" and inspect its importance in air conditioning system. Categorize the factors which affect effective temperature. (8)

ii) Explain in brief as to how the human body reacts to changes in temperature of environment. Analyze the effect of activities on the heat load calculation for comfort application. (8)

(OR)

b) The following data apply to an air conditioning system: Room sensible heat = 41868 kJ/hr (11.63 kW); room latent heat = 41868 kJ/hr (11.63kW); inside design condition = 25°C, 50% RH, outside design condition = 35°C, DBT, 27.8 WBT. Return air from the room is mixed with the outside air before entering the cooling coil in the ratio of 4:1. Return air from the room is mixed with the cooling air, i.e. after the cooling coil in the ratio of 1:4. Cooling coil by pass factor is 0.1. The air may be reheated if necessary before supplying to the conditioned space. Assume ADP as 10°C and Examine (16)

i) Supply air conditions into the room

ii) Refrigeration load due to the reheat

iii) Total refrigeration capacity

iv) The quantity of fresh air supplied.

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B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME402 – Mechatronics

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by a closed-loop system?
2. On what basis do we need to select the sensors? List any two significant factors.
3. Draw the symbols of the 3/2 and 4/3 valves.
4. Define grey code.
5. Differentiate between the stepper motor and servo motor.
6. Differentiate PI control and PI controller.
7. List any two input and output devices.
8. State the reason why PLC is more valuable.
9. List any four sensors used in the automatic car barrier system.
10. Distinguish between traditional and mechatronics approaches.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the emerging areas in mechatronics in detail. (16)

(OR)

b) Discuss the static and dynamic characteristics of the transducers. (16)

12. a) Discuss the electromechanical and hydraulic mechanical systems in detail with suitable sketches. (16)

(OR)

b) Explain the following systems with necessary sketches. (16)

1. Thermal system
2. Mechanical system

13. a) i) Explain the latching circuit. (8)

ii) Discuss the neural networks and fuzzy systems used in the actuation system. (8)

(OR)

b) i) Discuss the specifications and characteristics of a stepper motor with a suitable graph. (8)

ii) Explain the working principle of AC servomotors. (8)

14. a) i) Write the factors to be considered when selecting a PLC. (8)

ii) Describe relays and counters with a suitable diagram. (8)

(OR)

b) i) Draw the components of the PLC using a suitable block diagram. (8)

ii) Draw the PLC ladder diagram for (8)

1. AND
2. OR
3. NAND
4. NOR

15. a) Design the engine management system based on mechatronics system design. (16)

(OR)

b) Design a robot to pick and place the various objects with suitable examples. (16)

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(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME403 – Design of Transmission systems

(Use of approved design data book is permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Give the application of the following wire ropes:
   a) 6 x 7 rope b) 6 x 19 rope c) 6 x 37 rope
2. Why tight side of the belt should be at the bottom side of the pulley?
3. Sketch the profile of spur gear and mark terminology used to specify the gear.
4. What is herring bone gear? Where are they used?
5. Differentiate cross helical form parallel axis helical gear.
6. What are the materials used for worm and worm wheel?
7. Draw ray diagram for 18 speed gear box.
8. Compare sliding mesh and synchromesh gear box.
9. What is significance of pressure angle in cam design?
10. Distinguish between wet and dry clutch.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Power of 60 kW at 750 r.p.m. is to be transmitted from an electric motor to compressor shaft at 300 r.p.m. by V-belts. The approximate larger pulley diameter is 1500 mm. The approximate centre distance is 1650 mm, and overload factor is to be taken as 1.5. Give a complete design of the belt drive. A belt with cross-sectional area of 350 mm^2 and density 1000 kg/m^3 and having an allowable tensile strength 2 MPa is available for use. The coefficient of friction between the belt and the pulley may be taken as 0.28. The driven pulley is overhung to the extent of 300 mm from the nearest bearing and is mounted on a shaft having a permissible shear stress of 40 MPa with the help of a key. The shaft, the pulley and the key are also to be designed. (16)

(OR)

b) Design a belt drive to transmit 110 kW for a system consisting of two pulleys of diameters 0.9 m and 1.2 m. centre distance of 3.6 m, belt speed 20 m/s, coefficient of friction 0.3, a slip of 1.2 % at each pulley and 5 % friction loss at each shaft , 20 % overload. (16)

12. a) Design a helical gear drive to transmit power of 15 kW at 1440 rpm to the following specifications. Speed reduction is 3, pressure angle is 20°, helix angle is 15°, and the material of both gears is C45 steel, Allowable static stress is 180 N/mm^2. Young's modulus of the material is $2 \times 10^5 N/mm^2$. (16)

(OR)

b) A gear drive is required to transmit a maximum power of 22.5 kW. The velocity ratio is 1:2 and r.p.m. of the pinion is 200. The approximate centre distance between the shafts maybe taken as 600 mm. The teeth has 20° stub involute profiles. The static stress for the gear material (which is cast iron) may be taken as 60 MPa and face width as 10 times the module. Find the module, face width and number of teeth on each gear. Check the design for dynamic and wear loads. The deformation or dynamic factor in the Buckingham equation may be taken as 80 and the material combination factor for the wear as 1.4. (16)

13. a) Design a speed reducer unit of worm and worm wheel for an input of 1 kW with a transmission ratio of 25. The speed of the worm is 1600 r.p.m. The worm is made of hardened steel and wheel of phosphor bronze for which the material combination factor is 0.7 N/mm^2. The static stress for the wheel material is 56 MPa. The worm is made of double start and the centre distance between the axes of the worm and wheel is 120 mm. The tooth form is to be 14½° involute. Check the design for strength, wear and heat dissipation. (16)

(OR)

b) Two straight bevel gears are used in a speed reducer with a transmission ratio of 2. The wheel is supported on both sides and the pinion is over hanging. The input is from a 20 kW electric motor running at 950 rpm. Design the bevel gear. (16)

14. a) Design a nine speed gear box for a milling machine with speed ranging from 56-900 rpm. The output speed is 720 rpm; make a neat sketch of the gearbox. Indicate the no of teeth on all the gears and their speeds. (16)

(OR)

b) A gearbox is to be designed to provide 12 output speeds ranging from 160 to 200 rpm. The input speed of motor is 1600 rpm. Choosing a standard speed ratio construct the speed diagram and the kinematic arrangement calculate the no of teeth of all gears. (16)

15. a) In a band and block brake, the band is lined with 14 blocks, each of which subtends an angle of 20 degrees at the drum centre. One end of band is attached to the function of the brake lever and the other to a pin 150 mm from the fulcrum. Find the force required at the end of the lever 1 m long from the fulcrum to give a torque of 4 kN-m. The diameter of the brake drum is 1m and the co-efficient of friction between the blocks and the drum is 0.25. (16)

(OR)

b) A multi – disk clutch consists of five steel plates and four bronze plates. The inner and outer diameters of friction disks are 75 mm and 150 mm respectively. The coefficient of friction is 0.1 and the intensity of pressure is limited to 0.3 N/mm^2. Assuming the uniform wear theory, calculate (16)

i) The required operating force and

ii) Power transmitting capacity at 750 rpm.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME404 – Dynamics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish crank effort from crank pin effort.
2. Flywheel is necessary in a punching press. Justify.
3. Enlist the conditions to be satisfied for complete balancing of in- line engine.
4. Differentiate static balancing from dynamic balancing.
5. Recognize the term dynamic magnifier.
6. Write the meaning of transmissibility ratio and write its expression.
7. Write the necessary conditions to be satisfied for an equivalent system to that of geared system in torsional vibrations.
8. State the function of FFT analyser.
9. Distinguish gravity controlled governor from Sprig controlled governor.
10. Predict the condition for hunting of the governor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The length of crank and connecting rod of a horizontal reciprocating engine are 200 mm and 1.0 m respectively. The crank is rotating at 400 rpm. When the crank has turned 30° from the inner dead centre, the difference of pressure between the cover end and piston end is 0.4 N/mm^2. If the mass of the reciprocating parts is 100 kg and cylinder bore is 0.4 m. then calculate (i) Inertia (ii) Force on piston (iii) Piston effort (iv) Thrust on the sides of cylinder walls and (v) Thrust in the connecting rod (vi) Crank-effort and (vii) Turning moment on the crank shaft. Neglect the effect of piston rod diameter and frictional resistance. (16)

(OR)

b) A flywheel of mass 250 kg and radius of gyration of 600 mm is attached to a shaft. The shaft rotates at a speed of 200 rpm and drives a machine. The torque of the machines varies in a cyclic manner over a period of 3 revolutions. The torque rises from 250 Nm to 1000 Nm uniformly during first ½ revolutions and remains constant for next one revolution. It then falls uniformly to 250 Nm during the next ½ revolution and remains constant for one revolution, the cycle being repeated thereafter. Determine i) power required driving the machine and ii) percentage fluctuation in speed if the driving torque applied to the shaft is constant. (16)

12. a) A shaft is rotating at a uniform angular speed. Four masses m_1, m_2, m_3 and m_4 of magnitudes 300 kg, 450 kg, 360 kg and 390 kg respectively are attached rigidly to the shaft. The masses are rotating in the same plane. The corresponding radii of rotation are 200 mm, 150 mm, 250 mm and 300 mm respectively. The angles made by these masses with horizontal are 0°, 45°, 120° and 255° respectively. Find by analytically: (i) the magnitude of the balancing mass and ii) the position of the balancing mass if its radius of rotation is 200 mm. (16)

(OR)

b) A two cylinder uncoupled locomotive has inside cylinders 0.6 m apart. The radius of each crank is 300 mm and is at right angles. The revolving mass per cylinder is 250 kg and the reciprocating mass per cylinder is 300 kg. The whole of the revolving and two third of reciprocating masses are to be balanced and the balanced masses are placed, in the planes of rotation of the driving wheels, at a radius of 1 m. The driving wheels are 2 m in diameter and 1.5 m apart. If the speed of the locomotive is 80 km/hr. find the hammer blow, maximum variation in tractive effort and maximum swaying couple. (16)

13. a) A harmonic exciting force of 25 N is acting on a machine part, which is having a mass of 2 kg and is vibrating in a viscous medium. This exciting force causes resonance amplitude of 12.5 mm with a period of 0.20 seconds. Determine the damping coefficient. If the system is excited by a harmonic force of frequency 4 Hz, find the increase in amplitude of forced vibration when damper is removed. (16)

(OR)

b) The mass of an electric motor is 120 kg and it runs at 1500 rpm. The armature mass is 35 kg and its CG lies 0.5 m from the axis of rotation. The motor is mounted on five springs of negligible damping so that the force transmitted is one-eleventh of the impressed force. Assume that the mass of the motor is equally distributed among the five springs. Determine: (i) Stiffness of each spring. (ii) Dynamic force transmitted to the base at the operating speed. (iii) Natural frequency of the system. (16)

14. a) A shaft of length 1.25 m is 75 mm in diameter for the first 275 mm of its length, 125 mm in diameter for next 500 mm length, 87.5 mm in diameter for the next 375 mm length and 175 mm in diameter for the remaining 100 mm length. The shaft carries two rotors at two ends. The mass moment of inertia of the first rotor is 75 kg m^2 whereas of the second rotor is 50 kg m^2. Find the frequency of natural torsional vibrations of the system. The modulus of the rigidity of shaft material may be taken as 80 GN/m^2. (16)

(OR)

b) i) Explain the procedure for conducting free vibration experiment using Exciter. (8)

ii) Describe with neat sketch the working principle of Piezoelectric accelerometer. (8)

15. a) The mass of each ball in a Wilson-Hartnell governor is 2.5 kg. The length of ball arm of each ball-crank lever is 100 mm where as the length of the sleeve arm of bell-crank lever is 80 mm. The minimum equilibrium speed is 200 rpm. When radius of rotation is 100 mm. When the sleeve is lifted by 8 mm, the equilibrium speed is 212 rpm. The stiffness of each of the springs connected to the balls is 200 N/m. The lever for the auxiliary spring is pivoted at the midpoint. Find the stiffness of the auxiliary spring. (16)

(OR)

b) The lengths of the upper and lower arms of a porter governor are 200 mm and 250 mm respectively. Both the arms are pivoted on the axis of the rotation. The central load is 150 N, the weight of each ball is 20 N and the friction of the sleeve together with the resistance of the operating gear is equivalent to a force of 30 N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30° and 40°, determine the range of the speed of the governor. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22ME504 – Dynamics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the law of inertia.
2. Identify the role of weight in the performance of a flywheel.
3. List four causes of unbalance in rotary engines.
4. What are the effects of partial balancing in locomotives?
5. How do you calculate the damping ratio for a critically damped system?
6. What is the ratio of the maximum displacement in forced vibration to the deflection caused by a static force?
7. What is the significance of the natural frequency in forced vibrations?
8. Identify the role of transmissibility in vibration isolation.
9. Find the height of a watt governor when it rotates at 2 rps.
10. What is your insight into the sensitivity of an isochronous governor?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A petrol engine has a stroke of 120 mm and connecting rod is 3 times the crank length. The crank rotates at 1450 rpm. In clockwise direction. Determine the acceleration of the piston and the angular acceleration of the connecting rod, when the piston had travelled one-fourth of its stroke from inner dead center. (16)

(OR)

b) The turning moment curve for one revolution of a multi-cylinder engine, showing values above and below the line of mean resisting torque, is given by -30, +360, -250, +300, -300, +250, -380, +260, and -210 mm^2. The vertical and horizontal scales are 1 mm = 600 N.m and 1 mm = 5°, respectively. The fluctuation of speed is limited to ±1.55% of the mean speed, which is 250 rpm. The hoop stress in the rim material is limited to 10 N/mm^2. Neglecting the effect of the boss and arms, find the suitable diameter and cross-section of the flywheel rim. The density of the rim material is 7200 kg/m^3. Assume the width of the rim is four times its thickness. (16)

12. a) A shaft has three eccentrics of mass 1 kg each. The central plane of the eccentrics is 50 mm apart. The distances of the centers from the axis of rotation are 20, 30 and 20 mm and their angular positions are 120° apart. Find the amount of out-of-balance force and couple at 600 rpm. If the shaft is balanced by adding two masses at a radius of 70 mm and at a distance of 100 mm from the central plane of the middle eccentric, find the amount of the masses and their angular positions. (16)

(OR)

b) A single-cylinder reciprocating engine has speed 245 rpm, stroke 300 mm, mass of the reciprocating parts 60 kg and mass of the revolving parts 50 kg at 150 mm radius. If two-thirds of the reciprocating parts and all the revolving parts are to be balanced, find the residual unbalanced force when the crank has rotated 60° from top dead center. (16)

13. a) A shaft 30 mm diameter and 2 m long has a uniformly distributed load of 120 N/m length. It is simply supported at the ends and carries three loads of 1 kN, 1.5 kN and 0.5 kN at 0.6 m, 1m and 1.5 m respectively from the left end support. Calculate the natural frequency of transverse vibrations. Take E = 200 Gpa. (16)

(OR)

b) Determine the natural frequency and position of the node for the free torsional vibrations of the stepped shaft shown in Figure 1. Take G = 80 GPa. (16)

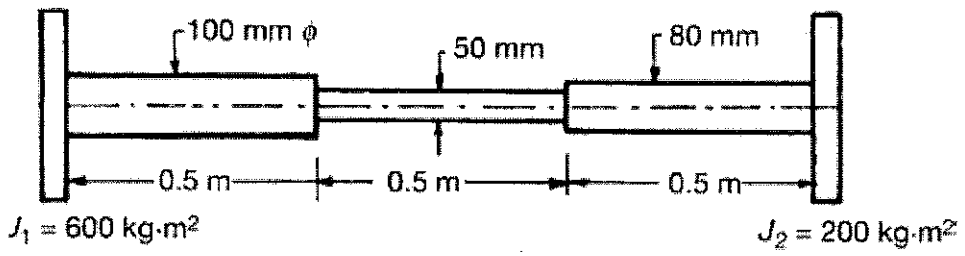


Figure. 1.

14. a) A mass of 5 kg hangs from a spring and makes damped oscillations. If the time of 50 complete oscillations is found to be 20 s, and the ratio of the first downward displacement to the sixth is found to be 22.5, find the stiffness of the spring and the damping coefficient. (16)

(OR)

b) The mass of a machine is 100 kg. Its vibrations are damped by a viscous dash pot which diminishes amplitude of vibrations from 40 mm to 10 mm in three complete oscillations. If the machine is mounted on four springs each of stiffness 25 kN/m, find the periodic time of the damped vibration. (16)

15. a) The arms of a Porter governor are 250 mm long. The upper arms are pivoted on the axis of revolution, but the lower arms are attached to a sleeve at a distance of 50 mm from the axis of rotation. The weight on the sleeve is 600 N and the weight of each ball is 80 N. Determine the equilibrium speed when the radius of rotation of the balls is 150 mm. If the friction is equivalent to a load of 25 N at the sleeve, determine the range of speed for this position. (16)

(OR)

b) A Hartnell governor moves between 300 rpm and 320 rpm for a sleeve lift of 20 mm. The sleeve arms and the ball arms are 80 mm and 120 mm respectively. The levers are pivoted at 120 mm from the governor axis. The weight of each ball is 25 N. The ball arms are parallel to the governor axis at the lowest equilibrium speed. Determine the loads on the spring at the minimum and the maximum speeds. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME202 – Engineering Materials and Metallurgy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between substitutional and interstitial solid solution.
2. What are the limitations of equilibrium diagram?
3. What are the applications of flame hardening?
4. Differentiate annealing and normalizing.
5. List some of the distinct characteristics of engineering ceramics.
6. Write down the advantages of CVD coating techniques.
7. Define the terms slip and twinning.
8. What are the factors affecting creep?
9. Describe the limitations of the NDT method.
10. Define surface engineering.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the microstructure, properties and applications of any two types of Steel and Cast iron. (16)

(OR)

b) Explain the various invariant reactions involved in the system with the help of the Fe - C equilibrium diagram. (16)

12. a) Describe shortly about a short note on: (16)
    1) Hardenability,
    2) Nitriding,
    3) Flame hardening,
    4) Cyaniding.

(OR)

b) Explain TTT diagram with neat sketch and indicate all the phases with microstructure. (16)

13. a) Discuss the properties and application of Al_2O_3 and SiC. (16)

(OR)

b) Describe various matrix materials and reinforcement materials used to make polymer matrix composites. (16)

14. a) Explain in brief the testing of materials to measure tension and compression with a graph and an example. (16)

(OR)

b) What is hardness test and impact test? Explain with a sketch and an example. (16)

15. a) Summarize the principles of various non-destructive methods which are used to detect the material defects. State the advantage of any two NDT method. (16)

(OR)

b) Write short notes on diffusion techniques and importance of surface engineering charts. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME401 – Heat and Mass Transfer

(Use at HMT Data Book is to be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Fourier's law of conduction? Write its mathematical expression.
2. List out the examples for composite geometries in heat conduction.
3. Differentiate between black body and grey body radiation.
4. What factors influence the emissivity of a surface?
5. Write down the basic governing equations for convective heat transfer.
6. How does flow direction affect convective heat transfer over surfaces?
7. List and describe the modes of boiling in heat transfer applications.
8. What are fouling factors, and how do they affect heat exchanger performance?
9. Differentiate between diffusion mass transfer and convective mass transfer.
10. Define mass transfer and its relevance to engineering applications.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A furnace wall is made up of three layers, one of fire brick, one of insulating brick and one of red brick. The inner and outer surfaces are at 870°C and 40°C respectively. The respective co-efficient of thermal conductivities of the layers are 1.0, 0.12, and 0.75 W/m-K and the thicknesses are 22 cm, 7.5 cm and 11 cm respectively. Assuming close bonding of the layer at their interfaces, find the rate of heat loss per unit area per hour and the interface temperatures. (16)

(OR)

b) A hot gas at 325°C flows through a metal pipe of 10 cm OD and 3 mm thick. It is insulated with mineral wool for reducing the heat loss in such a way that the insulation surface temperature should not exceed 50°C. Determine the thickness of insulation required taking the (16)

following data:

h_i=25 W/m²K and h_0=10 W/m²K

T (surrounding air temperature) = 25°C.

k (metal pipe) = 40 W/m-K.

k (mineral wool) = 0.045 W/m-K.

Also calculate the loss of heat per metre length of pipe after adding the insulation.

12. a) Derive the expression for radiative heat transfer between two gray surfaces in an enclosure, considering the effects of emissivity, absorptivity, and reflectivity. (16)

(OR)

b) A glass plate 40 cm x 40 cm in size is used on an electric furnace to view the radiations. The transmissivity of the glass is 0.5 in the wave band of 0.2 μ to 4 μ. The emissivity is 0.3 upto 4μ and 0.9 above that. The transmissivity of the glass is zero except in the range from 0.2 to 4 μ. Calculate the energy absorbed and transmitted by the glass assuming the furnace is a black body at 2000 K. (16)

13. a) Consider a design of nuclear reactor using free convection heating of liquid bismuth. The reactor core is constructed of parallel vertical plates 2 metre high and 1.3 metre wide. Find the maximum possible heat dissipation rate from both sides of each plate if the surface temperature of the plate is not to exceed 950°C and lowest allowable bismuth temperature is 350°C. Properties of Bismuth at mean temperature of 650°C are given below : (16)

$p = 10030$ kg/m³, $k = 11.2$ W/m-K, $\beta = 1.3 \times 10^{-4}$/K.

$\mu = 8.7 \times 10^{-4}$ kg/m-sec Cp = 0.15 kJ/kg-K

(OR)

b) Water flows inside a tube of 50 mm in diameter and 3 metre long at a velocity of 0.8 m/sec. Determine the heat transfer coefficient, if the mean water temperature is 50°C and wall temperature is 70°C. (16)

Properties of water at mean temperature of 60°C:

p =983.2 kg/m³, k = 0.65 W/m-K, $\gamma = 0.478 \times 10^{-6}$ m²/sec.

C_p = 4148 J/kg-K, $\mu = 0.467 \times 10^{-3}$ kg/m-s

14. a) A two pass surface condenser is required for 7000 kW turbo generator which has a steam consumption of 8 kg/kW-hr. The cooling water inlet and outlet temperatures are 32°C and 43°C respectively. The velocity of water in the 2 cm outside diameter and 1.2 mm thick tube is 1.5 m/sec. The desired vacuum is 660 mm of Hg and condensate temperature is not to fall below 50°C. If the dryness fraction of steam at inlet to the condenser is 0.9 and overall heat transfer coefficient is 3000 W/m²-K, find (16)

a) Cooling surface area required.

b) The number of tubes and the length of each tube. Barometer reads 760 mm of Hg

(OR)

b) A heat exchanger has 17.5 m² area available for heat transfer. It is used for cooling oil at 200°C by using water available at 20°C. The mass flow and specific heat of oil are 10000 kg/hr and 1.9 kJ/kg K and the mass flow and specific heat transfer coefficient is 300 W/m²-K. Estimate the outlet temperatures of oil and water for parallel flow and counter flow arrangements by using NTU method. (16)

15. a) A cooling tower is used to cool 100 tons of water per hour from 45°C to 25°C using air at 20°C and 55% R.H. Air leaves the tower at 42°C and 95% R.H. Taking atmospheric air pressure p as 1.03 bar, determine the flow rate of air required per hour and amount of water vapour evaporated per hour. (16)

(OR)

b) Water has been spilled out accidentally through the valve opening of a pipe line on the floor of an industrial plant. The water layer is 1 mm and at 25°C. The air is also at 25°C and 1 atm. The absolute humidity of air is 2 gm per kg of dry air. Determine the time required to evaporate the complete water if the evaporation takes place by molecular diffusion through an air film of 5 mm thick. Take p_1 = 1.03 bar. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME402 – Mechatronics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the main applications of mechatronics?
2. Classify sensors based on the transduction principle.
3. What are the purposes for modeling of a physical system?
4. Find the transfer function of given equation.

$$\frac{d^2y(t)}{dt^2} + 4y(t) = 6r(t)$$

5. What are the factors to be considered for selecting actuators?
6. What do you understand by artificial intelligence?
7. State the classification of PLC based on size.
8. Draw the waveforms for an ON delay timer.
9. Compare traditional and mechatronics systems.
10. Point out the two important operations categories of sensors in engine management.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the concept of mechatronics system with neat block diagram. (16)

(OR)

b) Explain the following; (16)

i) Hall effect sensor

ii) Eddy current proximity sensor

iii) Capacitive proximity sensor.

12. a) i) Find characteristic equation of the following electrical system as shown in the following figure.1. (8)

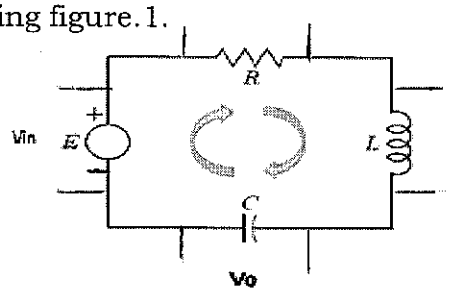


Figure.1.

ii) Explain about liquid level system giving suitable example. Obtain its transfer function. (8)

(OR)

b) i) Develop the transfer function for an electromechanical system. (8)

ii) Develop the characteristic equation for a pneumatic system. (8)

13. a) i) What do you understand by direction control valve? Explain with help of neat sketch functioning of any direction control valve. (8)

ii) Compare various types of drives used in Mechatronics system. (8)

(OR)

b) i) Explain the features of PID controller. (8)

ii) Explain about piezo actuators. (8)

14. a) i) Explain the concept of Ladder logic programming. (6)

ii) Describe the aspects of data handling with respect to Analog I/O in PLC. (10)

(OR)

b) i) Describe the classification of input/output modules of PLC. (6)

ii) Write a ladder diagram program for a three motor system having the following conditions: Motor 1 (M1) starts as soon as the start switch is ON, after 10 seconds M1 goes OFF and motor 2 (M2) starts. After 5 seconds M2 goes OFF and Motor 3 (M3) starts. After 10 seconds M3 goes OFF and M1 starts and cycle is repeated. (10)

15. a) What are the different stages in designing a mechatronics system, explain in detail? (16)

(OR)

b) Design a mechatronics system for an automatic Car Park Systems. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME403 – Design of Transmission Systems

(Use of PSG design data book is permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How the wire ropes are designed? Write any two rope applications.
2. Name four elements in a chain? Give any two applications of chain drive
3. What is meant by undercutting in gears?
4. How number of teeth affects the design of gears?
5. Under what situation bevel gears are used.
6. Why is the efficiency of worm gear drive comparatively low?
7. What does the ray-diagram of gear box indicates?
8. Specify the function of spacers in a gear box.
9. Write the formula for torque transmitted by multiplate clutch.
10. Define Jerk. Name the profile of the cam that gives no Jerk.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Design a V belt drive to the following specification (16)
Power to be transmitted = 75 kW,
speed of the driving wheel (N_1) = 1440 rpm,
speed of the driving wheel (N_2) = 440 rpm,
diameter of the driving wheel (d) = 300 mm,
Centre distance = 2500 mm, service = 16 hrs/ day.

(OR)

b) Design a chain drive to operate a compressor from a 15 kW electric motor at 900 rpm. The compressor is to run at a speed of 300 rpm, the minimum centre distance should be 550 mm. (16)

12. a) Design a spur gear to transmit 22.5 kW at 900 rpm, speed reduction is 2.5, material for pinion and wheel are C15 and Cast iron grade 30. Take pressure angle of 20° and working life of the gears are 10,000 hrs. (16)

(OR)

b) Design a pair of helical gears for the following data: (16)
Power = 7.5 kW, speed of pinion =1440 rpm, speed reduction = 3, pressure angle = 20°, Helix angle = 10°. Select the suitable materials and heat treatment process.

13. a) Design a bevel gear drive, to transmit 10 kW power at 1440 rpm. Gear ratio is 3, and life of gears 10,000 hrs. Pinion and gear are made of C45 steel and minimum number of teeth as 20. (16)

(OR)

b) A hardened steel worm rotates at 1250 rpm and transmits 8 kW to a phosphor bronze gear with gear ratio of 18. Design the worm gear drive and determine the power loss by heat generation. (16)

14. a) A machine tool gear box is to have 9 speeds. The gear box is driven by an electric motor whose shaft rotational speed is 1400 rpm. The gear box is connected to the motor by a belt drive. The maximum and minimum speeds required at the gear box output are 1000 rpm and 200 rpm respectively. Suitable speed reduction can also be provided in the belt drive. What is the step ratio and what are the values of 9 speeds? Sketch the arrangement. Obtain the number of teeth on each gear. (16)

(OR)

b) A screw press is to exert a force of 40 kN. The unsupported length of the screw is 400 mm. Nominal diameter of screw is 50 mm. The screw has square threads with pitch equal to 10 mm. The material of the screw and nut are medium carbon steel and cast iron respectively. For the steel used take ultimate crushing stress as 320 MPa, yield stress in tension or compression as 200 MPa and that in shear as 120 MPa. Allowable shear stress for cast iron is 20 MPa and allowable bearing pressure between screw and nut is 12 N/mm^2, Young's modulus for steel = 210 kN/mm^2. Determine the factor of safety of screw against failure. Find the dimensions of the nut. What is the efficiency of the arrangement? Take coefficient of friction between steel and cast iron as 0.13. (16)

15. a) A power of 20 kW is to be transmitted through a cone clutch at 500 rpm. For uniform wear condition find the main dimensions of clutch and shaft. Also determine the axial force required to engage the clutch. Assume coefficient of friction as 0.25, the maximum normal pressure on the friction surface is not to exceed 0.08 MPa and take the design stress for the shaft material as 40 MPa. (16)

(OR)

b) A radial cam rotates at 1200 rpm with the follower rising 20 mm with SHM in 150° of the cam rotation. The roller is 32 mm in diameter and the prime circle is 80 mm in diameter. Check whether undercutting will occur. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME404 – Dynamics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the conditions for a body to be in static and dynamic equilibrium?
2. Define coefficient of fluctuation of energy.
3. Why rotating masses are to be dynamically balanced?
4. List the effects of partial balancing of locomotives.
5. Define logarithmic decrement.
6. What is vibration isolation?
7. Define node in torsional vibration.
8. What is the natural frequency of torsional vibration of a simple system?
9. How governors are classified?
10. What is meant by isochronous condition in governors?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A horizontal steam engine running at 210 r.p.m has a bore of 190 mm and stroke of 350 mm. The piston rod is 20 mm in diameter and connecting rod length is 950 mm. The mass of the reciprocating parts is 8 kg and the frictional resistance is equivalent to a force of 350 N. Determine the following when the crank is 115^0 from the inner dead center, the mean pressure being 4500 N/m^2 on the cover side and 100 N/m^2 on the crank side i) thrust on the connecting rod and cylinder walls ii) load on the bearings iii) turning moment on the crankshaft. (16)

(OR)

b) The turning moment diagram for a multi cylinder engine is drawn to a scale of 1mm = 600 Nm and 1 mm = 3^0horizontally. The intercepted areas between the output torque curve and the mean resistance line, taken in order from one end are as follows: +52, -124, +92, -140, +85, -72 and +107 mm^2, when the engine is running at a speed of 600 r.p.m. If the total fluctuation of speed is not to exceed $\pm$15 % of the mean, find the necessary mass of the flywheel of radius of gyration 0.5 m. (16)

12. a) A shaft carries four rotating masses A, B, C and D which are completely balanced. The masses B, C and D are 50 kg, 80 kg, and 70 kg respectively. The masses C and D makes an angle of 90^0 and 195^0 respectively with mass B in the same sense. The masses A, B, C and D are connected at radius 75 mm, 100 mm, 50 mm and 90 mm respectively. The plan of rotation of masses B and C are 250 mm apart. Determine i) the magnitude of mass A and its angular position and ii) the position of planes A and D. (16)

(OR)

b) The cranks of a three cylinder locomotive are set at 120^0. The reciprocating masses are 450 kg for the inside cylinder and 390 kg for each outside cylinder. The pitch of the cylinder is 1.2 m and the stroke of each piston is 500 mm. The planes of rotation of the balance masses are 960 mm from the inside cylinder. If 40% of the reciprocating masses are to be balanced, determine the magnitude & position of the balancing masses required at a radial distance of 500 mm and the hammer blow per wheel when the axle rotates at 350 r.p.m. (16)

13. a) A machine mounted on springs and filled with a dashpot has a mass of 100 kg. There are four springs, each of stiffness 25 KN/m. The amplitude of vibrations reduces from 40 mm to 10 mm in three complete oscillations. Assuming that the damping force varies as the velocity, determine the resistance of the dashpot, the ratio of frequencies of damped and undamped vibrations and the periodic time of damped vibrations. (16)

(OR)

b) A single cylinder engine has an out of balance force of 500 N at an engine speed of 300 r.p.m. The total mass of the engine is 150 kg and it is carried on a set of springs of total stiffness 300 N/cm. i) find the amplitude of the steady motion of the mass and the maximum oscillating force transmitted to the foundation. ii) if a viscous damping is interposed between the mass and the foundation, the damping force being 1000 N at 1 m/s of velocity, find the amplitude of forced damped oscillations of mass and its angle of lag with disturbing force. (16)

14. a) The two rotors A and B are attached to the end of a shaft 500 mm long. The mass of the rotor A is 300 kg and its radius of gyration is 300 mm. The corresponding values of the rotor B are 500 kg and 450 mm respectively. The shaft is 70 mm in diameter for the 250 mm, 120 mm for the next 70 mm and 100 mm diameter for the remaining length. The modulus of rigidity for the shaft is 80 GN/m^2. Find the position of the node and the frequency of torsional vibrations. (16)

(OR)

b) Explain with the neat sketch, the working of vibrometer and accelerometer. (16)

15 a) The lengths of the upper and lower arms of a porter governor are 200 mm and 250 mm respectively. Both the arms are pivoted on the axis of rotation. The central load is 150 N, the weight of each ball is 20 N and the friction of the sleeve together with the resistance of the operating gear is equivalent to a force of 30 N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30^0 and 40^0, taking friction into account, find the range of speed of the governor. (16)

(OR)

b) The arms of the Hartnell governor are of equal length. When the sleeve is in the mid-position, the masses rotate in a circle of diameter 200 mm (the arms are vertical in the mid-position). Neglecting friction, the equilibrium speed for this position is 300 r.p.m. Maximum variation of the speed, taking friction into account, is to be $\pm$ 5% of the mid-position speed for a maximum sleeve movement of 25 mm. The sleeve mass is 5 kg and the friction at the sleeve is 30 N. Assuming that the power of the governor is sufficient to overcome the friction by 1% change of speed on each side of the mid-position, find (neglecting obliquity effect of arms) the mass of each rotating ball, the spring stiffness and the initial compression of the spring. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME601 – Engineering Economics and Financial Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate "technical efficiency and economic efficiency".
2. List out the scope of economics.
3. What do you mean by Make or Buy Decisions?
4. Identify the concept of discounting.
5. Point out the limitations of cash flow analysis.
6. List the various techniques of fund flow.
7. What is the time value of money?
8. Identify the sources of finance.
9. Differentiate between a journal and a ledger.
10. What is ratio analysis?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain how managerial economics helps in solving managerial problems. (16)

(OR)

b) What is demand forecasting? Explain any four methods of forecasting. (16)

12. a) A company has to replace an asset after 10 years at an outlay of Rs. 5 lakhs it plans to deposit an equal amount at the end of every year for the next year at an annually compounded interest of 20%. Find the equivalent amount to be deposited at the end of every year for the next 10 years. (16)

(OR)

b) Enumerate the function, and aims of value engineering and discuss the value engineering procedure. (16)

13. a) A company invests in one of the two mutually exclusive alternatives. The life of both alternatives is estimated to be 5 years with the following investment, annual returns & salvage values. (16)

	Alternative	
	A	B
Investment(Rs)	1,50,000	1,75,000
Annual equal return (Rs)	60,000	70,000
Salvage value (Rs)	15,000	35,000

Determine the best alternative based on the annual equivalent method by assuming i = 25%.

(OR)

b) A firm is diversifying into a new business. The life of the business is 10 years without any salvage value at the end of life. The initial outlay required is Rs. 20, 00, 000/- and the annual net profit estimated is Rs. 3, 50,000/-. Find the rate of return for the new business. Check whether the business is worth a cost of capital of 12%. (16)

14. a) i) Explain the components and types of working capital. (8)

ii) Enumerate the scope and objectives of financial management. (8)

(OR)

b) i) What is the need for working capital? Explain the factors affecting it. (8)

ii) Explain the sources of finance available for working capital. (8)

15. a) What do you mean by analysis and interpretation of financial statements? Explain various techniques of analysis. (16)

(OR)

b) Compare and contrast the fund flow statement and cash flow statement and give the advantages of financial statement analysis. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME602 – Finite Element Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Name the different phases of FEM.
2. Write down the difference between the initial value problem and boundary value problem.
3. Distinguish between 1D bar element and 1D beam element.
4. What are the characteristics of shape function?
5. Formulate the [B] matrix for CST element.
6. Write the expression for the stress- strain relationship matrix for a 2-D system.
7. What are isoparametric elements?
8. List the benefits of numerical integration.
9. State the governing equation for two dimensional fluid flow.
10. State the limite element equation for one dimensional heat transfer through a rod.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A simply supported beam is subjected to uniformly distributed load over entire span and it subjected to a point load at the center of the span. Calculate the deflection using Rayleigh - Ritz method and compare with exact solutions. (16)

(OR)

b) Describe the step by step procedure of solving FEA. (16)

12. a) Axial load of 500 N is applied to a stepped shaft, at the interface of two bars. The ends are fixed. Calculate the nodal displacement and stress when the element is subjected to all in temperature of 100°C. (16)

Take $E_1 = 30 \times 10^3$ N/mm^2 and $E_2 = 200 \times 10^3$ N/mm^2 ,

$A_1 = 900$ mm^2 and $A_2 = 1200$ mm^2 ,

$\alpha_1 = 23 \times 10^{-6}$ /°C and $\alpha_2 = 11.7 \times 10^{-6}$ /°C,

$L_1 = 200$ mm and $L_2 = 300$ mm.

(OR)

b) Derive the stiffness matrix for one dimensional beam element. (16)

13. a) Derive an expression for shape function for Constant Strain Triangular Element. (16)

(OR)

b) Calculate the stiffness matrix for the element shown in figure.1 the co-ordinates are given in millimeter. Assume plane stress conditions. Take E = 210000 N/mm^2 , poisson ratio = 0.25 and thickness = 10 mm (16)

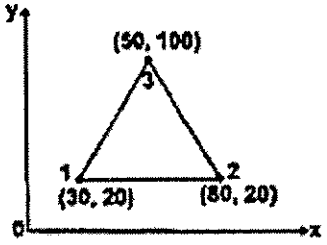


Figure.1

14. a) Derive element stiffness matrix for a linear Isoparametric Quadrilateral element. (16)

(OR)

b) Evaluate using gauss quadrature formula $I = \int_{-1}^{+1} \left[3e^x + x^2 + \frac{1}{(x+2)}\right] dx.$ (16)

15. a) Derive the finite element equation for solving 1D heat transfer in a thin fin problem. (16)

(OR)

b) A Composite slab consists of three materials with thermal conductivities of 20 W/m°K, 30 W/m°K, 50 W/m°K and thickness of 0.3 m, 0.15 m and 0.15 m respectively. The outer surface is at 20°C and the inner surface is exposed to the convective heat transfer coefficient of 25 W/m^2 °K and a medium at 800°C. Determine the temperature distribution within the wall. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME701 – Total Quality Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Give two examples of external failure costs.
2. Identify any two barriers to TQM implementation.
3. Write the importance of measuring customer satisfaction.
4. What do you understand by 5S?
5. Sketch a cause-and-effect diagram for passing this examination.
6. Write the relationship between the standard deviation and the sample size.
7. State the reasons for benchmarking.
8. Write down the outcomes of the FMEA.
9. Give any two benefits of ISO certification.
10. Identify the impacts of audits in ISO.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Elaborate on your perspectives in the dimensions of quality when considering the purchase of a motorbike. (16)

(OR)

b) Discuss your views on how strategic planning helps to improve the performance of an organization of your choice. (16)

12. a) Explain Herzberg's theory and analyze the expected challenges of implementing it in a small-scale industry located near your residence. (16)

(OR)

b) Discuss any eight factors that influence the selection of suppliers for the automotive industry. (16)

13. a) The following table gives the outcomes of the garment industry. Analyze the data with the help of a Pareto diagram and share your views. (16)

Types of Defect	Sleeve Defect	Pocket Defect	Cuff Defect	Collar Defect	Button Defect
Frequency of Defect	3	16	7	10	23

(OR)

b) i) Analyze how a matrix diagram helps people choose a car showroom located in your city with proper justification. (12)

ii) Examine the usage of Six Sigma in the product industry. (4)

14. a) Describe any eight benefits of QFD with a proper explanation. (16)

(OR)

b) Explain the eight pillars of TPM to improve overall equipment efficiency. (16)

15. a) Discuss your strategies if you are instructed to implement the ISO 9001:2008 quality systems at a large-scale foundry located in Tamil Nadu. (16)

(OR)

b) Share your understanding of TS 16949:2002 and how it helps to improve performance. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester(Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22ES101 – Engineering Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State triangular law of forces.
2. State the conditions for a particle to be in equilibrium in space.
3. Sketch the roller and hinge supports showing the reaction components.
4. State Varignon's theorem.
5. Derive moment of inertia of a triangle about the base.
6. Write the expression for centroid of a semi circle.
7. A body of weight 150 N rest on a horizontal plane. If a horizontal force of 50 N can just move it, then what will be the value of coefficient of friction?
8. What you mean by angle of repose?
9. Distinguish between kinetics and kinematics.
10. A particle starting from rest, moves in a straight line and its acceleration is given by $a = 40 - 46t^2$ m/s^2 where t is in seconds. Determine the velocity of the particle when it has travelled 52 m.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A string ABCD, attached to two fixed points A and D has two equal weight of 1000 N attached to it at B and C. The weights rest with the portions AB and CD inclined at an angle of 300 and 600 respectively, to the vertical as shown in Figure.1. Find the tension in the portion AB, BC, CD. (16)

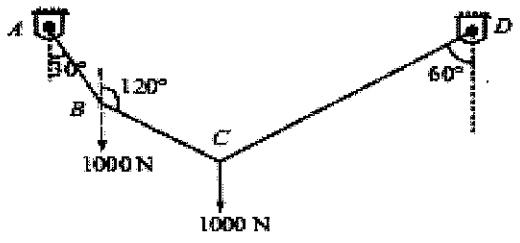


Figure.1.

(OR)

b) Two identical rollers, each of weight 50 N, are supported by an inclined plane and vertical walls as shown in the Figure.2. Find the reactions at the points of supports P, Q and R. Assume all the surfaces to be smooth. (16)

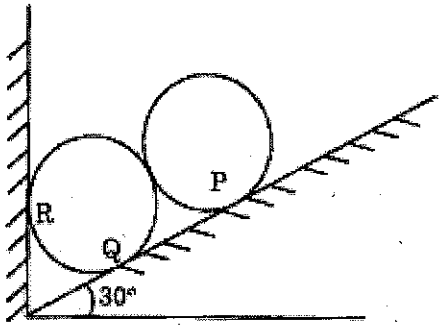


Figure.2

12. a) Find the reactions at supports due to applied load on the beam as shown in Figure.3. (16)

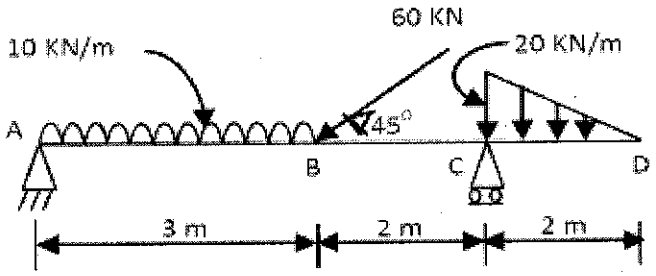


Figure.3

(OR)

b) Calculate the magnitude and line of action of the resultant force with respect to the sides of AB and BC as shown in Figure.4 (16)

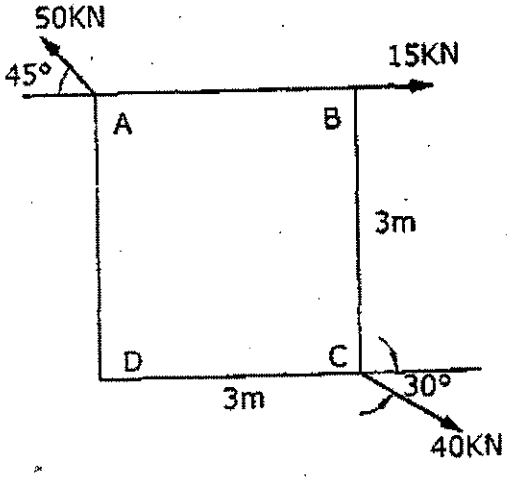


Figure.4

13. a) Determine the co-ordinates of the centroid of the Lamina as shown in the Figure.5. (16)

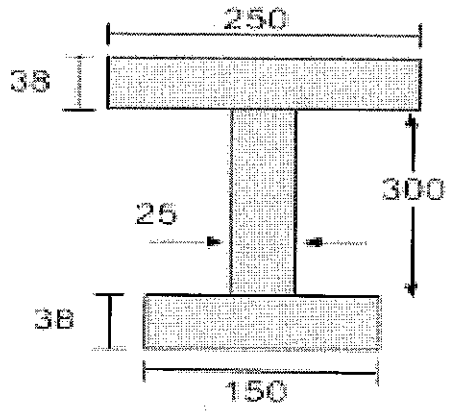


Figure.5

(OR)

b) Find the moment of inertia of a lamina as shown in Figure.6 about x-axis and y-axis through the centroid of the section. (16)

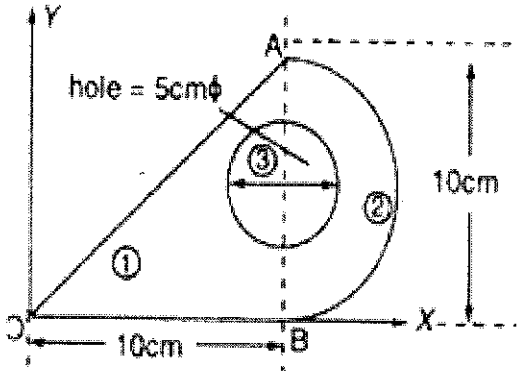


Figure.6

14. a) A pull of 250 N inclined at 250 to the horizontal plane is required just to move a body kept on a rough horizontal plane. But the push required just to move the body is 300 N. If the push is inclined at 250 to the horizontal, find the weight of the body and the coefficient of friction between the body and the plane. (16)

(OR)

b) A 7 m long ladder rests against a vertical wall, with which it makes an angle of 45° and on a floor. If a man whose weight is one half that of the ladder climbs it, at what distance along the ladder will he be, when the ladder is about to slip? Take coefficient of friction between the ladder and the wall is 1/3 and that between the ladder and the floor is ½. (16)

15. a) Two trains A and B leave the same station on parallel lines. A starts with a uniform acceleration of 0.15 m/s^2 and attains the speed of 24 km/hour after which its speed remains constant. B leaves 40 seconds later with uniform acceleration of 0.30 m/s^2 to attain a maximum of 48 km/hour; its speed also becomes constant thereafter. When will B overtake A. (16)

(OR)

b) Two weights 80 N and 20 N are connected by a thread and move along a smooth horizontal plane under the action of a force 40 N, applied to the first weight of 80 N as shown in Figure.7. Find the acceleration of the weights and the tension in the thread. (16)

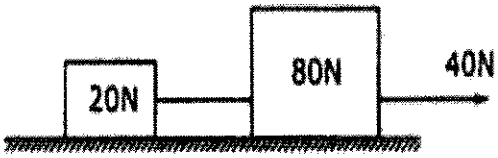


Figure.7

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME503 – Automobile Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Enlist the types of sections used to make the frames.
2. Mention the purpose of 3 -way catalytic convertor.
3. Compare the single point and multi point injection system.
4. State the advantages of electronic ignition system using contact breaker.
5. Write the basic principle of a synchromesh gear box.
6. Differentiate Hotchkiss drive and torque tube drive.
7. Name the parameters checked during the wheel alignment.
8. Recite the benefits of anti-lock brake system.
9. Write the compositions of CNG and LPG.
10. Recall the advantages of fuel cell.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain about the various aerodynamics forces and its influenced moments acting on a fast-moving passenger car. (8)

ii) Explain about the Engine emission control by three-way catalytic converter system. (8)

(OR)

b) i) Explain briefly the various types of chassis construction with the help of suitable diagram. (8)

ii) Explain the construction and working of Turbocharger with a neat sketch. (8)

12. a) i) Explain in detail the working of rotary distribution type fuel injection system. (8)

ii) Explain with the help of a neat diagram about working of a magnetic coil ignition system. (8)

(OR)

b) i) Explain briefly about MPFI fuel supply system used in Automobiles with neat sketch. (8)

ii) Explain briefly the Electronic Engine Management System. (8)

13. a) With the help of a neat sketch, explain the construction and operation of a constant mesh gearbox. (16)

(OR)

b) Explain the construction and working of a differential with a neat sketch. (16)

14. a) i) Explain the probable causes of various steering troubles and suggest suitable remedies. (8)

ii) Explain the functions of rear wheel suspension system. (8)

(OR)

b) i) Discuss how various defects are caused in the braking system of automobiles. Suggest also suitable remedies. (8)

ii) Explain the working principles of Air bag in Automobiles. (8)

15. a) Describe the construction of LPG system in petrol engine, also describe the salient features of using LPG as alternate fuel. (16)

(OR)

b) Describe the components of a Hydrogen Fuel Cell electric vehicle and give typical examples of vehicles based on Fuel Cell. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTMEE07 – Power Plant Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by super critical boiler?
2. What is stoker? Classify it.
3. Compare open cycle and closed cycle gas turbine plant.
4. What is combined cycle power plant? Give its types.
5. How do you cater for safety of nuclear power plant?
6. What is the function of pressurizer on PWR?
7. What are the classifications of geothermal energy?
8. What are the limitations of tidal power plant?
9. What is the use of load curves in power plants?
10. What are the major factors that decide the economics of power plants?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the working of FBC boiler with a neat diagram. (8)

ii) Briefly discuss the commonly used ash handling systems. (8)

(OR)

b) i) Explain the different draught systems. (8)

ii) Describe with the help of a neat sketch the working of induced draught cooling tower. (8)

12. a) Explain in detail about the construction and working of Integrated Gasifier based Combined Cycle system. (16)

(OR)

b) Discuss the essential components of diesel power plant with neat layout. (16)

13. a) Explain the working of a CANDU reactor with a schematic diagram. Also discuss merits and demerits. (16)

(OR)

b) Explain the construction and working of nuclear power plant with a layout. (16)

14. a) i) With a neat diagram explain the working Solar thermal power systems. (8)

ii) Draw the typical layout of hydroelectric power plant and explain its working. (8)

(OR)

b) i) Briefly explain solar PV system. (8)

ii) What are various kinds of fuel cell? Explain the working of any one type of fuel cell. (8)

15. a) What are fixed and operating costs of steam power plant? How are they accounted for fixing cost of electricity? (16)

(OR)

b) Discuss on pollution control and waste disposal in coal and nuclear power stations? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTMEE08 – Rapid Product Development Technologies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Rapid prototyping? Why this is important in industries?
2. Write short notes on the history of RP systems.
3. What is sintering process in SLS technique?
4. Discuss the machine details of DMLS process.
5. List out the process parameters of FDM process.
6. What is the impact of laser speed on quality of LOM products?
7. Describe the function of photomasks in solid ground curing process.
8. Differentiate sander's model maker with object quadra system.
9. How is the Rapid Tooling different from conventional tooling?
10. What is soft tooling and hard tooling?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail the various steps involved in RP processes with neat sketch. (10)

ii) Discuss the role of Rapid prototyping in product development cycle. (6)

(OR)

b) i) Classify RP techniques. Briefly explain the growth of RP systems in various fields such as medical, automobile, Aerospace, electronics, Architectural, art and jewellery. (10)

ii) Describe the advantages and limitations of RP system. (6)

12. a) Explain the various features of Stereo lithography (SLA) with simple sketch. Describe the impact of process parameters on the performance of SLA process. (16)

(OR)

b) With the aid of simple sketch, explain the working of laser based SLS system. List out its advantages, limitations and applications. (16)

13. a) i) Explain the machine details of FDM process with suitable sketch. Detail the need of support structures used in FDM. (12)

ii) List out the advantages of solid based system over liquid based system. (4)

(OR)

b) i) What are the features of LOM process? Describe the process flow of LOM process with neat sketch. (12)

ii) Compare the advantages of LOM and FDM processes. (4)

14. a) Discuss describe the process steps in solid ground curing process with suitable sketch. List out its advantages and disadvantages. (16)

(OR)

b) Compare the process features, advantages, limitations and applications of LENS and BPM processes. (16)

15. a) Classify indirect tooling and direct tooling techniques and explain any three indirect tooling techniques with clear sketch. (16)

(OR)

b) Explain the various software used in RP system. Detail the applications of RP techniques in medical field. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING

22THE73 – Solar Energy Appliances

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the types of solar cell.
2. How the PV Cells are interconnected?
3. Name the various types of solar cookers.
4. Label some of the applications of the solar cookers.
5. How the solar dryer is better than conventional dryers?
6. List some of the applications of hybrid dryer.
7. Show the need of solar desalination.
8. Compare desalination and electro dialysis process.
9. Tell some of the limitations of solar furnace in industries.
10. Why sun tracking is essential?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Construct the working principle of a solar cell with a suitable diagram.	(12)
		ii)	Explain the function of solar lanterns?	(4)
			(OR)	
	b)	i)	Develop the solar home lighting system.	(12)
		ii)	List out the steps involved in rural electrification process.	(4)
12.	a)		With a neat sketch construct the working of paraboloidal cooker.	(16)
			(OR)	
	b)		Evaluate the testing expressions of solar cookers. How to determine efficiency is it?	(16)

13. a) Examine the functions of mixed mode solar dryer with a neat sketch. (16)

(OR)

b) Develop the circular and rectangular beep bed grain dryer with a proper sketch. (16)

14. a) Explain the working of a simple solar still with a neat sketch. (16)

(OR)

b) Examine in detail about the synergetic effect of UV-A radiation and temperature of SODIS. (16)

15. a) i) Explain the various types of solar furnaces with an appropriate layout. (10)

ii) Explain the components of solar furnaces. (6)

(OR)

b) i) Construct with sketch about the multiple heliostats solar furnace. (10)

ii) Explain about single concentrator furnace. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

MECHANCIAL ENGINEERING

18ME301 – Manufacturing Processes

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Select the suitable casting method to fabricate gas turbine blades.
2. List the various types of casting defects.
3. Distinguish between soldering and brazing.
4. Why TIG is preferred to weld aluminium and magnesium as compared to other welding processes?
5. List the properties of cutting tools.
6. State the principle behind ultrasonic machining.
7. Differentiate between thermoplastics and thermosetting plastics.
8. Why is forming is preferred for manufacturing components that requires high mechanical strength?
9. Define the term sintering.
10. What is the forming method used to fabricate collapsible tooth paste tubes?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail about the working principle of centrifugal casting. (8)

ii) Briefly explain the different components of casting and procedure to make sand mould. (8)

(OR)

b) With neat sketch, explain the procedure to fabricate a component using investment casting. (16)

12. a) Briefly explain the following types of welding. (16)

(a) Resistance welding

(b) Thermit welding

(OR)

b) Explain in detail about the construction and working principle of plasma arc welding along with its merits and demerits. (16)

13. a) With help of neat diagrams explain the components and working of Capstan lathe. (16)

(OR)

b) Explain the construction and working of machining process which uses high velocity abrasive particles for metal removal with neat sketch. (16)

14. a) Briefly explain the following types of welding. (16)

1) Film blowing

2) Blow moulding

(OR)

b) Briefly explain the following types of moulding (16)

1) Compression moulding

2) Transfer moulding

15. a) A connecting rod for IC engine is to be fabricated. Select the suitable forming process and explain the step by step procedure to fabricate the same. (16)

(OR)

b) Explain in detail about the steps involved in powder metallurgy process along with the advantages and limitations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME401 – Kinematics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the degree of freedom of a mechanism.
2. Differentiate between Rigid bodies and Resistant Bodies.
3. Write the relation between the number of instantaneous centre and the number of links in a mechanism.
4. Find the resultant acceleration of an 80 mm radius crank rotating at a constant angular velocity of 10 rad/s, at the crank — pin position.
5. Write down the classification of cams according to the manner of constraint of the follower.
6. Draw the displacement, velocity and acceleration diagram for a follower when it moves with simple harmonic motion?
7. State the law of Gearing.
8. Differentiate between ordinary gear train and epicyclic gear train.
9. What are the laws of solid dry friction?
10. In an open belt drive of horizontal type, the slack side of belt should be kept on the top side of pulleys. Why?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the working principle of Whitworth Quick-Return Mechanism. (8)

ii) Derive an expression to find the length of the stroke for the quick return mechanism. (8)

(OR)

b) i) Explain the inversions of Slider Crank Mechanisms with suitable examples. (8)

ii) Find the degrees of freedom for the mechanisms shown in the figure.1. (8)

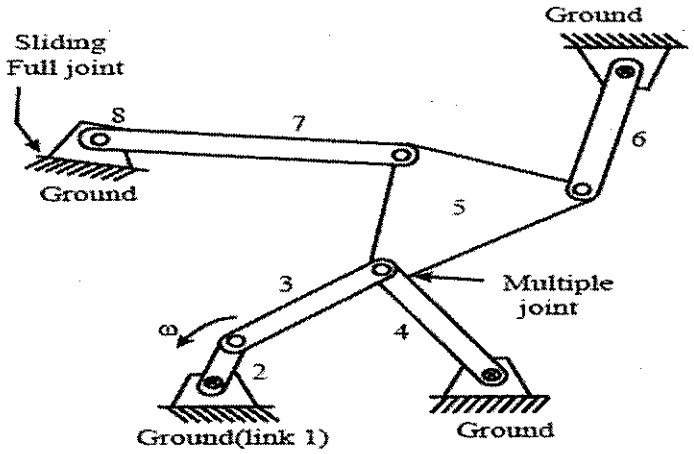


Figure.1.

12. a) In a slider-crank mechanism, the length of crank OB and connecting rod AB are 125 mm and 500 mm respectively. The centre of gravity G of connecting rod is 275 mm from slider A. The crank speed is 600 rpm clockwise. When the crank has turned 45° from inner-dead centre position, determine velocity of slider A, velocity of point G and angular velocity of the connecting rod AB. (16)

(OR)

b) The crank of a slider crank mechanism is 15 cm and the connecting rod is 60 cm long. The crank makes 300 rpm in the clockwise direction. When it has turned 45° from the inner dead centre position, determine i) acceleration of the mid-point of the connecting rod and ii) angular acceleration of the connecting rod. (16)

13. a) A cam is designed for a knife edge follower with following data: (16)

— Cam lift = 40 mm during 90° of cam rotation with SHM.

— Dwell for next 30°.

— During the next 60° of cam rotation, the cam follower returns to original position with SHM.

— Dwell for the remaining 180°.

— Draw the profile of the cam when the line of stroke is offset 20 mm from the axis of the camshaft. Radius of base circle of Cam is 40 mm.

(OR)

b) Follower type = roller follower, lift = 25 mm; base circle radius = 20 mm; roller radius = 5 mm; out stroke with UARM, for 120° cam rotation; dwell for 60° cam rotation; return stroke with UARM, 90° cam rotation; dwell for the remaining period. Determine max. velocity and acceleration during out stroke and return stroke if the cam rotates at 1200 rpm in counterclockwise direction. Draw the cam profile for conditions with follower off set to right of cam center by 5 mm. (16)

14. a) Two gear wheels mesh externally to give a velocity ratio of 3:1. The involute teeth have 6 mm module and 20° pressure angle. The addendum has 1 module. The pinion rotates at 90 rpm. Determine: (16)

a) Number of teeth an pinion to avoid interference and the corresponding number on the Wheel and Arc.
b) The length of Path and Arc of contact.
c) Contact Ratio.
d) The maximum velocity of sliding.

(OR)

b) i) Explain the sub classification of compound gear train with neat sketches. (8)

ii) In the epicyclic gear train shown in Fig. 2 the compound wheels A and B as well as interval wheels C and D rotate independently about the axis O. The wheels E and F rotate on the pins fixed to the arm G. All the wheels are of the same module. The number of teeth on the wheels are $T_A = 52$, $T_B = 56$, $T_E = T_F = 36$. Determine the speed of C if the wheel D fixed and arm a rotates at 200 rpm clockwise. (8)

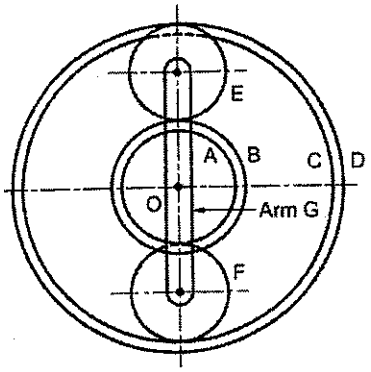


Figure.2.

15. a) i) Compare sliding and rolling friction. (8)

ii) A single plate clutch transmits 20 KW 900 rpm. The maximum pressure intensity between plates is 85 KN/m². The outer diameter of the plate is 360 mm. Both the sides of the plate are effective and the coefficient of friction is 0.25. Determine the inner radius of the plate and axial force to engage the clutch. (8)

(OR)

b) i) Discuss the friction in bearing and brakes with suitable examples. (8)

ii) The external and internal radii of a friction plate of a single clutch are 120 mm and 60 mm respectively. The total axial thrust with which the friction surfaces are held together is 1500 N. For uniform wear, find the maximum, minimum and average pressure on the contact surfaces. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME402 – Applied Thermodynamics

(Thermodynamic tables, Molierdiagram, Psychometric chart Book and Steam Table may be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the important requirements of fuel injection system.
2. What are the factors that affect the knocking?
3. What are the assumptions made for air standard cycle analysis?
4. Draw the p-V and T-s diagram for Brayton cycle and show the state and the process on it.
5. Define coefficient of nozzle or nozzle efficiency.
6. Differentiate impulse and reaction steam turbines.
7. What do you mean by perfect intercooling?
8. Compare rotary compressor over reciprocating compressor.
9. List the important properties of a good refrigerant.
10. What is the difference between air conditioning and refrigeration?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A trial carried out on a four stroke, single cylinder gas engine gave the following results. Cylinder diameter gas engine gave the following results. Cylinder diameter – 300 mm; engine stroke – 500 mm; clearance volume – 6750 cm^3; explosions per minute – 100; indicated mean effective pressure – 765 kN/m^2; net load on the brake – 190 kg; brake diameter – 1.5 m; rope diameter – 2.5 cm; speed – 240 rpm; gas used – 30 m^3/hr; calorific value of gas – 20,515 kJ/m^3. Determine a) compression ratio b) mechanical efficiency, c) indicated thermal efficiency, d) air standard efficiency and e) relative efficiency. Assume $\gamma = 1.4$ for air. (16)

(OR)

b) Explain the construction and working principle of pressure lubrication system with neat sketch. Also state its advantages and disadvantages. (16)

12. a) An engine uses air as the working substance. At the beginning of compression the pressure is 90 kN/m^2 and the temperature 40°C. During the adiabatic compression, the volume is reduced to one-sixteenth of its value at the beginning of compression stroke. Heat is then added at constant pressure until the temperature is 1400°C. The stroke is completed by adiabatic expansion until the initial volume is reached, when the cycle is closed by a constant volume. Take $\gamma = 1.4$; $C_p = 1.004$ kJ/kg.K. (16)

(a) Sketch the p-V diagram for the engine.

(b) Determine the thermal efficiency of the cycle.

(c) Calculate the pressure and temperature at all points of the cycle.

(OR)

b) Compare and discuss the actual and theoretical PV diagram of four stroke petrol engine with the help of PV diagram. (16)

13. a) Steam enters a group of nozzles of a steam turbine at 12 bar and 220°C and leaves at 1.2 bar. The steam turbine develops 220 kW with a specific steam consumption of 13.5 kg/kWh. If the diameter of nozzles at throat is 7 mm, calculate the number of nozzles. (16)

(OR)

b) The blade angle of a single ring of an impulse turbine is 300 m/s and the nozzle angle is 20°. The isentropic heat drop is 473 kJ/kg and nozzle efficiency is 85%. Given the blade velocity coefficient is 0.7 and the blades are symmetrical, Draw the velocity diagram and calculate for a mass flow of 1 kg/s; i) axial thrust on balding ii) steam consumption per BP hour if the mechanical efficiency is 90% iii) blade efficiency and stage efficiency. (16)

14. a) A single acting single stage reciprocating air compressor has a bore of 200 mm and a stroke of 300 mm. It runs at a speed of 500 rpm. Air is compressed according to the law $P.V^{1.3} = C$, from a pressure of 97 kN/m^2 and compression pressure is 550 kN/m^2. Air is delivered at this pressure. The initial temperature is 20°C. Determine: i) the delivery temperature ii) the amount of air delivered and iii) the power required to drive the compressor. Neglect clearance and assume R = 0.29 kJ/kgK. (16)

(OR)

b) A two- stage acting reciprocating compressor takes in air at the rate of 0.2 m^3/s. The intake pressure and temperature of air 0.1 MPa and 16°C. The air is compressed to a final pressure of 0.7 Mpa. The intermediate pressure is ideal and intercooling is perfect. The compression index in both the stages is 1.25 and the compressor runs at 600 rpm. Neglecting clearance determine: (16)

i. The intermediate pressure

ii. The total volume of each cylinder,

iii. The power required to drive the compressor and

iv. The rate of heat rejection in the intercooler.

Take cp = 1.005 kJ/kg K and R = 0.287 kJ/kg K.

15. a) Explain the construction and working principle of vapour compression refrigeration system with neat sketch. Also state its advantages and disadvantages. (16)

(OR)

b) Following data refers to an air conditioning system to be designed for an industrial process for hot and wet climate: (16)

Outside conditions = 30° C DBT and 75% RH

Required inside conditions = 20° C DBT and 60% RH

The required condition is to be achieved first by cooling and dehumidifying and then by heating. If 20 m^3 of air is absorbed by the plant every minute, find: 1. capacity of the cooling coil in tonne of refrigeration; 2. capacity of the heating coil in kW and 3. Amount of water removed per hour.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME403 – Fluid Mechanics and Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Calculate the sp.weight, density and sp.gravity of one litre of liquid which weights 7 N.
2. The gauge pressure at the surface of a liquid of density 900 kg/m^3 is 0.4 bar. If the atmospheric pressure is 1×10^5 Pa, calculate the absolute pressure at a depth of 50 m.
3. State Bernoulli's theorem.
4. Show that the equation $v = \sqrt{2}\,gh$ is dimensionally homogeneous.
5. State significance of Navier-stokes equation.
6. Differentiate between Laminar and Turbulent flows.
7. Name the major components of Kaplan turbine.
8. Write the function of draft tube in reaction turbine.
9. Mention the main parts of the centrifugal pump.
10. Write the uses of indicator diagram in pumps.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Calculate the Capillary rise in a glass tube of 2.5 mm diameter when immersed vertically in (a) water and (b) mercury. Take surface tensions σ = 0.0725 N/m for water and σ = 0.52 N/m for mercury in contact with air. The specific gravity for mercury is given as 13.6 and angle of contact is 130°. (16)

(OR)

b) "U" tube manometer is used to measure water in a pipeline which is in excess of atmosphere pressure. The right limb of the manometer contains mercury and is open to atmosphere. The contact between water and mercury is in the left limb. Calculate the pressure of water (16)

in the mainline if the difference in level of mercury in the limbs is 10.5 cm and. the free surface of mercury is in level with centre of pipe. If the pressure of water in the pipeline is reduced by

1) 10000 N/m^2 and

2) 12000 N/m^2.

Find the new difference if level of mercury.

12. a) Derive the continuity equation in cartesian coordinates. (16)

(OR)

b) The drag force (F) on a partially submerged body depends on the relative velocity (V) between the body and the fluid, characteristic linear dimension (l), height of surface roughness (k), fluid density (ρ), the viscosity (μ) and the acceleration due to gravity (g). Obtain an expression for the drag force, using the method of dimensional analysis. (16)

13. a) Derive an expression for steady laminar flow in circular pipes and prove that Umax/V = 2 .Draw the necessary sketches. (16)

(OR)

b) i) With a neat sketch, explain 'Pipes in parallel'. (6)

ii) A 150 mm diameter pipe reduces in diameter abruptly to 100 mm. If the pipe carries water at 30 Liters/Sec, Calculate the pressure loss across the contraction and express this as a percentage of the loss to be expected if the flow was reversed. Take the coefficient of contraction as 0.6. (10)

14. a) Briefly describe the function of various main components of Pelton turbine with neat sketch. (16)

(OR)

b) The following data is given for a Francis turbine. Net head = 60 m, speed N = 700 rpm, shaft power = 294.3 kW, overall efficiency = 93 %, hydraulic efficiency = 90 %, flow ratio = 0.20, breath ratio = 0.1, outer diameter of runner = 2 x inner diameter of runner, the thickness of vanes occupies 5 % of circumferential area of runner, velocity of flow is constant at inlet and outlet and discharge is radial at outlet. Evaluate (16)

i) Guide blade angle

ii) Runner vane angle at inlet and outlet

iii) Diameter of runner at inlet and outlet

iv) Width of the wheel at inlet.

15. a) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm works against a total head of 40 m, the velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm, determine: (16)

i) vane angle at inlet

ii) work done by impeller on water per second and

iii) manometric efficiency.

(OR)

b) Explain the working principle of single and double acting reciprocating pumps with neat diagram in detail. Also explain the effects of inertia pressure and friction on the performance of the pump using indicator diagrams with and without air vessel. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME404 – Strength of Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define factor of safety and explain its importance in design.
2. Determine the poisson's ratio of a material for which young's modulus is 1.2×10^5 N/mm^2 and modulus of rigidity is 4.8×10^4 N/mm^2.
3. What is the difference between uniformly distributed load and uniformly varying load?
4. Drive the section modulus for circular section.
5. What do you mean by fixed beam and continuous beam?
6. What is equivalent length of a column?
7. What are the stresses acting on a thick cylinder when it is subjected to internal radial pressure?
8. How do you distinguish between thin and thick cylinders?
9. Write the assumptions made in the derivation of torsion equation.
10. Mention the applications of springs in automobile industry.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A steel bar of 10 mm diameter is subjected to an axial load of 12 kN. If the change in diameter is found to be 0.0022 mm, determine Poisson's ratio, the modulus of elasticity and the bulk modulus. Take G = 78 GPa. (16)

(OR)

b) The stresses on two perpendicular planes through a point are 120 MPa tensile and 80 MPa compression along with 60 MPa shear. Determine the normal and shear stress components on a plane at 60° to that of the 120 MPa stress and also the resultant and its inclination with the normal components on the plane. (16)

12. a) A cantilever 1.5 m long is loaded with a uniformly distributed load of 2 kN/m run over a length of 1.25 m from the free end. It also carries a point load of 3 kN at a distance of 0.25 m from the free end as given figure.1. Draw the shear force and bending moment diagram of the cantilever. (16)

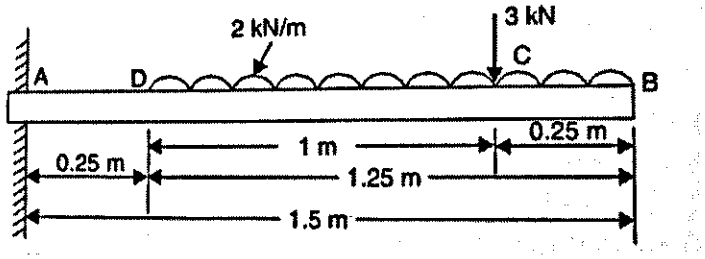


Figure.1.

(OR)

b) A beam of I-section is having overall depth as 500 mm and overall width as 190 mm. The thickness of flanges is 25 mm whereas the thickness of the web is 15 mm. The moment of inertia about N. A is given as 6.45×10^8 mm^4. If the section carries a shear force of 40 kN, calculate the maximum shear stress. Also sketch the shear stress distribution across the section. (16)

13. a) A cantilever of length 3 m carries a uniformly distributed load of 15 kN/m over a length of 2 m from the free end. If I = 10^8 mm^4 and E = 2×10^5 N/mm^2, find (16)

1) slope at the free end
2) deflection at the free end.

(OR)

b) The external and internal diameter of a hollow cast-iron column are 5 cm and 3 cm respectively. If the length of the column is 4 m and both of its ends are fixed, determine the crippling load using Rankine's formula. Take the value of σ_c = 550 N/mm^2 and $\alpha = 1/1600$ in rankine's formula. (16)

14. a) Derive the expression for circumferential and volumetric strain produced in a thin cylinder when subjected to internal fluid pressure 'p'. (16)

(OR)

b) Determine the maximum and minimum hoop stress across the section of a pipe of 400 mm internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8 N/mm^2. Also sketch the radial pressure distribution and hoop stress distribution across the section. (16)

15. a) A hollow shaft of diameter ratio 4/8 (internal diameter to external diameter) is to transmit 350 kW power at 100 r.p.m. the maximum torque being 25% greater than the mean. The shear stress is not to exceed 60 N/mm^2 and twist in a length of 4 m not to exceed 2°. Calculate its external and internal diameters which would satisfy both the above conditions. Assume modulus of rigidity, $C = 0.85 \times 10^5 N/mm^2$. (16)

(OR)

b) An open-coiled helical spring has 10 coils and is made out of a 12 mm diameter steel rod. The mean diameter of the coils is 80 mm and the helix angle 15°. Find the deflection under an axial load of 250 N. What are the maximum intensities of direct and shear stresses induced in the section of the wire? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME501 – Heat and Mass Transfer

(Heat and Mass Transfer Data Book may be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down the equation for conduction of heat through a hollow cylinder.
2. State the applications of fins.
3. What is the significance of boundary layer?
4. Define critical Reynolds number.
5. Differentiate film wise and drop wise condensation.
6. What is meant by Fouling factor?
7. Compare absorptivity, reflectivity and transmissivity.
8. State Wien's displacement law.
9. Give the examples of mass transfer.
10. What is forced convective mass transfer?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive an expression for general heat conduction equation in cylindrical coordinates. (16)

(OR)

b) i) A furnace wall made up of 7.5 cm of fire plate and 0.65 cm of mild steel plate. Inside surface exposed to hot gas at 650°C and outside air temperature 27°C. The convective heat transfer coefficient for inner side is 60 W/m^2K. The convective heat transfer co-efficient for outer side is 8 W/m^2K. Calculate the heat lost per square meter area of the furnace wall and also find outside surface temperature. (8)

ii) Copper plate 2 mm thick is heated up to 400°C and quenched into water at 30°C. Find the time required for the plate to reach the temperature of 50°C. Heat transfer co-efficient is 100 W/m^2K. Density of copper is 8800 kg/m^3. Specific heat of copper = 0.36 kJ/kg K. Plate dimensions = 30 x 30 cm. (8)

12. a) Air at 25°C flows past a flat plate at 2.5 m/s. the plate measures 600 mm X 300 mm and is maintained at a uniform temperature at 95°C. Calculate the heat loss from the plate, if the air flows parallel to the 600 mm side. How this heat loss would be affected if the flow of air is made parallel to the 300 mm side. (16)

(OR)

b) A thin 100 cm long and 10 cm wide horizontal plate is maintained at a uniform temperature of 150°C in a large tank full of water at 75°C. Estimate the rate of heat to be supplied to the plate to maintain constant plate temperature as heat is dissipated from either side of plate. (16)

13. a) A vertical flat plate in the form of fin is 500 m in height and is exposed to steam at atmospheric pressure. If surface of the plate is maintained at 60°C. calculate the following. (16)

1. The film thickness at the trailing edge
2. Overall heat transfer coefficient
3. Heat transfer rate
4. The condensate mass flow rate.

(OR)

b) A parallel flow heat exchanger is used to cool 4.2 kg/min of hot liquid of specific heat 3.5 kJ/kg K at 130°C. A cooling water of specific heat 4.18kJ/kg K is used for cooling purpose of a temperature of 15°C. The mass flow rate of cooling water is 17 kg/min. calculate the following. (16)

1. Outlet temperature of liquid
2. Outlet temperature of water
3. Effectiveness of heat exchanger

14. a) Two large parallel planes at 800 K and 600 K have emissivities of 0.5 and 0.8 respectively. A radiation shield having an emissivity of 0.1 on one side and an emissivity of 0.05 on the other side is placed between the plates. Calculate the heat transfer rate by radiation per square meter with and without radiation shield. Common on the results. (16)

(OR)

b) Two parallel plates of size 1.0 m by 1.0 m spaced 0.5 m apart are located in a very large room, the walls of which are maintained at a temperature of 270°C. One plate is maintained at a temperature of 9000°C and other at 4000°C. their emissivities are 0.2 and 0.5 respectively. If the plates exchange heat between themselves and the surroundings, find the net heat transfer to each plate and to the room. Consider only the plate surface facing each other. (16)

15. a) i) State and explain Fick's law of diffusion. (6)

ii) A vessel contains a binary mixture of O_2 and N_2 with partial pressure in the ratio of 0.21 and 0.79 at 15°C. The total pressure of the mixture is 1.1bar. Calculate the Following. (10)

1. Molar concentration,
2. Mass densities,
3. Mass fractions,
4. Molar fractions.

(OR)

b) Dry air at 20°C [ρ =1.2 kg/m^3, γ = 15 x 10^{-6} m^2/s, D = 4.2 x 10^{-5} m^2/s] flows over a flat plate of length 50 cm which is covered with a thin layer of water at a velocity of 1 m/s. Estimate the local mass transfer co-efficient at a distance of 10 cm from the leading edge and the average mass transfer co-efficient. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME503 – Metrology and Quality Control

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between accuracy and Precision.
2. List some of the characteristics of systematic error.
3. Why measuring instruments should be calibrated?
4. What are the requirements of a good comparator?
5. What is involute tooth profile?
6. Differentiate between addendum and Dedendum?
7. What are the methods used for surface finish?
8. Compare roughness and waviness?
9. Differentiate between control chart and scatter chart.
10. What are the benefits of Total Quality Management?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) State Abbe's principle of alignment. Explain it with suitable examples. (8)

ii) Illustrate the three stages of a generalized measurement system with a neat sketch. (8)

(OR)

b) i) Illustrate the factors to be considered for the selection of the instrument. (8)

ii) Differentiate between random and systematic errors and discuss how to reduce the same, if possible, with suitable examples. (8)

12. a) i) What is wringing of slip gauges? State the working principles and conditions for wringing slip gauges with a neat sketch. (8)

ii) Illustrate with a suitable diagram showing the working mechanism of a dial indicator. (8)

(OR)

b) i) Which comparator is most helpful in measuring the roundness and taperness of the cylinder bore? Explain it working with a neat sketch. (8)

ii) Illustrate an optical comparator's construction and working principle with a neat sketch. (8)

13. a) i) Design a general type plug gauge for checking a hole dimension $30^{+0.05}_{-0.03}$. Consider both wear allowance and gauge tolerance as 10 % of work tolerance. (8)

ii) Illustrate the various configurations available in CMMs? With neat diagrams, explain the merits and demerits of the different configurations. (8)

(OR)

b) i) Illustrate with a neat sketch, the use of the "Vernier gear tooth caliper" to measure the chordal thickness of the gear tooth on the pitch circle. (8)

ii) Calculate the setting of a gear tooth vernier caliper for a straight spur having 30 teeth of module 5. (8)

14. a) i) Examine the various qualitative methods of surface finish measurement. Explain any one with a neat sketch. (8)

ii) The surface roughness height of successive ten peaks and troughs was measured from a datum of 33, 25, 30, 19, 22, 27, 29, 20, 18, and 32 microns. If these measurements were obtained on 10 mm length, determine CLA and RMS values of surface roughness. (8)

(OR)

b) i) Illustrate the sampling plans with suitable examples and explain in detail? (8)

ii) Control Charts for X and R are maintained for control of an important dimension of a component. The sub group size is settled as 5. The values of $\bar{X}$ and R are computed for each sub group and the values of $\sum\bar{X}$ and $\sum R$ and are computed for each group and the value of $\sum\bar{X}$ and $\sum R$ after 25 subgroups are found to be 614.8 and 120.0 respectively. Compute the value of 3- sigma limits for the chart. Assume $\check{R} = 2.326\ \sigma$. (8)

15. a) i) What do you mean by six-sigma? Describe with suitable example. (8)

ii) Illustrate the methodology for system improvement using six-sigma. State various certifications used in six-sigma. (8)

(OR)

b) i) Illustrate the cause and effect diagram with suitable examples? (8)

ii) List out the seven tools of quality control? And explain about it? (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME504 – Dynamics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between static force analysis and dynamic force analysis.
2. Define piston effort and crank effort.
3. State the conditions for complete balance of several masses revolving in different planes of a shaft.
4. What is hammer blow in locomotives?
5. Define frequency, cycle and period.
6. What are the different types of damping?
7. Write the formula for free torsional vibrations of a single rotor system.
8. What is meant by torsionally equivalent length of a shaft?
9. Differentiate between governor and fly wheel.
10. What is meant by sensitiveness of a governor?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The equation of the turning moment curve of a three crank engine is $(5000 + 1500 \sin 3\theta)$ N-m, where θ is the crank angle in radians. The moment of inertia of the flywheel is 1000 kg-m^2 and the mean speed is 300 r.p.m. Calculate : a) power of the engine and b) the maximum fluctuation of the speed of the flywheel in percentage when i) the resisting torque is constant and ii) the resisting torque is $(5000 + 600 \sin\theta)$ N-m. (16)

(OR)

b) The length and connecting rod of a horizontal reciprocating engine are 200 mm and 1 meter respectively. The crank is rotating at 400 rpm. When the crank has turned 30° from the inner dead center, the difference of pressure between cover end and piston rod is 0.4 N/mm^2. If the mass of the reciprocating parts is 100 kg and a cylinder bore is 0.4 meters calculate i) Inertia force ii) Force on piston iii) Piston effort iv) Thrust on the side of the cylinder walls v) Thrust in the connecting rod vi) Crank effort. (16)

12. a) A shaft carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100° and that between the masses at B and A is 190° both being measured in the same direction. The axial distance between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance Determine: 1) The magnitude of the masses at A and D 2) the distance between planes A and D and 3) the angular position of the mass at D. (16)

(OR)

b) A four crank engine has the two outer cranks set at 120° to each other, and their reciprocating masses are each 400 kg. The distance between the planes of rotation of adjacent cranks are 450 mm, 750 mm and 600 mm. If the engine is to be in complete primary balance, find the reciprocating mass and the relative angular position for each of the inner cranks. If the length of each crank is 300 mm, the length of each connecting rod is 1.2 m and the speed of rotation is 240 r.p.m., what is the maximum secondary unbalanced force? (16)

13. a) A shaft 2.5 m long, supported in flexible bearings at the ends carries two wheels each of 75 kg mass. One wheel is situated at the centre of the shaft and the other at a distance of 625 mm from the centre towards left. The shaft is hollow of external diameter 80 mm and internal diameter 40 mm. The density of the shaft material is 7700 kg/m^3 and its modulus of elasticity is 200 GN/m^2. Find the lowest whirling speed of the shaft, taking into account the mass of the shaft. (16)

(OR)

b) The measurements on a mechanical vibrating system show that it has a mass of 8 kg and that the springs can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating system have a dashpot attached which exerts a force of 40 N when the mass has a velocity of 1 m/s, Find: i) Critical damping coefficient ii) Damping factor iii) Logarithmic decrement and iv) Ratio of two consecutive amplitudes. (16)

14. a) A 4-cylinder engine and flywheel coupled to a propeller are approximated to a system in which the engine is equivalent to a rotor of moment of inertia 800 kg-m^2, the flywheel to a second rotor of 320 kg-m^2 and the propeller to a third rotor of 20 kg-m^2. The first and second rotors being connected by 50 mm diameter and 2 m long shaft and the second and third rotors being connected by a 25 mm diameter and 2 m long shaft. Neglecting the inertia of the shaft and taking its modulus of rigidity as 80 GN/m^2, Determine i) Natural frequencies of torsional oscillations and ii) The positions of the nodes. (16)

(OR)

b) A steel shaft ABCD 1.5 m long has flywheel at its ands A and D. The mass of the flywheel A is 600 kg and has a radius of gyration of 0.6 m. The mass of the flywheel D is 800 kg and has a radius of gyration of 0.9 m. The connecting shaft has a diameter of 50 mm for the portion AB which is 0.4 m long; and has a diameter of 60 mm for the portion BC which is 0.5 m long; and has a diameter of 'd' mm for the portion CD which is 0.6 m long. Determine: (16)

i) The diameter 'd' of the portion CD so that the node of the torsional vibration of the system will be at the center of the length BC; and

ii) The natural frequency of the torsional vibrations. The modulus of rigidity for the shaft material is 80 GN/m^2.

15. a) In a porter governor, each of the four arms is 400 mm long. The upper arms are pivoted on the axis of the sleeve, whereas the lower arms are attached to the sleeve at a distance of 45 mm from the axis of rotation. Each ball has a mass of 8 kg and the load on the sleeve is 60 kg. What will be the equilibrium speeds for the two extreme radii of 250 mm and 300 mm of rotation of the governor balls? (16)

(OR)

b) The radius of rotation of the balls of a Hartnell governor is 80 mm at the minimum speed of 300 r.p.m. Neglecting gravity effect, determine the speed after the sleeve has lifted by 60 mm. Also determine the initial compression of the spring, the governor effort and the power. The particulars of the governor are given below: Length of ball arm = 150 mm, length of sleeve arm = 100 mm, mass of each ball = 4 kg and stiffness of the spring = 25 N/mm. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VIII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE53 – Nuclear Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write any one equation of uranium during its fission process.
2. Define isomers.
3. What are the important characteristics of nuclear fuel?
4. What is evaluation equation?
5. What is a yellow cake?
6. What is a MOX fuel? Give an example.
7. What is the purpose of control rod in nuclear reactor?
8. Define breeding ratio.
9. Name any three important sources of radioactive waste.
10. Write the main safety systems used in nuclear power plant.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Explain the different possibilities of radioactivity with suitable examples.	(16)
		(OR)	
	b)	Calculate the power of a nuclear reactor which consumes 4kg of U 235 per day. (given average energy released U 235 fission is 200Mev).	(16)
12.	a)	Describe the step-by-step procedure followed in the production of zirconium.	(16)
		(OR)	
	b)	Explain the acidic method followed in the purification of uranium with necessary flow diagram.	(16)
13.	a)	Describe the Solvent Extraction process for the uranium spent fuel with suitable diagram.	(16)
		(OR)	
	b)	Explain the nuclear fuel cycle of uranium with a flow chart.	(16)

14. a) Explain the construction and working of PWR reactor. Mention its merits and demerits. (16)

(OR)

b) Explain the heat transfer mechanism applied in the breeder reactor. (16)

15. a) Classify nuclear waste. Discuss the different possibilities of its disposal. (16)

(OR)

b) Describe the procedure followed after an accident in a nuclear power plant. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME601 – Computer Integrated Manufacturing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the CIM jigsaw.
2. List the role of marketing engineer in CIM.
3. Differentiate between production planning and process planning.
4. Differentiate between DCLASS coding and Opitz coding.
5. List the type of FMS.
6. State the four reasonable tests of flexibility in an automated manufacturing system.
7. Differentiate between broadcasting and communicating.
8. Differentiate between LAN and WAN.
9. Relate any two-database terminology used in CIM.
10. Draw the open system interconnection for CIM.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Apply the CIM wheel any one industry and explain how it is useful to analyze the functions then justify the selected industry requires all CIM wheel domain. (16)

(OR)

b) Analyze the different reasons to implement CIM for achieving company business strategy with an aid of company's hierarchical structure in details. (16)

12. a) Apply the production planning communication and plant operation communication to any one company for the CAD / CAM integration. (16)

(OR)

b) Four machines used to produce a family of parts are to be arranged into a GT cell. The From-To data for the parts processed by the machine~ are shown in the table below. (a) Determine the most logical sequence of machines for this data using Hollier Method I. (b) Construct the flow diagram for the data, showing where and how many parts enter and exit the system. (c) Compute the percentage of in-sequence moves and the percentage of backtracking moves in the solution. (d) Develop a feasible layout plan for the cell. (16)

From	To			
	1	2	3	4
1	0	10	0	40
2	0	0	0	0
3	50	0	0	20
4	0	50	0	0

13. a) Design and explain in-line FMS layouts for one direction flow similar to a transfer line and linear transfer system with secondary part handling system at each station to facilitate flow in two directions with necessary diagrams. (16)

(OR)

b) Identify the different group of categories in FMS computer control system and explain each category in details with necessary sketches. (16)

14. a) Create an IDEF diagram for a small department in a company with which you are familiar and explain how is the diagram comprehensive and acceptable to all relevant activities. (16)

(OR)

b) Apply the product data management in a manufacturing enterprise wheel and explain how it uses in the framework of CIM architecture in details. (16)

15. a) Apply manufacturing automation protocol and technical office protocol for computer integrated manufacturing and explain its implementation in details. (16)

(OR)

b) Design any one data modelling system for CIM and explain the database, data association and data operation in details. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME602 – Finite Element Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Give examples for the finite element.
2. What methods are generally associated with finite element analysis?
3. What are the types of loading acting on the structure?
4. Define shape function.
5. Differentiate between LST and CST elements.
6. What are the ways in which a three-dimensional problem can be reduced to a two-dimensional approach?
7. What is the purpose of Isoparametric elements?
8. What is the difference between natural co-ordinate and simple co-ordinate?
9. Write down the finite element equation for one-dimensional heat conduction with free-end convection.
10. Write down the governing equation for two-dimensional heat conduction.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the steps involved in finite element formulation. (16)

(OR)

b) The differential equation of a physical phenomenon is given by $d^2y/d^2x + 500x^2 = 0$; $0 \leq x \leq 1$. By using the trial function, $y = a_1 (x - x^3) + a_2 (x - x^5)$, calculate the value of the parameters a_1 and a_2 by the following (16)

1) Point collocation;
2) Subdomain collocation;
3) Least squares;
4) Galarkin.

The boundary conditions are: $y(0) = 0$, $y(1) = 0$.

12. a) For the bar loaded as shown in the figure.1. Calculate the nodal displacements and elemental stresses. (16)

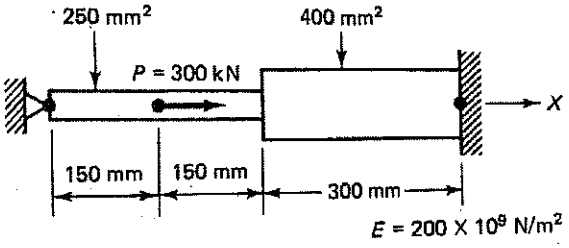


Figure.1.

(OR)

b) For the cantilever beam as shown in figure.2, has a uniform cross-sectional area as shown. The beam undergoes static deflection by a downward load of P = 1000 N applied at the free end. Find the deflection at the free end of the beam and the reaction force at the support using single element. The beam is made of aluminium whose properties are E = 69 Gpa and Poisson ratio 0.3. (16)

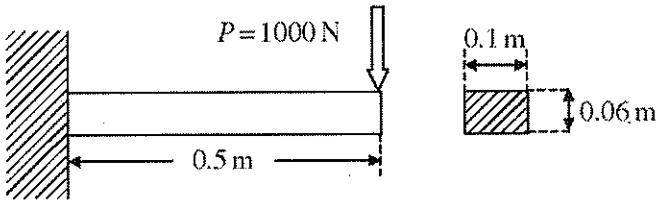


Figure.2

13. a) Derive the strain-displacement matrix for constant strain triangular element (CST). (16)

(OR)

b) Calculate the element strains for an axisymmetric triangular element shown in figure.3. The nodal displacement are, u_1= 0.001, u_2 = 0.002, u_3 = -0.003, w_1 = 0.002, w_2 = 0.001 and w_3 = 0.004 all dimensions are in mm. (16)

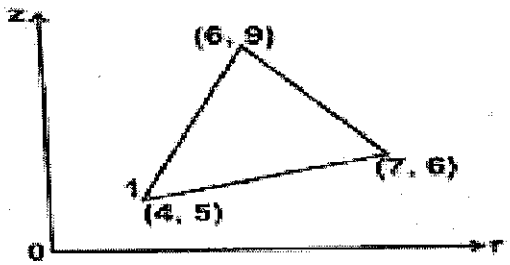


Figure.3.

14. a) Evaluate the Jacobian matrix for the isoparametric quadrilateral element shown in the figure.4. (16)

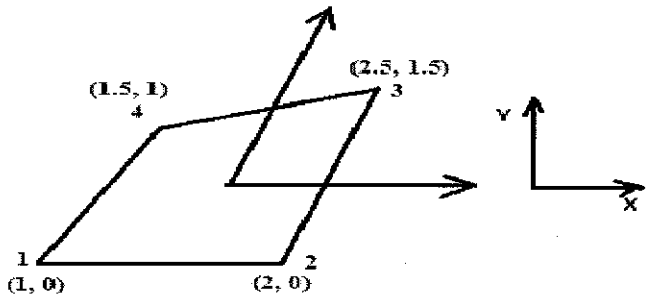


Figure. 4.

(OR)

b) Evaluate the integral by two-point Gaussian Quadrature Gauss points are +0.57735 and -0.57735 each of weight 1.0000. (16)

$$\int_{-1}^{1}\int_{-1}^{1}(2x^2+3xy+4y^2)dxdy$$

15. a) A furnace wall is made up of three layers, the inside layer with thermal conductivity of 8.5 W/mK, the middle layer with a conductivity of 0.25 W/mK, and the outer layer with a conductivity of 0.08 W/mK. The respective thickness of the inner, middle, and outer layers are 25 cm, 5 cm, and 3 cm respectively. The inside temperature of the wall is 600°C and the outside of the wall is exposed to atmospheric air at 30°C with a heat transfer coefficient of 45 W/m²K. Determine the nodal temperatures. (16)

(OR)

b) Derive the finite element equation for the fluid flow problem shown in figure.5. Also find the potentials at nodes 2 and 3 using FEM. The potential at nodes 1 and 4 are 7 m and 1.6 m respectively. Take k =1 for all pipes. (16)

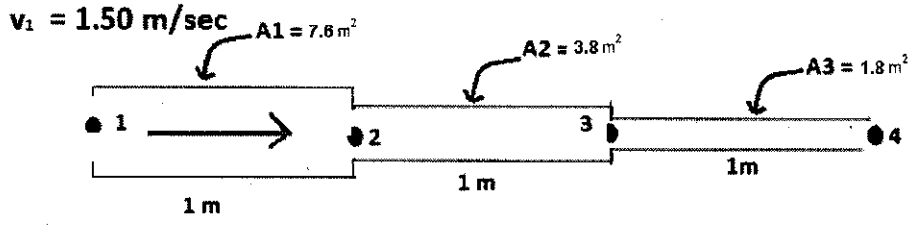


Figure.5

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE15 – Metal Cutting and Tool Design

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write about the difference between orthogonal cutting and oblique cutting.
2. Classify cutting force dynamometers.
3. Sate the Taylor's tool life equation.
4. List the methods for the measurement of tool wear.
5. Classify form tools.
6. What is tool nomenclature?
7. Classify milling cutters.
8. Classify drill bits.
9. What is the chip space-filling factor in broaching?
10. List a few thread-cutting tools.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Analyze the generation of heat in metal-cutting operations and its effects. (10)

ii) Identify the requirements for a dynamometer for cutting force measurement. (6)

(OR)

b) i) Analyze the formation of Built-up-Edge and its effects. (10)

ii) Identify the cutting variable that needs to be controlled to reduce the effects of temperature. (6)

12. a) Summarize the wear mechanisms in metal cutting with suitable examples. (16)

(OR)

b) Summarize the tool wear measurement techniques in metal cutting with suitable examples. (16)

13. a) i) Explain the procedural steps for designing a flat-form tool with suitable examples. (10)

ii) Analyze the tool nomenclature systems. (6)

(OR)

b) i) Explain the procedural steps for the design in a single-point cutting tool with a suitable application example. (10)

ii) Analyze the effects of basic cutting angles. (6)

14. a) i) Describe the nomenclature of the twist drill with the help of a neat sketch. (10)

ii) Analyze the influence of cutting angles in a twist drill. (6)

(OR)

b) i) Describe the procedure for the design of a milling cutter with an example. (10)

ii) Analyze the need for form-relieved milling cutters and give their applications. (6)

15. a) i) Analyze the design aspects associated with elements of broach. (10)

ii) List out the advantages, disadvantages and applications of broaching. (6)

(OR)

b) i) Analyze the design aspects associated with elements of the reamer. (10)

ii) List out the advantages, disadvantages and applications of reamer. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE35 – Rapid Product Development Technologies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List any four advantages of RP in product design and development.
2. Discuss on STL files and define slicing relevant to CAD.
3. What are the materials used in stereo lithography process?
4. Suggest the materials for Direct Metal Laser Sintering process.
5. List any two applications of Laminated object manufacturing.
6. Illustrate the process parameter for fused deposition modelling.
7. Write the application of Solid Ground Curing process.
8. What is the principle of Ballistic Particle Manufacturing?
9. Differentiate soft tooling and hard tooling in RP.
10. How does medical field make use of rapid tooling applications?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Distinguish between (16)
    i) Traditional prototyping and Rapid Prototyping
    ii) Digital prototyping and virtual prototyping

(OR)

b) Draw the outline showing the history of development of RP systemaround the world and classification of RP system. (16)

12. a) With a suitable sketch explain the Direct Metal Laser Sintering system. Also discuss its limitations. (16)

(OR)

b) Discuss how prototypes are produced by selective Laser Sintering with the help of a neat sketch and briefly describe its processing activities. (16)

13. a) Evaluate the impact of process parameters (such as temperature, speed, and layer thickness) on the quality of parts produced by FDM. Provide examples to illustrate your points. (16)

(OR)

b) Critically assess the potential of Laminated Object Manufacturing in producing complex geometries and its implications for design freedom in engineering applications. (16)

14. a) Explain in detail the LENS process with a neat diagram. Also write the advantages and disadvantages. (16)

(OR)

b) Explain in detail the working principle, process parameter and machine details of Solid Ground Curing in modern manufacturing. (16)

15. a) Discuss the advantages and disadvantages of using silicone rubber tooling compared to aluminum-filled epoxy tooling in rapid prototyping and production processes. Include specific applications, material properties, and manufacturing considerations. (16)

(OR)

b) Discuss the application of rapid tooling in the medical field, focusing on the use of RP software in producing surgical tools. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII & VIII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE65 – Design of Production Tooling

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the Tool Design.
2. List the suitable materials used to make cutting tools.
3. How to reduce the cost of machining?
4. What are the factors to be considered for selection of machining process?
5. Which type of work pieces often need more than six locating points?
6. What is modular fixtures? Give typical uses for the same.
7. What are the advantages of Box jigs?
8. Write two essentials in design of Jigs.
9. Bring out the difference between blanking and piercing.
10. Classify Presses.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)		With neat sketches, explain the various angles with nomenclature of single point cutting tool.	(16)
			(OR)	
	b)		What are the different types of milling cutter? Explain the terms to be considered for design of milling cutter.	(16)
12.	a)		Explain the different types of tool holding devices used in lathe.	(16)
			(OR)	
	b)		Explain various tool holding devices used for boring bars.	(16)
13.	a)	i)	Explain the various principles involved in clamping.	(10)
		ii)	Write a note on clamping force.	(6)
			(OR)	
	b)	i)	Describe any one type of welding fixture.	(10)
		ii)	Summarise the essentials of milling fixture.	(6)

14. a) i) Explain any four types of drill bushes with neat sketch. (10)

ii) Illustrate an universal drill jig. (6)

(OR)

b) i) Design a drill jig to make hole of 10 mm, as shown in figure.1 below and mention the part list. (10)

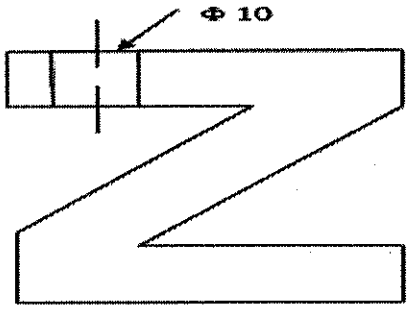


Figure.1

ii) Explain essential features of an Indexing Jigs/Fixtures. (6)

15. a) Write short notes on the following : (16)

i) Direct and Indirect knockouts

ii) Metal flow in drawing operations

iii) Shut height of a press

iv) Redraw dies in deep drawing

(OR)

b) Write short note on the following: (16)

i) Calculation of centre of pressure with an example.

ii) Press Tonnage

iii) Strip layout

iv) Strippers

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE46 – Total Quality Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the Dimensions of Quality?
2. How will you determine the optimum cost?
3. Define Recognition and Reward.
4. Give the need for feedback in an organization.
5. What is Measures of dispersion?
6. Differentiate Population and Sample.
7. What are the types of benchmarking?
8. How will you build a house of quality?
9. Define quality audit.
10. Differentiate between ISO 9000 and ISO 9001.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What is quality cost? Explain the techniques used for Quality cost. (8)

ii) Examine the principles of TQM. (8)

(OR)

b) i) Discuss the Deming philosophy. (8)

ii) Analyse the barriers to TQM implementation. (8)

12. a) i) Explain Juran trilogy for continuous process improvement. (8)

ii) A service organization wants to improve its customer satisfaction scores. Design a TQM strategy to enhance service quality using Six Sigma and Kaizen principles. (8)

(OR)

b) i) How do you measure the performance of a supplier? Suggest your strategies for improving their performance. (8)

ii) A manufacturing company faces frequent quality complaints from customers. Propose a TQM-based approach to address the problem. Include tools and techniques for root cause analysis and process improvement. (8)

13. a) i) Describe the concept of Six Sigma. Explain the DMAIC methodology with an example. (8)

ii) Plot the control chart for variables and attributes. (8)

(OR)

b) i) Explain the seven management tools. (8)

ii) Coffee shop owner gets sudden increases in complaints about poor quality, apply cause and effect diagram to this situation. (8)

14. a) i) Discuss the concept of Quality Function Deployment (QFD). Explain its process with an example. (8)

ii) Examine the Taguchi loss function and the evaluation method of the loss developed by him. (8)

(OR)

b) i) Define Total Productive Maintenance (TPM). Explain its pillars and significance in quality management. (8)

ii) Illustrate with a simple case study the process of FMEA. (8)

15. a) i) Illustrate the steps to be followed in implementing quality system ISO 9001:2008. (8)

ii) A hospital is planning to implement ISO 9001 to improve its service quality. Outline the steps, key focus areas, and benefits of implementing QMS in the healthcare sector. (8)

(OR)

b) i) Compare QS 9000 with TS 16949 quality system. (8)

ii) Develop a plan for conducting an internal audit for an organization's QMS. Explain the steps, team composition, and expected outcomes. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

MECHANICAL ENGINEERING

23PTME101 – Engineering Thermodynamics

(Steam tables and Mollier chart to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Prove that for an isolated system, there is no change in internal energy.
2. What is perpetual motion machine of first kind?
3. Why Carnot cycle cannot be realized in steam power plant?
4. State Cornot's Theorem.
5. Why is excessive moisture in steam undesirable in steam turbines?
6. A pure substance at 8 MPa and 400°C is having a specific internal energy of 2864 kJ/kg and a specific volume of 0.03432 m^3/kg. Find its specific enthalpy.
7. State the advantages of regenerative cycle.
8. Compare the Carnot and Rankine cycles.
9. How does the Vander Waal's equation differ from the ideal gas equation of state?
10. What does compressibility factor signify?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Apply and explain the steady flow energy equation concept for any two heat transfer devices. (16)

(OR)

b) A mass of 8 kg gas expands within a flexible container so that the p–v relationship is of the form $pv^{1.2}$ = constant. The initial pressure is 100 kPa and the initial volume is 1 m^3. The final pressure is 5 kPa. If specific internal energy of the gas decreases by 40 kJ/kg, find the heat transfer in magnitude and direction. (16)

12. a) i) Obtain a relation between COPs of a refrigerator and heat pump with flow diagrams. (4)

ii) Show that the efficiency of the reversible h eat engine depends only on the maximum and minimum absolute temperature in the cycle. (12)

(OR)

b) i) State and prove Clausius inequality and hence define entropy. (4)

ii) A heat pump working on the Carnot cycle takes in heat from a reservoir at 5°C and delivers heat to a reservoir at 60°C. The heat pump is driven by a reversible heat engine which takes in heat from a reservoir at 840°C and rejects heat to a reservoir at 60°C. The reversible heat engine also drives a machine that absorbs 30 kW. If the heat pump extracts 17 kJ/s from the 5°C reservoir, determine (12)

a) The rate of heat supply from the 840°C source

b) The rate of heat rejection to the 60°C sink.

13. a) One Kg steam at a pressure of 4 bar and a dryness fraction of 0.963 is compressed isentropically until it is dry saturated. Heat is then supplied at constant pressure until the initial volume is attained and the steam is finally restored to its initial state by constant volume cooling. Evaluate the work and heat transfer in each step and verify that the net work done is equal to the difference between the heat supplied and heat rejected over the cycle. (16)

(OR)

b) Find the specific volume and enthalpy of steam at 9 bar when the condition of steam is (16)

a) Wet with dryness fraction 0.95

b) dry saturated

c) superheated temperature of 240°C.

14. a) A steam power plant operates on a theoretical reheat cycle. Steam at 25 bar pressure and 400°C is supplied to a high pressure turbine. After its expansion to dry state the steam is reheated to a constant pressure to its original temperature. Subsequent expansion occurs in the low pressure turbine to a condenser pressure of 0.04 bar. Considering feed pump work, make calculation to determine (16)

i) quality of steam at the entry to the condenser

ii) thermal efficiency

iii) Specific steam consumption

(OR)

b) With a neat schematic diagram and T-S diagrams, explain the working of regenerative vapour cycle with open feed water heater. Derive the thermal efficiency expression for the same. (16)

15. a) A certain gas has Cp = 1.968 kJ/kgK and Cv = 1.505 kJ/kgK. Find its molecular weight and the gas constant. A constant volume chamber of 0.3 m^3 capacity contains 2 kg of this gas at 5°C. Heat is transferred to the gas until the temperature is 100°C. Find the work done, heat transferred and the changes in internal energy, enthalpy and entropy. (16)

(OR)

b) Derive Maxwell relations and Tds equations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

MECHANICAL ENGINEERING

23PTME102 – Fluid Mechanics and Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Newton's law of viscosity.
2. State hydrostatic law.
3. Write the types of fluid flow, with the effect of Reynold's number.
4. How Buckingham π theorem is used in fluid dynamics?
5. Write the Navier strokes equation and specify its condition.
6. What is the use of Moody's diagram?
7. How hydraulic turbines are classified?
8. Define specific speed and unit speed of the turbine.
9. What is the difference between ideal and actual indicator diagram?
10. Define the function of air vessels.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe about vapour pressure and cavitation with suitable example. (6)

ii) The weight of 5.024 litres of oil is 62.8 N. Calculate the following terms: (10)

i) Weight density

ii) mass density

iii) specific gravity and

iv) specific volume.

(OR)

b) i) The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of sp.gr. 0.9 is flowing. The center of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm. (6)

ii) Find the volume of the water displaced and position of centre of buoyancy for a wooden block of width 2.5 m and of depth 1.5 m, when it floats horizontally in water. The density of wooden block is 650 kg/m^3 and its length 6.0 m. (10)

12. a) If for a two-dimensional potential flow, the velocity potential is given by $\varphi = x(2y-1)$ determine the velocity at the point P (4, 5). Determine also the value of stream function ψ at the point P. (16)

(OR)

b) A pump has capacity of 18 kW and efficiency of 85 %. It supplies crude oil to a head tank of relative density 0.8 from a storage tank. For the overhead tank, level of oil is 15 m above the ground level. For the storage tank, the oil level is 2 m above the ground level with pressure of 40 kPa. The loss of head due to friction is 2 m. Calculate the flow rate of crude oil. (16)

13. a) A main pipe divides into two parallel pipes which again forms one pipe. The length and diameter for the first parallel pipe are 2000 m and 1.0 m respectively, while the length and diameter of 2nd parallel pipe are 2000 m and 0.8 m. Find the rate of flow in each parallel pipe, if total flow in the main is 3.0 m^3/s. The coefficient of friction for each parallel pipe is same and equal to 0.005. (16)

(OR)

b) Calculate the thickness of boundary layer at the end and drag force on one side of the flat plate 2 m long and 1.2 m wide when placed in water flowing with velocity of 0.13 m/s. Calculate coefficient of drag. Take μ = 0.001 Pa-s. (16)

14. a) A Pelton wheel generates 8000 kW under net head of 130 m at a speed of 200 rpm. Assuming the C_v = 0.98, η_h = 0.87, speed ratio = 0.46 and the wheel diameter is 9 times the jet diameter. Determine: i) the discharge ii) diameter of the wheel iii) diameter and number of jet iv) specific speed. The mechanical efficiency of the turbine is 75 %. (16)

(OR)

b) The hub diameter of a Kaplan turbine, working under a head of 12 m, is 0.35 times the diameter of the runner. The turbine is running at 100 rpm. If the vane angle of the extreme edge of the runner at outlet is 15° and flow ratio is 0.6. Find: i) diameter of the runner ii) diameter of the boss and iii) diameter through the runner. The velocity of whirl at outlet is given as zero. (16)

15. a) The length and diameter of a suction pipe of a single-acting reciprocating pump are 5 m and 10 cm respectively. The pump has a plunger of diameter 15 cm and a stroke length of 35 cm. The center of the pump is 3 m above the water surface in the pump. The atmospheric pressure head is 10.3 m of the water and pump is running at 35 rpm. Determine: i) pressure head due to acceleration at the beginning of the suction stroke ii) maximum pressure head due to acceleration and iii) pressure head in the cylinder at the beginning and at the end of the stroke. (16)

(OR)

b) Explain briefly the working principle of Gear and Vane Pump with neat sketches. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22ME301 – Engineering Thermodynamics

(Use of steam table and Mollier diagram permitted in the examinations)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State that First law of thermodynamics for a non-flow process and for a cycle.
2. Show that work is a path function and not a property.
3. State kelvin Planck's second law.
4. Define Entropy.
5. Outline the p-T diagram? What is its use?
6. Discuss latent heat of vaporization.
7. Draw the standard Rankine cycle on P-V and T-S coordinates.
8. State the advantages of regenerative cycle.
9. How does the Vander Waal's equation differ from the ideal gas equation of state?
10. Define compressibility factor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A cylinder contains 0.45 m^3 of a gas at 1 × 105 N/m^2 and 80°C. The gas is compressed to a volume of 0.13 m^3, the final pressure being 5 × 105 N/m^2. Determine: (16)

    i) The mass of gas

    ii) The value of index 'n' for compression

    iii) The increase in internal energy of the gas

    iv) The heat received or rejected by the gas during compression.

    Take $\gamma = 1.4$, $R = 294.2$ J/kg°C.

(OR)

b) A centrifugal pump delivers 60 kg of water per second. The inlet and outlet pressures are 10 kPa and 400 kPa, respectively. The suction is 2 m below and delivery is 8 m above the centre line of the pump. The suction and delivery pipe diameters are 20 cm and 10 cm, respectively. Determine the capacity of the electric motor to run the pump. (16)

12. a) A reversible heat engine operates between two reservoirs at temperatures of 600°C and 40°C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 40°C and -20°C. The heat transfer to the heat engine is 2000 kJ and the net work output of the combined engine refrigerator plant is 360 kJ. (16)

a) Evaluate the heat transfer to the refrigerant and the net heat transfer to the reservoir at 40°C.

b) Reconsider (a) given that the efficiency of the heat engine and the COP of the refrigerator are each 40% of their maximum possible values.

(OR)

b) State and prove Clausius inequality. (16)

13. a) Calculate the internal energy per kg of superheated steam at a pressure of 10 bar and a temperature of 300°C. Also find the change of internal energy if this steam is expanded to 1.4 bar and dryness fraction 0.8. (16)

(OR)

b) A vessel having a capacity of 0.05 m^3 contains a mixture of saturated water and saturated steam at a temperature of 245°C. The mass of the liquid present is 10 kg. Examine the following: (16)

i) The pressure
ii) The mass
iii) The specific volume
iv) The specific enthalpy
v) The specific entropy and
vi) The specific internal energy.

14. a) A steam power plant operates on a theoretical reheat cycle. Steam at boiler at 150 bar, 550°C expands through the high pressure turbine. It is reheated at a constant pressure of 40 bar to 550°C and expands through the low pressure turbine to a condenser at 0.1 bar. Draw T-s and h-s diagrams. Evaluate: (16)

i) Quality of steam at turbine exhaust

ii) Cycle efficiency

iii) Steam rate in kg/kWh.

(OR)

b) A binary-vapour cycle operates on mercury and steam. Saturated mercury vapour at 4.5 bar is supplied to the mercury turbine, from which it exhausts at 0.04 bar. The mercury condenser generates saturated steam at 15 bar which is expanded in a steam turbine to 0.04 bar. Find the overall efficiency of the cycle. (16)

15. a) Derive Maxwell's equations and write down the first and second TdS equations. (16)

(OR)

b) Explain the Joule – Thomson Co-efficient and express the relations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22ME303 – Manufacturing Processes

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the requirements of core sand?
2. What are the differences between the solidification of pure metals and metal alloys?
3. Why flux is coated on filler rods?
4. Write the working principle of electron beam welding.
5. What is recrystallization temperature?
6. Differentiate between open die and closed die forging.
7. Write down the factors that have to be considered for the selection of presses.
8. Write the advantages of rotational moulding.
9. Differentiate the formability and spinning process.
10. Indicate the areas where powder metallurgy fabrication has application?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the shell moulding process with a neat sketch. (16)

(OR)

b) Classify the materials used for pattern making and explain. (16)

12. a) Analyze various types of oxy-acetylene flames with sketches. (16)

(OR)

b) Discuss about the concepts of straight and reverse polarities in electric arc welding practice with neat sketches. Mention about their respective uses. (16)

13. a) i) Explain the hydro mechanical forming with a neat sketch. (10)

ii) What are the defects that occur in the extrusion and drawing? (6)

(OR)

b) i) Explain hot extrusion and its types with a neat sketch. (10)

ii) Flow forming has emerged as the most advanced metal forming technique in comparison to extrusion and tube drawing. Comment on the statement. (6)

14. a) i) Briefly mention the criteria for selecting plastic processing methods. (8)

ii) Explain the polymerization briefly? (8)

(OR)

b) i) Explain with neat sketch 'Injection moulding' Give its advantages and disadvantages. (8)

ii) Explain the various methods of Bonding of Thermoplastics. (8)

15. a) Explain bending operations with suitable sketches. (16)

(OR)

b) Explain the finishing operations of sintered parts in detail. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22MEH303 – Additive Manufacturing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Rapid Tooling?
2. What are the business opportunities in AM?
3. How does part consolidation enhance AM capabilities?
4. Define part orientation.
5. What are the limitations of Stereolithography Apparatus?
6. What are the advantages of Digital Laser Processing?
7. What are the main advantages of Electron Beam Melting?
8. How does Electron Beam Melting differ from Selective Laser Melting?
9. What is Binder Jetting in additive manufacturing?
10. What are the limitations of the Sheet Lamination process?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the transition of Rapid prototyping (RP) to Additive Manufacturing (AM). (16)

(OR)

b) Explain in details of additive manufacturing process chain and also discuss on AM technology influencing the future of electronics manufacturing, in terms of printing circuits. (16)

12. a) How can Design for Additive Manufacturing techniques be applied to enhance part quality and reduce production costs? (16)

(OR)

b) Explain the integration of tool path generation, model slicing, and support structure generation help streamline the AM workflow and improve production. (16)

13. a) Describe about various Stereolithography Apparatus (SLA) materials, advantages and applications. (16)

(OR)

b) Explain the process variables of following processes: (16)
1) Fused deposition Modeling.
2) Digital light processing.

14. a) Explain the applications of Selective Laser Sintering (SLS) and its processing techniques. (16)

(OR)

b) Discuss the processing techniques used in Laser Engineered Net Shaping (LENS). (16)

15. a) In what ways can Material Jetting, particularly Multi-jet Modeling, offer advantages in terms of high-resolution prints and material diversity? (16)

(OR)

b) Briefly explain the various process parameters and working principle of Laminated Object Manufacturing (LOM). (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22MEH204 – Introduction to Machine Learning

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the objective of machine learning?
2. Infer the concept of overfitting in machine learning.
3. Consider "safe cars". Express how version space learning would represent the boundary between specific and general hypotheses in this context.
4. How version spaces can be used to represent the hypothesis space during concept learning.
5. A decision tree algorithm always tests the attribute with highest information gain first. Interpret how this represents an inductive bias and why it might be beneficial.
6. What is the "replicated subtree problem" in decision trees and why does it occur when dealing with XOR-like relationships?
7. Why the hidden layer activation function needs to be non-linear for the network to learn non-linear relationships?
8. How eigen faces are used in face recognition and state one limitation of this approach?
9. How does the Naive Bayes classifier handle the "curse of dimensionality"?
10. Pointout one advantage and one disadvantage of EBG.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Interpret the key differences between the major types of machine learning and provide relevant examples for each. (16)

(OR)

b) i) Explain how the size and structure of the hypothesis space can affect the learning process. Provide examples to illustrate your points. (8)

ii) Give examples of different types of inductive biases (e.g., structural, preference, language) and outline how they can influence the learning process. (8)

12. a) i) Relate the difference between the version space and the hypothesis space and explain how they are related. (8)

ii) Extend the key ideas behind the candidate elimination algorithm for concept learning. Discuss its strengths and limitations. (8)

(OR)

b) i) Describe and compare different search strategies used to explore the hypothesis space, such as breadth-first search, depth-first search, and hill-climbing. Discuss the advantages and disadvantages of each approach. (8)

ii) Explain the role of heuristics in guiding the search process and improving efficiency. (8)

13. a) Compute the Decision Tree Learning Algorithm in detail. Illustrate its working with an example and explain the concepts of entropy and information gain in the context of decision tree construction. (16)

(OR)

b) Compose what is decision tree. Construct the decision trees to represent the following Boolean functions. (16)

1) $A \cap B$
2) $A \cup (B \cap C)$
3) A xor B
4) $(A \cap B) \cup (C \cap D)$

14. a) i) Catogorize Perceptrons with an example and neat diagram. (8)

ii) Draw the decision surface represented by two input perceptron. (8)

(OR)

b) i) Examine the derivation of the Back propagation Algorithm. (8)

ii) Analyze in detail about Gradient Descent Algorithm. (8)

15. a) Breakdown with an example why Gibbs Algorithm is better than the Bayes Optimal classifier. (16)

(OR)

b) Outline the inductive bias of k- Nearest neighbor algorithm with example. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

MECHANICAL ENGINEERING

23PTME301 – Strength of Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. A material has a Young modulus of 1.25 x 10^5 N/mm^2 and a Poisson's ratio of 0.25. Calculate the modulus of rigidity.
2. What is meant by thermal stresses?
3. A cantilever of length 'l' is subjected to a point load of 'W' at its free end. Draw the bending moment diagram.
4. What is meant by transverse loading on beam?
5. What is the maximum deflection in a simply supported beam subjected to uniformly distributed load over the entire span?
6. Define Slenderness Ratio.
7. Differentiate between a thin cylinder and a thick cylinder.
8. State Lames theorem.
9. Define helical springs.
10. Define Maximum Principal Stress theory.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A steel bar ABCD 4 m long is subjected to forces as shown in figure.1 (16)
Find the elongation of the bar. Take E for steel as 200 GPa.

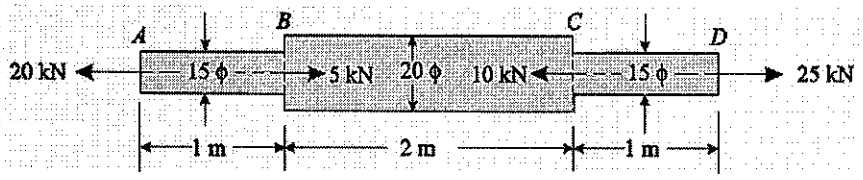


Figure.1

(OR)

b) Two vertical rods one of steel and the other of copper are each rigidly fixed at the top and 50 cm apart. Diameters and lengths of each rod are 2 cm and 4 m respectively. A cross bar fixed to the rods at the lower ends carries a load of 5000 N such that the cross bar remains horizontal even after loading. Find the stress in each rod and the position of the load on the bar. Take E for steel = 2 x 10^5 N/mm^2 and E for copper = 1 x 10^5 N/mm^2. (16)

12. a) A beam 10 m long carries load as shown in figure.2 Draw the shear force and bending moment diagrams for the beam and also determine point of contraflexture if any. (16)

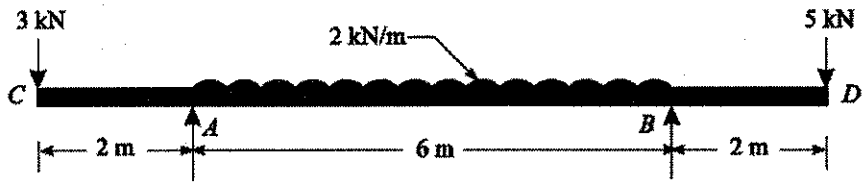


Figure.2

(OR)

b) Determine vertical displacement at free end of a cantilever beam as shown in figure.3 using method of virtual work. Take E = 2 x 10^5 MPa and I = 825 x 10^7 mm^4. (16)

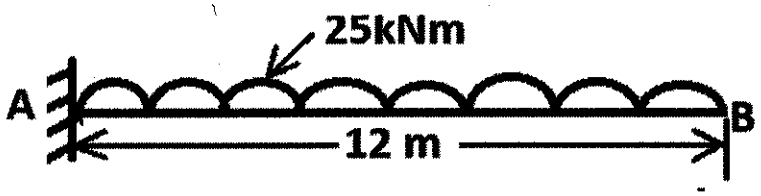


Figure.3

13. a) A beam AB of length 8 m is simply supported at its ends and carries two point loads of 50 kN and 40 kN at a distance of 2 m and 5 m respectively from left support A. Determine, deflection under each load, maximum deflection and the position at which maximum deflection occurs. Take E = 2 x 10^5 N/mm^2 and I = 8.5 X10^6 mm^4. (16)

(OR)

b) Determine the section of a hollow C.I. cylindrical column 5 m long with ends firmly built in. The column has to carry an axial compressive load of 588.6 KN. The internal diameter of the column is 0.75 times the external diameter. Use Rankine's constants. a = 1 / 1600, σ_c = 57.58 KN/cm^2 and F.O.S = 6. (16)

14. a) A closed cylindrical vessel made of steel plates 4 mm thick with plane ends, carries fluid under a pressure of 3 N /mm^2. The diameter of cylinder is 25 cm and length is 75 cm, calculate the longitudinal and hoop stresses in the cylinder wall and determine the change in diameter, length and volume of the cylinder. Take E = 2.1 x 10^5 N/mm^2 and μ = 0.286. (16)

(OR)

b) A cylindrical Shell 3 m long which is closed as the ends an internal diameter of one metre and a wall thickness of 15 mm. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of 1.5 N/mm^2 and μ = 0.3. (16)

15. a) Two shafts of the same material and of same lengths are subjected to the same torque, if the shaft is of a solid circular section and the second shaft is of hollow circular section, whose internal diameter is 2/3 of the outside diameter and the maximum shear stress developed in each shaft is the same, compare the weights of the shafts. (16)

(OR)

b) A closely coiled helical spring of mean diameter 20 cm is made up of 3 cm diameter rod and has 16 turns. A weight of 3 kN is dropped on this spring. Find the height by which the weight should be dropped before striking the spring so that the spring so that the spring may be compressed by 18 cm. Take 8 x 10^4 N/mm^2. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

MECHANICAL ENGINEERING

23PTME302 – Kinematics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. In which way a machine differs from a structure?
2. Illustrate completely constrained motion with an example.
3. What are the different methods used for finding the velocity?
4. Define Coriolis component of acceleration.
5. Differentiate radial cam with cylindrical cam.
6. What is pressure angle in radial cam? Write its importance.
7. State law of gearing.
8. In actual practice, the involute gears are more commonly used. Why?
9. What do you mean by angle of repose?
10. What is centrifugal tension in a belt? How does it affect the power transmitted?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What is a kinematic inversion? Discuss any three inversions of single slider crank chain. (16)

(OR)

b) Sketch and brief the following exact straight line mechanisms. (16)
i) Peaucellier mechanism. ii) Hart's mechanism.

12. a) Explain the properties of Instantaneous centre. Locate all the instantaneous centres of the slider crank mechanism as shown in figure 1. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find (16)
i) velocity of the slider A and
ii) angular velocity of the connecting rod AB.

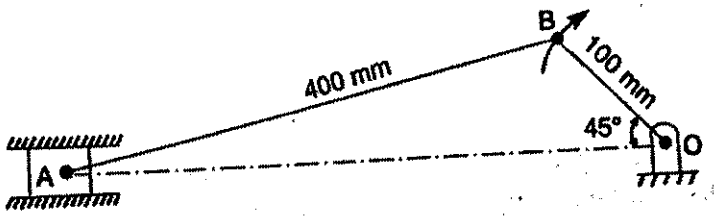


Figure. 1

(OR)

b) ABCD is a four bar chain with link AD fixed. The lengths of the links are AB = 62.5 mm, BC = 175 mm, CD = 112.5 mm and AD = 200 mm. The crank AB rotates at 10 rad/s clockwise. Draw the velocity and acceleration diagram when angle BAD = 60° and B and C lie on the same side of AD. Find the angular velocity and angular acceleration of links BC and CD. (16)

13. a) Design a cam for operating the exhaust valve of an oil engine. It is required to give equal uniform acceleration and retardation during opening and closing of the valve each of which corresponds to 60° of cam rotation. The valve must remain in the fully open position for 20° of cam rotation. The lift of the value is 37.5 mm and the least radius of the cam is 40 mm. the follower is provided with a radius 20 mm and its line of stroke passes through the axis of the cam. (16)

(OR)

b) A cam rotating clockwise with a uniform speed is to give the roller follower of 20 mm diameter with the following motion: (16)

i) Follower to move outward through a distance of 30 mm during 120° of cam rotation.

ii) Follower to dwell for 60° of cam rotation.

iii) Follower to return to its initial position during 90° of cam rotation.

iv) Follower to dwell for the remaining 90° of cam rotation.

The minimum radius of the cam is 45 mm and the line of stroke of the follower is offset 15 mm from the axis of the cam and the displacement of the follower is to take place with simple harmonic motion on both the outward and return strokes. Draw the cam profile.

14. a) Two mating gears have 20 and 40 involute teeth of module 10 mm and 20° pressure angle. The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half the maximum possible length. Determine the addendum height for each gear wheel, length of path of contact, arc of contact and contact ratio. (16)

(OR)

b) An epicyclic gear train, as shown in figure 2, has a sun wheel S of 30 teeth and two planet wheels P-P of 50 teeth. The planet wheels mesh with the internal teeth of a fixed annulus A. The driving shaft carrying the sunwheel, transmits 4 kW at 300 rpm. The driven shaft is connected to an arm which carries the planet wheels. Determine the speed of the driven shaft and the torque transmitted, if the overall efficiency is 95 %. (16)

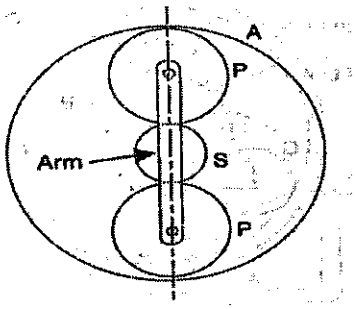


Figure. 2

15. a) i) What are the important factors should be considered when selecting a belt drive to transmit power? (3)

ii) A leather belt is required to transmit 7.5 kW from a pulley 1.2 m in diameter, running at 250 rpm. The angle embraced is 165° and the co-efficient of friction between the belt and the pulley is 0.3. if the safe working stress for the leather belt is 1.5 MPa, density of leather 1 Mg/m^3 and thickness of belt 10 mm, determine the width of the belt taking centrifugal tension into account. (13)

(OR)

b) i) A single plate clutch transmits 25 kW at 900 rpm. The maximum pressure intensity between the plates is 85 kN/m^2. The outer diameter of the plate is 360 mm. Both the sides of the plate are effective and the co-efficient of friction is 0.25. Determine the (13)

1) Inner radius of the plate

2) Axial force to engage the clutch.

ii) What are the types of clutches? Where we are using multiple disc clutches? (3)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDC13 – Advanced Mechanics of Materials

(Use of Design data book is permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Identify the concept of compatibility.
2. State Airy's stress function.
3. Distinguish between symmetric and un-symmetric bending.
4. What is shear centre?
5. Point out the stresses in curved beams.
6. Identify the relationship between stress, strain and temperature.
7. State St.Venants theory.
8. What is shear circulation?
9. What are the different methods of computing contact stresses?
10. Sketch a plane frame element and give its finite element equation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The two tension members shown in Figure. 1 are made of the same material with yield strength Y. Which member A or B can absorb the greater energy up to initiation of yield? Explain your answer. Ignore the stress concentration at the change in cross-section of member B. (16)

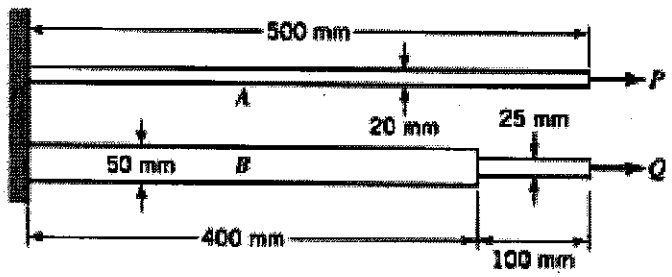


Figure.1

(OR)

b) The shaft in Figure. 2 is supported in flexible bearings at A and D, and two gears B and C are attached to the shaft at the locations shown. The gears are acted on by tangential forces as shown by the end view. The shaft is made of a ductile steel having a yield stress 290 MPa. If the factor of safety for the design of the shaft is 1.85, determine the diameter of the shaft using the maximum shear-stress criterion for the initiation of yielding failure. (16)

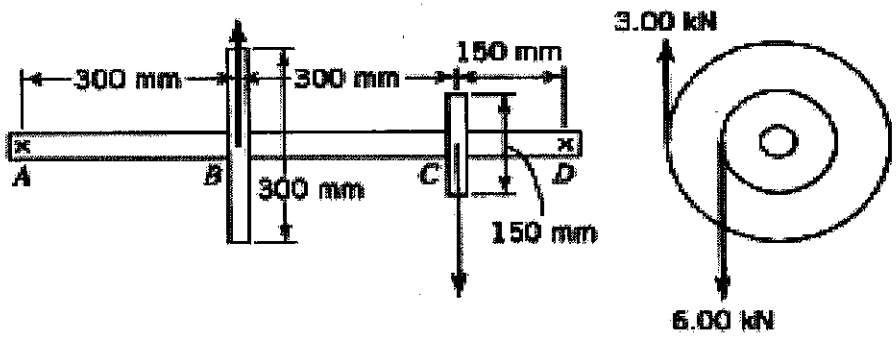


Figure.2

12. a) Locate the shear center for the unsymmetrical channel section shown in Figure.3. The thickness of the flange and webs are of uniform thickness 6 mm. (16)

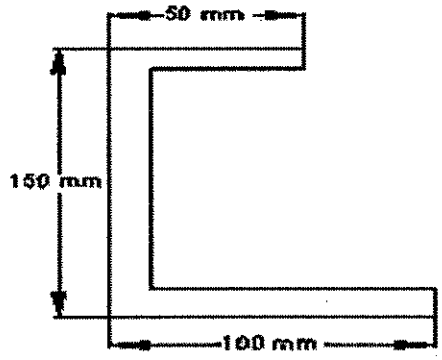


Figure.3

(OR)

b) An extruded bar of aluminum alloy has the cross-section shown in Figure. 4. A 1.00-m length of this bar is used as a cantilever beam. A concentrated load P = 1.25 kN is applied at the free end and makes an angle of $\varphi = 5\pi/9$ with the x-axis. The view in Figure.4 is from the free end toward the fixed end of the beam. Determine the maximum tensile and compressive stresses in the beam. (16)

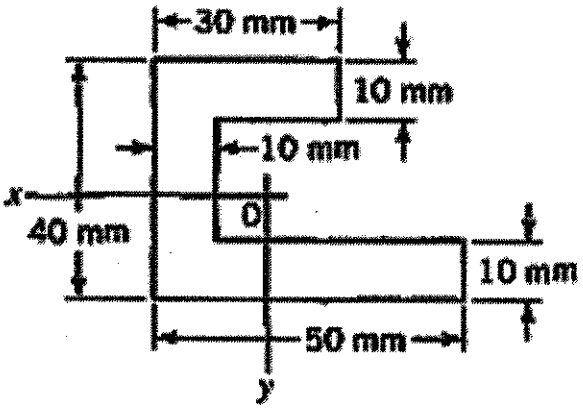


Figure.4

13. a) A crane hook whose horizontal cross-section through the centre of curvature is trapezoidal, 40 mm wide at the inside and 10 mm wide at the outside, thickness of 40 mm carries a vertical load of 10 kN, whose line of centre of curvature which is 30 mm from the inside edge of the section. Calculate the maximum tensile and compressive stress developed in the section. (16)

(OR)

b) A rectangular plate is 2000 mm square and 20 mm thick, two opposite edges are simply supported on a rigid foundation, and the other two edges are supported on a 75 mm I beam of steel ($I = 1.05 \times 10^6$ mm^4). The plate supports a uniformly distributed load of 0.03 N/mm^2, $E = 2.16 \times 10^3$ N/mm^2. Calculate (16)

1) Maximum bending stress in the plate.
2) Maximum deflection of the plate.
3) Maximum bending stress in the beams.

14. a) Using the membrane analogy, analyze the following section shown in Figure.5 for torsional shear stresses and torsional rigidity. Uniform thickness = t. (16)

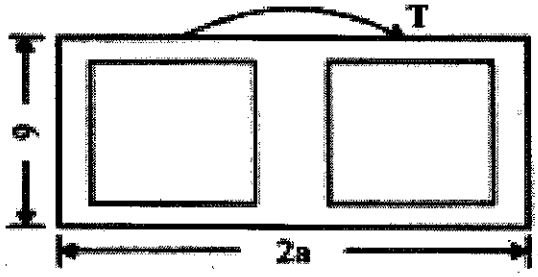


Figure.5

(OR)

b) An aluminum alloy extruded section as shown in Figure.6 is subjected to a torsional load. Determine the maximum torque that can be applied to the member if the maximum shear stress is 75 MPa. Neglect stress concentrations at changes in section. (16)

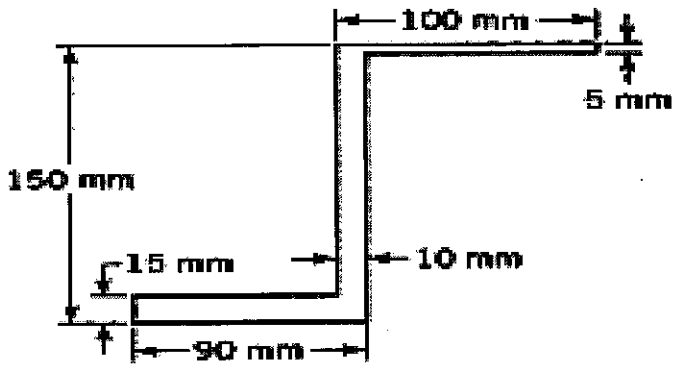


Figure.6

15. a) i) Explain the influence of friction between the contact surfaces on contact stress for bodies in point contact, and in line contact. (8)

ii) Discuss the methods of computing contact stresses. (8)

(OR)

b) i) Obtain the shape functions for a bilinear rectangular element. (8)

ii) Obtain the shape functions for a linear isoparametric quadrilateral. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDE54 – Failure Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate crack and fracture.
2. List the important factors causing the premature failure of metallic components and structures.
3. Sketch geometry of fracture of tension overload failure.
4. Clarify Pitting corrosion phenomena.
5. Which is the cause of wear?
6. Differentiate erosion wear and abrasive wear.
7. List the causes of failure in forging.
8. Define stress concentration factor.
9. Draw the Bathtub Curve.
10. Define condition monitoring.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Enlist different tools and techniques which are used for failure Investigations. (8)

ii) Explain the characteristics feature of ductile fracture and brittle fracture. (8)

(OR)

b) Discuss any Aerospace Industry component failure case study with its remedies. (16)

12. a) Explain the different stages in creep and discuss the effect of stress and temperature on the creep rate. (16)

(OR)

b) Why majority failures are due to Fatigue failure? Explain in brief. (16)

13. a) Explain the mechanism of stress corrosion cracking (SCC) in alloys. Mention the most prominent combination of metals and environments which can lead to SCC. (16)

(OR)

b) Write case study in which component fail due to wear. List our preventions methods also. (16)

14. a) Why Soft Spots defects appear on heat treated component? Explain with suitable example. (16)

(OR)

b) Discuss case study of Inter granular Corrosion (IGC) attack on Welded austenitic Stainless Steel? List its remedies (16)

15. a) Explain the reliability design concept and hazard function with a suitable example. (16)

(OR)

b) i) Write short notes on parallel and series system. (8)

ii) Explain the importance of condition monitoring system in an automotive industry. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDE74 – Nano Materials Technology

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the size range of nano-materials?
2. Write the differences between bottom up and top down approaches in technology.
3. Write the principle of Laser Pyrolysis method.
4. Write any two materials used as precursors in sol-gel.
5. Give the advantages and disadvantages of SEM.
6. What properties can be analyzed by Energy dispersive X-ray (EDX) analysis?
7. What is band gap engineered quantum devices?
8. What are quantum dots?
9. Write 4 applications of nano fluid in industries.
10. What is the difference between base fluid and surfactants?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Analyze the various optical and electronic properties of nano materials and provide insights into how these properties can be leveraged for specific applications related to nano technology. (16)

(OR)

b) Describe the use of magnetic nanoparticles in biomedical applications and provide examples of how they are applied in the field. (16)

12. a) Explain working principle and construction of inert gas condensation technique for the synthesis of nano materials with an illustrative diagram. (16)

(OR)

b) Examine the Chemical Vapor Deposition process used for the synthesis of carbon nanotubes and evaluate its key parameters and applications. (16)

13. a) Analyze the construction and working principle of nano fabrication using X-ray-based lithography, and provide a detailed explanation of how this process is applied in the creation of nanoscale structures. (16)

(OR)

b) Apply the principles of Nano fabrication using Electron Beam Lithography to the creation of specific nanomaterials for a real-world application and outline the steps and considerations for its practical implementation. (16)

14. a) i) Analyze the applications and functioning of Nano-electro-mechanical systems (NEMS) using a minimum of two NEMS devices and discuss how these devices contribute to advancements in various fields. (8)

ii) Describe the fundamental setup of Nano optical tweezers and provide a detailed explanation of how this setup enables precise manipulation at the nanoscale. (8)

(OR)

b) i) Explain the working of Night vision systems with suitable illustrations. (8)

ii) Classify the various types of packaging in MEMS and provide an in-depth explanation of the zero-level packaging method. (8)

15. a) i) Outline and categorize the essential steps involved in the preparation of Nano fluids, highlighting their significance in achieving stable and effective formulations. (8)

ii) Analyze a specific method for measuring the thermal conductivity of nano-fluids and assess its effectiveness and relevance. (8)

(OR)

b) i) Analyze the impact of Brownian motion on flow and heat transfer in nanofluids and explain how the stability of nanofluids are achieved? (8)

ii) Explain the environmental impact of nanoparticles and briefly describe the role of nanotechnology in water treatment and environmental control. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE301 – Electric Circuit Analysis

Time : 3 Hours | Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. State reciprocity theorem.
2. A load is connected to a network which has R_{th} = 10 Ω and V_{th} = 40 V. Calculate the maximum power supplied to the load.
3. Define time constant for RL circuit. Draw the transient current characteristics.
4. A RLC series circuit has R = 10 Ω and L = 2 H. What value of capacitance will make the circuit critically damped?
5. Find the current through a circuit with 5 Ω resistor across a voltage source of 10cos (50t -50°) volts.
6. Define self inductance and mutual inductance of a coil.
7. Give the equations for Laplace and inverse Laplace transform.
8. Determine the Laplace transform of unit step function u(t).
9. Draw the frequency response characteristics of a series resonance circuit.
10. When a two port network is said to be reciprocal?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Apply superposition theorem to determine current i through 3 Ω resistor for the circuit given in figure.1. (16)

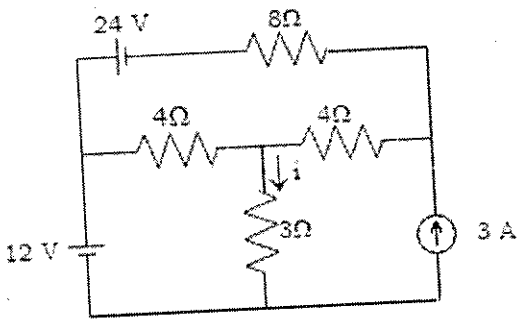


Figure.1.

(OR)

b) Use branch currents in the network shown in figure.2. To find the current supplied by the 60 V source. Solve the circuit by the mesh current method. (16)

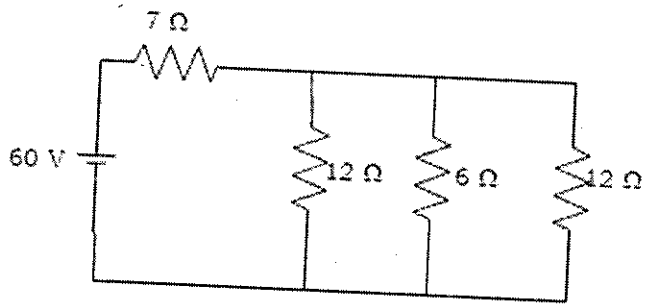


Figure.2.

12. a) A series RL circuit with R = 50 Ω and L= 30 H has a constant voltage Vs = 50 volts applied at t = 0 as shown in figure.3. Determine the current i, voltage across inductor. Derive the necessary expression and plot the respective curves. (16)

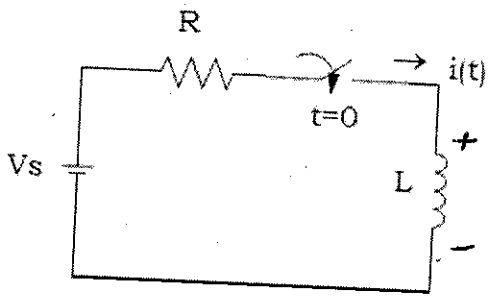


Figure.3.

(OR)

b) Derive the step response of series RLC Circuit and Analyze the response for different values of R. (16)

13. a) i) Determine the power factor of the circuit given in the figure.4. as seen by the source. Calculate the average power delivered by the source. (10)

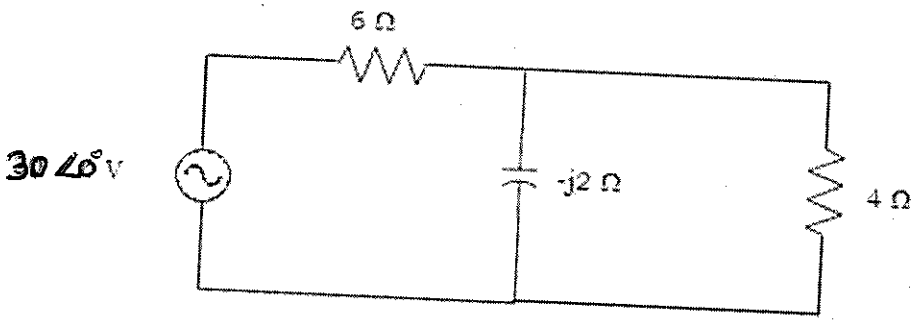


Figure.4.

ii) A symmetrical three phase, three wire 440 V supply to a star connected load. The impedance in each branch is Z_R=2+j3Ω, Z_Y=1-j2 Ω and Z_B= 3+j4 Ω. Find its equivalent delta connected load. (6)

(OR)

b) i) Three equal impedances, each of 8+ j10 Ω are connected in star. This is further connected to a 440 V, 50 Hz, three phase supply. Calculate the active and reactive power and line and phase current. (10)

ii) Define Mutual inductance and illustrate the dot convention for coupled circuits. (6)

14. a) Find $v_o(t)$ in the circuit of figure.5. Assume $v_o(0) = 5$ V using Laplace transform. (16)

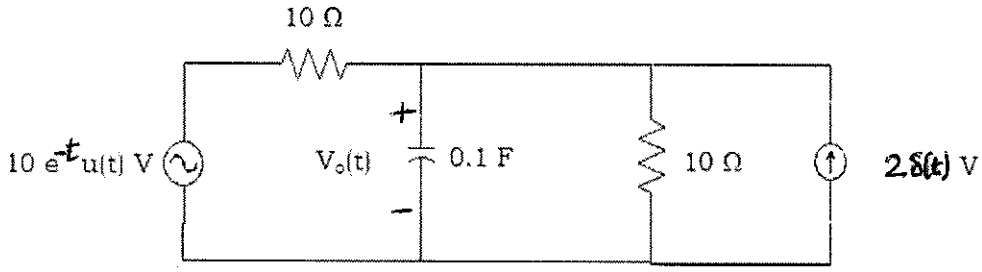
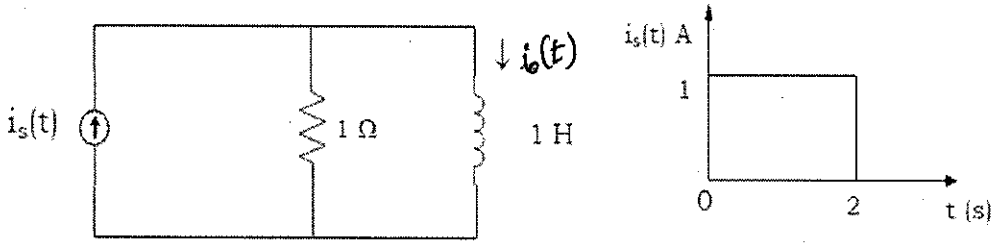


Figure.5.

(OR)

b) For the RL circuit shown in the figure.6, use the convolution integral to find the response $i_o(t)$ due to the excitation shown . (16)



Circuit Excitation

Figure.6.

15. a) For the circuit shown in Figure.7, determine the impedance at resonant frequency 10 Hz above resonant frequency and 10 Hz below resonant frequency. (16)

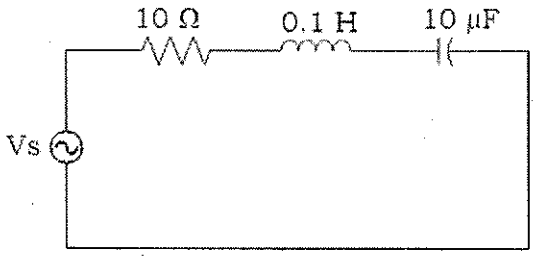


Figure.7.

(OR)

b) Find the transmission parameters for the circuit in Figure.8. (16)

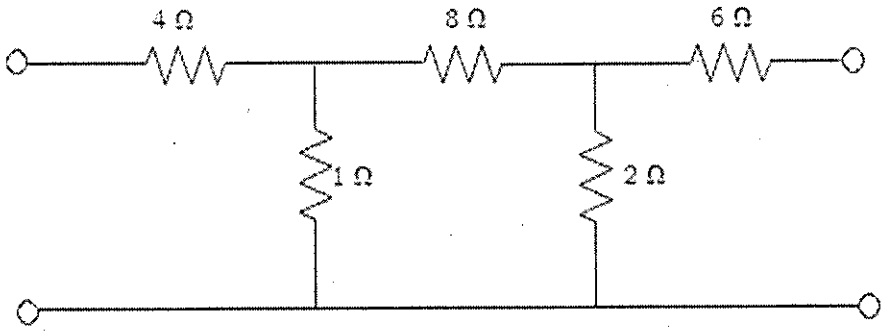


Figure.8.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE302 – Electromagnetic Theory

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Specify the unit vector extending from the origin toward the point P (2, -2, -1).
2. Determine the electric field intensity in free space if $\vec{D} = 30\,\vec{a}_x$ C/m².
3. Define i) Dielectric constant ii) Dielectric strength.
4. Give the significant physical differences between Poisson's and Laplace's equations.
5. A circular loop of radius 1 m is carrying a current of 10 A. Find the value of magnetic field intensity at the centre of the loop.
6. Find the magnetic moment of a square loop of 1000 turns placed in a field of uniform flux density 1 Tesla. The loop has 10 cm sides and carries a current of 3 A.
7. Calculate the emf induced in a circuit having an inductance of 700 μH if the current through it varies at the rate of 5000 A/sec.
8. Distinguish between conduction and displacement current densities.
9. What is the major factor for determining whether a medium is free space, lossless dielectric, lossy dielectric or good conductor? State the expression for the same.
10. If a plane wave is incident normally from medium 1 to medium 2, write the expressions for reflection and transmission coefficients.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) If $\vec{B} = y\vec{a}_x + (x+z)\vec{a}_y$ and a point Q is located at (-2, 6, 3), Express (10)

1) the point Q in cylindrical and spherical coordinates, 2) $\vec{B}$ in spherical coordinates.

ii) By using Gauss's law, determine the electric field intensity at a point P distance 'h' m from an infinite line of uniform charge 'λ' C/m. (6)

(OR)

b) i) Find the divergence and curl of the following vector fields and evaluate them at the specified points: (10)

a) $\vec{A} = yz\vec{a}_x + 4xy\vec{a}_y + y\vec{a}_z$ at (1, -2, 3)

b) $\vec{B} = \rho z \sin\phi \vec{a}_\rho + 3\rho z^2 \cos\phi \vec{a}_\phi$ at (5, π/2, 1)

ii) State and explain Coulomb's law of force. (6)

12. a) i) Two point charges -4 μC and 5 μC are located at (2, -1, 3) m and (0, 4, -2) m respectively. Find the potential at (1, 0, 1) m assuming zero potential at infinity. (6)

ii) At an interface separating dielectric 1 (ε_{r1}) and dielectric 2 (ε_{r2}), show that the tangential component of $\vec{E}$ is continuous across the boundary, whereas the normal component of $\vec{E}$ is discontinuous at the boundary. (10)

(OR)

b) i) A dielectric slab of flat surface with $\varepsilon_r = 4$ is disposed with its surface normal to a uniform field with flux density 1.5 C/m^2. The slab occupies a volume of 0.08 m^3 and is uniformly polarized. Determine 1) Polarization in the slab 2) total dipole-moment of slab. (6)

ii) A capacitor consists of two parallel metal plates 30 cm × 30 cm surface area, separated by 5 mm in air. Determine its capacitance. Find the total energy stored by the capacitor and the energy density if the capacitor is charged to a potential difference of 500 V? (10)

13. a) i) Derive Ampere's law using the concept of magnetic vector potential. (8)

ii) What is meant by 'Magnetization'? Explain briefly the classification of magnetic materials with examples. (8)

(OR)

b) i) By means of Biot-Savart's law, derive an expression for the magnetic flux density produced by an infinitely long straight wire carrying a current 'I', at any point P distant 'a' normal to the wire. (8)

ii) Obtain the expression for energy stored in the magnetic field and also derive the expression for magnetic energy density. (8)

14. a) i) An iron ring with a cross-sectional area of 3 cm^2 and a mean circumference of 15 cm is wound with 250 turns of wire carrying a current of 0.3 A. The relative permeability of the ring is 1500. Calculate the flux established in the ring. (6)

ii) Derive the point form of time-harmonic Maxwell's equations. (10)

(OR)

b) i) A conducting cylinder of radius 7 cm and height 50 cm rotates at 600 rpm in a radial field $\vec{B} = 0.1\,\vec{a}_r$ Tesla. Sliding contacts at the top and bottom are used to connect a voltmeter. Calculate the induced voltage. (6)

ii) Explain how the circuit equation for a series RLC circuit is derived from the field relations? (10)

15. a) Derive the Electromagnetic wave equations in frequency domain, and obtain the expressions for intrinsic impedance and propagation constants for free space, conductor and dielectric medium. (16)

(OR)

b) Show that the total power flow along a coaxial cable is given by the surface integration of the Poynting vector over any closed surface. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE303 – DC Machines and Transformers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the principle of energy conservation in electromechanical energy conversion.
2. Differentiate between single-excited and multiply-excited magnetic field systems.
3. Four terminals of a D.C Shunt machine are available, but they are unmarked. How will you identify the field and armature terminals?
4. List the different types of DC generators and their typical applications.
5. A D.C. Series motor should not be started on no-load. Why?
6. Give reasons why the armature connections are selected for reversal of motor direction rather than the field connections of dc motors.
7. What is the function of the conservator in a transformer?
8. Why transformers are rated in kVA not in kW?
9. What is the purpose of Swinburne's test in DC machines?
10. When testing large transformers, the OC test is conducted on the LV side and SC test is conducted oh HV side. Why?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A coil of 200 turns is placed in a magnetic field. The flux linking the coil changes from 0.5 Wb to 0.2 Wb in 0.01 seconds. Calculate the induced EMF. Explain the underlying principle and derive the formula used. (10)

ii) Derive the expression for energy stored in a magnetic field. (6)

(OR)

b) i) A single-excited magnetic system has an air gap flux of 0.3 Wb. If the system length is 15 cm, calculate the mechanical force developed. Show the steps and explain how the energy in the magnetic field contributes to this force. (10)

ii) In an AC magnetic circuit, the flux lags the applied voltage by 90 degrees. Explain this phenomenon with a detailed phasor diagram. (6)

12. a) Explain the constructional features of DC machine with a neat diagram. (16)

(OR)

b) Explain the process of armature reaction in DC generators and discuss how compensating windings help mitigate its effects. (16)

13. a) i) Draw and explain the electrical and mechanical characteristics of DC Shunt Motors. (8)

ii) A 460 V Series motor runs at 500 rpm taking a current of 40 A. Calculate the speed and % change in torque, if the load is reduced so that the motor is drawing 30 A. Total resistance of armature and field circuit is 0.8 Ω. Assume flux and field current are proportional. (8)

(OR)

b) i) Why is a starter necessary for a motor? Give the diagram and explain the working of a 3 point starter for a DC Shunt motor including the features of 'No Volt Release' and 'Over load Release'. (8)

ii) A D.C. Shunt motor runs at 9000 r.p.m. from a 400 V supply when taking an armature current of 25 A. Calculate the speed at which it will run from a 230 V supply when taking an armature current of 15 A. The resistance of the armature circuit is 0.8 Ω. Assume the flux per pole with 230 V to have decreased to 75 % of its value at 400 V. (8)

14. a) i) Derive the e.m.f. equation of a single phase transformer. (8)

ii) With supporting phasor diagrams, derive the expression for secondary side voltage regulation of a transformer for lagging power factor loads. (8)

(OR)

b) i) From first principle, deduce the equivalent circuit of a transformer. (8)

ii) Derive the expression for the savings of copper when compared to a two-winding transformer. (8)

15. a) The efficiency of 100 kVA, 110/220 V, 50 Hz single phase transformer is 98.5 % at half full load and 0.8 p.f. lead and 98.8% at FL upf, find (16)

i) Iron loss

ii) FL copper loss

iii) Maximum efficiency at upf.

(OR)

b) A 50 kVA transformer has Full load copper loss of 750 W and core loss of 600 W. Determine the all day efficiency, when the load during the day is as follows: (16)

i) 6 hrs – 5 kW at a p.f. of 0.6 lead

ii) 12 hrs – 40 kW at a p.f. of 0.8 lag

iii) 6 hrs – 30 kW at a p.f. of 0.85 lag.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE102 – DC Machines and Transformers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define field energy and Co-energy.
2. Sketch the energy flow in electromechanical energy conversion device as a motor.
3. Infer the conditions under which a DC machine fails to excite.
4. Interpret how the critical field resistance of DC shunt generator is estimated from its OCC?
5. Indicate the significance of back EMF in DC motor.
6. Interpret the factors on which the speed of a DC motor depends?
7. Does the transformer draw any current when secondary is open? Justify.
8. A certain transformer has a turn's ratio of 1 and a coupling coefficient of 0.85. When 2 V AC is applied to the primary, calculate the secondary voltage?
9. Show the expression for the condition for maximum efficiency in DC machine.
10. Define All day efficiency.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Distinguish between statically and dynamically induced emf and also discuss the magnetization curve. (8)

ii) Discuss the AC operation of magnetic circuits and derive the equation for field energy. (8)

(OR)

b) i) Distinguish between singly excited and doubly excited systems. (8)

ii) For a singly excited linear magnetic system, solve the expression for the electromagnetic torque. (8)

12. a) A 4 pole, lap wound 750 r.p.m DC generator has an armature resistance of 0.4 Ω and field resistance of 200 Ω. The armature has 720 conductors and the flux per pole is 30 mWb. If the load resistance is15 Ω. Determine the terminal voltage. (16)

(OR)

b) Derive the expression for emf induced in DC generator and also discuss the no load and load characteristics of DC shunt generator with neat sketch. (16)

13. a) Illustrate and explain the construction and working of DC motor. (16)

(OR)

b) Interpret the necessity of starter for DC motor and discuss the functions and demerits of three point starter with neat sketch. (16)

14. a) i) Discuss the phasor diagrams of transformer on load and no load cases with neat sketch. (8)

ii) A 10 kVA, single phase transformer for 2000/400 V, at no load, has R_1 = 5.5 Ω, X_1 = 12 Ω, R_2 = 0.2 Ω, X_2 = 0.45 Ω. Determine the approximate value of the secondary voltage at full load, 0.8 power factor lagging when the primary applied voltage is 2000 V. (8)

(OR)

b) Interpret in detail about the autotransformer with principle and derive the expression for saving of copper. (16)

15. a) i) Elaborate the different losses in DC machines and derive the expression for efficiency of DC machine. (8)

ii) With neat sketch, explain Swinburne's test and derive the relations for efficiency (both for generator and motor) and also state the merits and demerits of this method. (8)

(OR)

b) i) Draw and explain the circuit diagram of Sumpner's test and derive the relations for efficiency with advantages. (8)

ii) Derive an expression for condition for maximum efficiency of a transformer. (8)

Registration Number :

Government College of Engineering, Salem

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III [Full Time] / I [Part Time]

Electrical and Electronics Engineering

22EE303/22PTEE102/23PTEE102 – DC MACHINES AND TRANSFORMERS

(Regulations 2022/2023)

Time : 3 Hours | Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	Distinguish between statically and dynamically induced EMF.	2	K2	1
2.	Write the relationship between reluctance and magneto motive force.	2	K1	1
3.	State the significance of critical field resistance of a DC shunt generator.	2	K2	2
4.	Why commutator is employed in dc generator?	2	K2	2
5.	Why DC series motor should be started with loaded condition?	2	K2	2
6.	What is the function of no voltage release coil provided in a dc motor starter?	2	K1	3
7.	Specify the applications of autotransformer.	2	K1	2
8.	Give the conditions to be satisfied for parallel operation of transformer.	2	K1	3
9.	Why swinburne's test cannot be conducted on DC series motor?	2	K2	4
10.	Full load copper loss in a transformer is 1600 watts. What will be the loss at half load?	2	K2	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	A ring of magnetic material has rectangular cross section. The inner diameter of the ring is 20 cm and the outer diameter is 25 cm, its thickness being 2 cm. An air gap of 1 mm length is cut across the ring. The ring is wound with 500 turns carrying a current of 2 A. The permeability of the magnetic material is 6000. Find the following : i) Flux density in the air gap. ii) Inductance of the coil. iii) Energy stored in the magnetic material and in the air gap. Neglect fringing and leakage.	16	K4	1

Q. No			M	BTL	CO
		(OR)			
	b)	Derive an expression for energy, co-energy and force of a doubly excited system.	16	K4	1
12.	a)	With neat diagram explain the construction and operating principle of DC generator and also obtain the EMF equation of DC generator.	16	K2	2
		(OR)			
	b)	Describe the effects of armature reaction on the operation of DC machines and explain the parallel operation of DC generators in detail.	16	K2	2
13.	a)	i) Explain the performance characteristics of DC shunt and series motor with necessary graphs.	10	K2	3
		ii) Explain the operation of 3 point starter with circuit diagram.	6	K1	2
		(OR)			
	b)	i) Explain the various methods of speed control for DC shunt motor.	10	K2	3
		ii) List the applications of different types of DC motors.	6	K1	2
14.	a)	Explain the construction and principle of operation of single phase transformer with neat diagram and derive its emf equation.	16	K2	2
		(OR)			
	b)	Explain the operation of single phase transformer with no load condition and loaded condition with phasor diagram and also draw the equivalent circuit of a single phase transformer.	16	K2	3
15.	a)	Describe the procedure with neat diagram for determining a DC generator's efficiency using Swinburne's test.	16	K2	4
		(OR)			
	b)	With neat circuit diagram explain how the open circuit test and short circuit test performed on a single phase transformer. Also explain how efficiency of transformer is calculated from the test.	16	K2	5

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE304 – Electron Devices and Circuits

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Sketch clipping and clapping circuits.
2. Differentiate PN junction diode and Zener diode.
3. Comment on the base width due to effect of early effect.
4. Why there is variation in Q-point stability based on temperature?
5. Define CMRR.
6. Mention the advantages of darlington amplifiers.
7. What are power amplifiers?
8. List the characteristics of Class A and Class B power amplifier.
9. What are the advantages of negative feedback amplifier?
10. State Barkhausen criteria for oscillation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) In a center tapped transformer based full wave rectifier the load resistance is 1 KΩ Each diode has idealized characteristics having slope corresponding to a forward resistance of 400 Ω. Voltage across half of the secondary winding is 240 sin 50t. Find peak value of current, average value of current, rms value of current, rectifier efficiency and ripple factor. (12)

ii) Compare full wave and half wave rectifier. (4)

(OR)

b) i) Derive the expression for junction capacitance of PN junction diode under reverse biased condition. (12)

ii) Infer the effect of doping on junction capacitance and depletion region. (4)

12. a) i) Illustrate the operation on depletion type N-channel MOSFET. (6)

ii) Explain the operation of BJT in common emitter configuration along with its input and output characteristics. (10)

(OR)

b) i) Illustrate the operation on enhancement type N-channel MOSFET. (6)

ii) Explain about the construction and characteristics of UJT. (10)

13. a) Discuss about the operation of BJT differential amplifier and derive the expression for differential mode and common mode gain with resistive and active load. (16)

(OR)

b) Explain the FET amplifiers at low, medium and high frequencies. (16)

14. a) i) Explain the operation of class B push pull amplifier and derive the expression for power dissipation, output power and conversion efficiency. (12)

ii) What are complementary symmetry power amplifiers? (4)

(OR)

b) i) Explain the operation of class C amplifier and derive the expression for power dissipation, output power and conversion efficiency. (12)

ii) Compare the conversion efficiency of different power amplifiers. (4)

15. a) Draw the block diagram of series-series feedback amplifier and derive the expression for input resistance, output resistance, voltage gain and current gain. (16)

(OR)

b) Explain the operation of Wien bridge oscillator and derive the expression for frequency of oscillation (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE504 – Electrical Drives and Control

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How will you change the direction of rotation of a DC motor?
2. List out the merits of chopper fed dc drive.
3. What are the types of control techniques in a dc chopper?
4. Why duty cycle is usually changed by varying the on time rather than chopping frequency?
5. What are the three region in the speed-torque characteristics of the induction motor?
6. What is meant by v/f control?
7. What is meant by rotor resistance control?
8. Give the application of static Kramer drive system.
9. Write down the torque equation of SRM.
10. Mention the classification of Brushless DC motor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the speed-torque characteristics of separately excited dc motor with neat sketch and necessary derivation. (16)

(OR)

b) Discuss about armature current ripple and its effect on motor performance. (16)

12. a) Explain the operation and control of four-quadrant chopper fed dc drive. (16)

(OR)

b) Derive the dynamic equations for motor, speed and current controller of speed controlled of dc motor drive. (16)

13. a) i) Draw and derive the necessary equations for induction motor equivalent circuit. (8)

ii) Explain the speed-torque characteristics of an Induction Motor. When the three Phase AC Voltage magnitude & frequency are varied individually. Give equations to support the explanation. (8)

(OR)

b) Discuss about control of three phase induction motor by voltage source inverter with neat circuit diagram and waveforms. (16)

14. a) i) Draw and explain about the operation of slip ring induction motor with external rotor resistance. (8)

ii) Discuss about speed-torque characteristics of slip ring induction motor. (8)

(OR)

b) With neat sketch explain about static scherbius drive. Also derive necessary torque equation. (16)

15. a) i) Explain the construction and working principle of SRM. (8)

ii) Discuss about torque control of SRM using current controller. (8)

(OR)

b) Draw the block diagram and explain about the current controlled brushless dc motor drive. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE404 – Electrical Drives and Control

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are chopper fed DC drives?
2. Draw the speed torque characteristics of separately excited DC motors.
3. What are the advantages of chopper-controlled drive?
4. Where are DC drives used?
5. What is the working principle of induction motor drives?
6. Write the principle of v/f control in Induction Motor?
7. What are the drawbacks of rotor resistance control for induction motor?
8. How slip power is recovered in induction motor?
9. Write the applications of Switched Reluctance motors.
10. Draw the block diagram of BLDC motors.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the principle of DC chopper operation. Derive an expression for its average output voltage. (16)

(OR)

b) Explain the steady state operation of a chopper fed DC drive with suitable waveform. (16)

12. a) Explain the four quadrant operation of chopper fed DC drive. (16)

(OR)

b) Explain the speed control structure of DC motor drive. (16)

13. a) i) Induction motor speed control with constant supply voltage and reduced supply frequency is rarely used in practice. Justify the statement. (8)

ii) A 400 B, 50 Hz, 3-phase SCIM develops full-load torque at 1470 rpm. If supply voltage reduces to 340 V, with load torque remaining constant, calculate the motor speed. Assume speed-torque characteristics of the motor to be linear in the stable region. Neglect stator resistance. (8)

(OR)

b) Explain the operation of three phase voltage source inverter with sinusoidal modulation. (16)

14. a) Describe static rotor resistance control method for speed control of three phase induction motor. (16)

(OR)

b) Explain the operation of static Scherbius drive. (16)

15. a) With neat sketch explain the torque speed characteristics of SRM. Mention its applications, advantages and disadvantages. (16)

(OR)

b) Explain the sensing and logic switching schemes in speed control BLDC motor. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE305 – Signals and Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare the difference between continuous and discrete time signal.
2. Summarize the properties of linear system.
3. Show the necessary and sufficient condition on the impulse response of the system for causality and stability.
4. Define state space analysis of continuous time system. Give an example for state space representation of continuous time systems.
5. Determine the fourier series coefficients of the signal, $x(t)=4(\cos t)(\sin 4t)$.
6. State and prove the parseval's theorem for DTFT.
7. Express the final value theorem of Z transform.
8. Show the relationship between s-plane and z-plane in Z transform.
9. Categorize the different types of sampling techniques.
10. Define zero-order hold in signals and systems and write its transfer function.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Elaborate in detail about different classification of signals and systems with suitable examples. (12)

ii) Examine the relation between the unit step and unit impulse signals. (4)

(OR)

b) i) Prove the following: (12)

1) Energy of the power signal is infinite over infinite time.

2) Power of the energy signal is zero.

ii) Determine if the given signal is periodic. If it is periodic, identify its fundamental period. (4)

$x(t) = 3\cos(4t) + 2\sin(\pi t)$

12. a) i) For each of the following impulse responses, analyze whether the corresponding system is causal and stable. (10)

1) $h(n) = 2^n u(-n)$

2) $h(n) = \delta(n)+\sin(\pi n)$

ii) Determine the system function and the impulse response for the given system. (6)

$y(n)-5y(n-1) = x(n)-x(n-1)$.

(OR)

b) i) Determine the impulse response, frequency response, magnitude response and phase response of the given second-order system. (10)

$$y(n) - y(n-1) + \frac{3}{16}y(n-2) = x(n) - \frac{1}{2}x(n-1)$$

ii) Analyze the properties of the state transition matrix and its significance in both continuous and discrete time systems. (6)

13. a) i) Obtain the Fourier transform of each of the following signals and plot the magnitude and phase as functions of frequency, covering both positive and negative frequencies. (12)

1) $\delta(t+1)+\delta(t-1)$

2) $e^{-\alpha t}u(t)$, α-real and positive

ii) Find the Fourier series representation of the given signal. (4)

$x(t) = 2+\cos(4t) + \sin(6t)$

(OR)

b) i) Derive and illustrate the butterfly diagram for calculating the 8-point DFT of a sequence x(n) using the DIF FFT algorithm. (12)

ii) Find the DTFT of $x(n) = 2\ (3)^n\ u(-n)$. (4)

14. a) i) List and prove any five properties of the Z-transform. (10)

ii) Calculate the Z-transform of $x(n) = n^2u(n)$ (6)

(OR)

b) i) Find the inverse Z-transform of (10)

$X(Z) = \frac{1+3Z^{-1}}{1+3Z^{-1}+2Z^{-2}}$, ROC $|Z|>2$.

ii) Calculate the linear convolution of X(n)={1, 2, 3, 4, 5, 6, 7} with h(n) = {2, 4, 6, 8} (6)

15. a) i) State and prove the sampling theorem and describe how the original signal can be reconstructed from the sampled version with necessary illustrations. (10)

ii) Give a brief summary of spectral density and the aliasing effect. (6)

(OR)

b) i) Examine the mathematical relation between continuous and discrete time signal. (10)

ii) Outline the various filtering techniques employed in signals and systems. (6)

Registration Number :

Government College of Engineering, Salem

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: III & IV [Full Time]

Electrical and Electronics Engineering

22EE305/18EE401 – SIGNALS AND SYSTEMS

(Regulations 2022/2018/2018A)

Time : 3 Hours | Maximum Marks : 100

PART A (10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	Define systems.	2	K1	1
2.	Distinguish between energy and power signals.	2	K2	1
3.	What is meant by state of a system?	2	K1	2
4.	Give the condition for stable LTI system.	2	K2	2
5.	State Parsevel's theorem.	2	K3	3
6.	What are poles and zeros?	2	K1	3
7.	What is convolution?	2	K1	4
8.	Give the formula for inverse of Z transform.	2	K2	5
9.	State sampling theorem.	2	K3	6
10.	How aliasing could be prevented?	2	K2	6

PART B (5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	Discuss on the properties: Additivity and Homgeneity, shift invariance and realizability of a system.	16	K2	1
	(OR)			
b)	Elaborate with examples on the 4 basic signals.	16	K3	1
12. a)	How do you represent a system using difference equations and differential equations?	16	K2	2
	(OR)			
b)	Elaborate on state transition matrix and its role.	16	K3	2
13. a)	Discuss the fourier series representation using symmetry of signal.	16	K2	3
	(OR)			
b)	Derive the relation between Laplace transform and fourier transform.	16	K3	3

Q. No		M	BTL	CO
14. a)	Find the Z transform of $y(n) = 2^n u(n-1)$.	16	K3	4
	(OR)			
b)	Explain the properties of Z transform with examples.	16	K3	4
15. a)	Elaborate on zero order hold sampling.	16	K2	5
	(OR)			
b)	What is reconstruction? Explain on ideal interpolator.	16	K2	5

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE501- Control Systems

(Semi-logarithmic and Linear Graph Sheets may be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What type of feedback is employed in control system? Justify?
2. Write the analogous electrical elements in force voltage analogy for the elements of mechanical translational system.
3. Define order of the system. Find order for the system G(s) H(s) = (S+2)/(S+3).
4. What is the effect of PD controller on system performance?
5. List the frequency domain specifications of the system.
6. What are two contours of Nichols chart?
7. State Routh stability criterion.
8. What are the effects of adding a zero and pole to a system?
9. What are the uses of lead compensator?
10. What are the turning methods of PID controller?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Determine the transfer function $X_1(s)$ / F(s) of the given mechanical system, shown in Figure.1. (12)

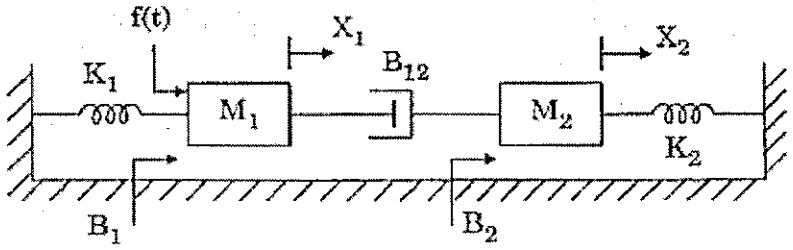


Figure.1

ii) Compare A.C and D.C servomotor. Give few application of Servomotor. (4)

(OR)

b) i) Determine the transfer function C (s)/R (s) of the given system using Mason's Gain formula. Shown in figure.2. (12)

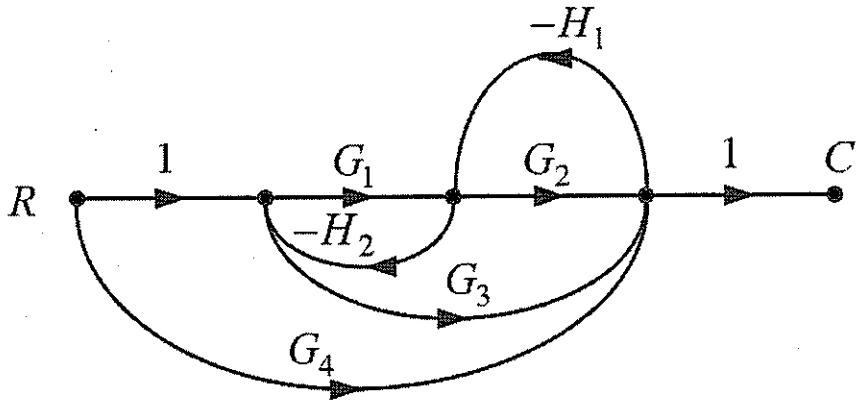


Figure.2

ii) What is the significance of Synchro and write down its application. (4)

12. a) A positional control system with velocity feedback shown in figure.3 What is the response c(t) to the unit step input. Given that damping ratio = 0.5.Also determine rise time, peak time, maximum overshoot and settling time. (16)

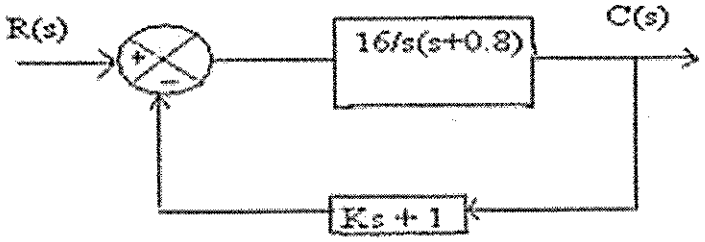


Figure.3

(OR)

b) For a unity feedback control system the open loop transfer function G(s) = $(S+2)$ / S^2 $(S+1)$. (i) Determine the position, velocity and acceleration error constants. (ii) The steady state error when the input is R(S) = $[3/S]$ – $[2/S^2]$ + $[1/3S^3]$. (16)

13. a) Draw the Bode plot for the following Transfer Function G(s) H(s) = $[20(0.1S+1)]$ / $[S^2(0.2S+1)(0.02S+1)]$ and Determine (a) Gain Margin (b) Phase Margin (c) Comment on the stability of the system. (16)

(OR)

b) i) Explain the correlation between time and frequency response of the system. (8)

ii) Derive the expression for second order system for under damped case and when the input is unit step. (8)

14. a) A unity feedback control system has an open loop transfer function $G(S) = K / [S (S^2 + 4S + 14]$. Sketch the root locus and determine the value of K. (16)

(OR)

b) Use the Routh stability criterion, determine the range of K for stability of unity feedback system whose open loop transfer function is $G(s) = K / [S (S+1) (S+2)]$. (16)

15. a) Explain the design procedure of a lead compensator with a neat diagram and suitable example. (16)

(OR)

b) Explain the concept of Ziegler-Nichols tuning methods for PID controllers. What are the primary objectives of these methods? How do you determine the parameters for the PID controller? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE401 – Control Systems

(Polar Chart, Semi-log graph sheet and ordinary graph sheet to be provided)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the characteristics of feedback control system.
2. What is synchros pair?
3. Distinguish between type and order of a system.
4. What is the effect of adding poles and zeros to transfer function?
5. What are frequency domain specifications?
6. What is Nichols chart?
7. State Nyquist stability criterion.
8. What are asymptotes? How will you find the angle of asymptotes?
9. Why compensation is necessary in feedback control system?
10. Draw pole-zero plot of lag compensator.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write the differential equations governing the mechanical system shown in Figure1. Draw the force-voltage and force-current electrical analogous circuits and verify by writing mesh and node equations. (10)

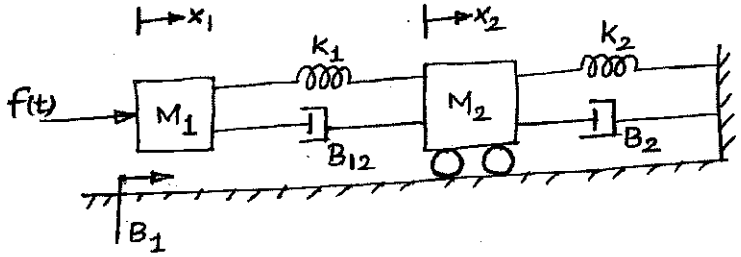


Figure.1.

ii) Derive the transfer function of AC servomotor. (6)

(OR)

b) i) Using block diagram reduction technique, find the closed loop transfer function C(s)/R(s) for the system shown in Figure.2. (10)

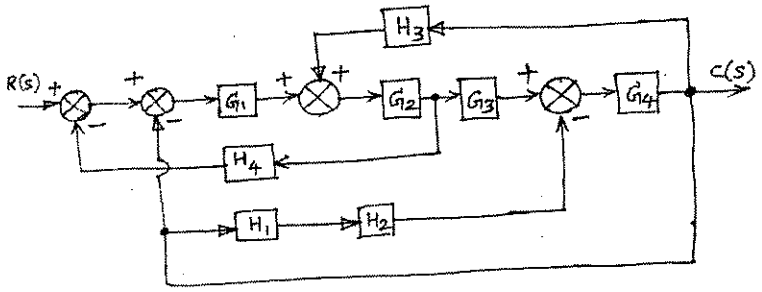


Figure.2.

ii) Derive the transfer function of field controlled DC servomotor. (6)

12. a) Derive the expression for a unit step input response of a typical under damped second order system. Also derive an expression for peak time, rise time, delay time, settling time and peak overshoot of the system. (16)

(OR)

b) A unity feedback control system is characterized by the following open-loop transfer function. $G(s) = \frac{1}{s\,(1+0.5\,s)(1+0.2\,s)}$. Evaluate the static error constants (K_p, K_v, K_a) for the system. Also obtain the steady state error of the system when subjected to an input given by the polynomial $r(t) = a_0 + a_1 t + \frac{a_2}{2} t^2$. (16)

13. a) Consider a unity feedback system having an open loop transfer function is $G(s) = \frac{1}{s\,(1+s)\,(1+2\,s)}$. Sketch the polar plot and determine the gain margin and phase margin. (16)

(OR)

b) Sketch Bode plot for the given open loop transfer function and determine the gain and phase cross over frequency. (16)

$$G(s) = \frac{10}{s\,(1+0.4\,s)\,(1+0.1\,s)}$$

14. a) Sketch the root locus for the unity feedback system whose open loop transfer function is (16)

$$G(s)\,H(s) = \frac{K}{s\,(s+1)\,(s+3)}$$

(OR)

b) Draw the Nyquist plot for the unity feedback control system whose loop transfer function $G(s)\,H(s) = \frac{K}{s\,(s+2)\,(s+10)}$ (16)

Determine the range of K for which closed loop system is stable.

15. a) Consider a unity feedback system whose open loop transfer function is $G(s) = \frac{K}{s\,(s+1)}$ (16)

Design a phase lead compensator in frequency domain with velocity error constants, $K_v = 12\ sec^{-1}$, and phase margin greater than 40°.

(OR)

b) What are the factors to be considered for choosing suitable compensators? Realize the lag and lead compensators using electrical network and obtain the transfer functions. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE502 – Microprocessors and Microcontrollers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the function of program counter and accumulator in 8085 microprocessor?
2. Calculate the execution time of an instruction MVI A,82H in 8085 runs at 2 MHz.
3. Mention any four data transfer instructions of 8051 microcontroller.
4. Examine the role of an assembler and a compiler in processors programming.
5. Recall the different peripheral interfacing used with 8085 microprocessor.
6. Define key debouncing in micro controller.
7. Give example for synchronous and asynchronous communication.
8. List the difference between I2C and SPI.
9. Give the advantage of using a μ_c in a closed loop control system.
10. Point out the need for driver between the microcontroller and the stepper motor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the features in the hardware architecture of 8085 microprocessor with a neat diagram. Explain the function of the various registers available in it. (16)

(OR)

b) Develop an assembly language program based on 8085 microprocessor instruction set to search the smallest data in a set. (16)

12. a) Discuss and explain in detail about the memory organization of 8051 microcontroller. (16)

(OR)

b) Develop an 8051 ALP with a flow chart to transfer a block of data. (16)

13. a) Design an 8-digit seven segment display system using 8051 microcontroller. (16)

(OR)

b) Discuss how to program and interface LCD to an 8051. (16)

14. a) Describe the blue tooth operating principle for a short range personal area network (PAN) with necessary diagrams. (16)

(OR)

b) Explain the structure of the Zigbee protocol stack for custom short-range networks. (16)

15. a) i) Demonstrate with a neat diagram, a 4x4 keyboard interfacing with 8051 microcontroller. (8)

ii) Draw the diagram to interface a servo motor with 8051 microcontroller and explain. (8)

(OR)

b) Explain the stepper motor control using 8051 and write an assembly language program for running the stepper motor as following sequence (16)

a. Clockwise direction for 15 seconds.

b. Off for 5 seconds.

a. Anti-clockwise direction for 10 seconds.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE501 - Microprocessor and Microcontroller

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Calculate the number of memory chips needed to design 8K-byte memory if the memory chip size is 1024 × 1.
2. Compare software and hardware interrupts.
3. Examine, how the microcontrollers respond to any interrupt request?
4. Identify the functions of the pins TXD, RXD in 8051 microcontroller.
5. List the use of sample and hold ICs.
6. Identify the need of interfacing ICs in 8051 controller.
7. List out the different types of communication protocols.
8. What is ZigBee and how does it work?
9. Write an assembly language program to add two 8-bit numbers.
10. Define step angle.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain with neat timing diagram, the opcode fetch machine cycle of 8085 microprocessor. (12)

ii) Develop an assembly language program to do the addition using the numbers 09H and 0AH with 8085 processor. (4)

(OR)

b) i) Explain the operations carried out when 8085 executes the following instructions with appropriate examples. (12)

(i) MOV M, A (ii) XCHG (iii) RAL (iv) DAA.

ii) Compare I/O mapped I/O and Memory mapped I/O in 8085 processor. (4)

12. a) i) Explain the architecture of the 8051 microcontroller. (12)

ii) Analyze the mode 0 operation of the timer in 8051 microcontroller. (4)

(OR)

b) i) Describe the interrupt structure of 8051 microcontroller. (12)

ii) List the functions of I/O ports in 8051 microcontroller. (4)

13. a) i) Explain the interfacing of a 4x4 matrix keyboard with an 8051 microcontroller. (8)

ii) How to interface a DAC with an 8051 microcontroller, illustrate with a neat schematic. (8)

(OR)

b) i) Write a program using 8051 instructions to send commands and data to LCD with a time delay. (8)

ii) Summarize with a diagram, how to interface Hall Sensor with the 8051 microcontroller. (8)

14. a) i) What are the functionalities of RS232 standard and explain them in detail. (8)

ii) Compare RS232 and RS485 standards. (8)

(OR)

b) i) Explain in detail about SPI communication protocol and its interfacing techniques. (8)

ii) Write a detailed notes on Blue-tooth interfacing protocols. (8)

15. a) Draw the schematic for interfacing a stepper motor with 8051 microcontroller and write 8051 ALP for changing speed and direction of motor. (16)

(OR)

b) Explain with a neat diagram the closed loop control of servo motor using microcontroller. (16)

Registration Number :

Government College of Engineering, Salem

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Full Time] / IV & V [Part Time]

Electrical and Electronics Engineering

22EE502/22PTEE501/23PTEE402 – MICROPROCESSORS AND MICROCONTROLLERS/ MICROPROCESSOR AND MICROCONTROLLER

(Regulations 2022/2023)

Time : 3 Hours

Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	What are the functions of an accumulator?	2	K1	1
2.	Define a subroutine.	2	K1	1
3.	What are the addressing modes of 8051 microcontroller?	2	K2	2
4.	List interrupts of 8051 microcontroller?	2	K1	2
5.	What is meant by A/D converter?	2	K2	3
6.	Draw the circuit of LED interface with 8051 microcontroller in sourcing mode and sinking mode.	2	K3	3
7.	Differentiate synchronous and asynchronous communication mode.	2	K2	4
8.	What is meant by baud rate?	2	K2	4
9.	Write an assembly language program to add two 4-bit numbers.	2	K3	5
10.	List any four application of Microcontroller.	2	K1	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	With the help of neat diagram explain the architecture of 8085 microprocessor in detail.	16	K2	1
	(OR)			
b)	Explain the addressing modes of 8085 microprocessor with one example for each.	16	K2	1
12. a)	With functional block diagram briefly discuss the architecture of the 8051 microcontroller.	16	K2	2
	(OR)			
b)	Describe the various operating modes of the timers, counters and associated control registers of 8051 microcontroller.	16	K2	2
13. a)	Explain in detail about the interfacing of LCD display with 8051 microcontroller.	16	K3	3
	(OR)			

Q. No		M	BTL	CO
	b) With neat diagram explain the interfacing of current, voltage and RTD sensors with 8051 microcontroller.	16	K3	3
14.	a) Describe the operation of SPI and I2C communication protocol with microcontroller in detail.	16	K4	4
	(OR)			
	b) Explain the concept of interfacing of Bluetooth and Zig-bee protocols with microcontroller in detail.	16	K4	4
15.	a) Sketch the block diagram of the 8279 Keyboard Display Interface and explain the functions in detail.	16	K2	5
	(OR)			
	b) Describe the basic operation of stepper motor and also discuss about microcontroller based stepper motor control.	16	K2	5

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE503 – Electrical Machine Design

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define space factor in electrical machine windings.
2. List out the major considerations to make a good design of electrical machine.
3. Mention the factors to be considered for the selection of number of poles in dc machine.
4. What is the limiting value of DC armature?
5. What are the methods of cooling in transformers?
6. Explain why stepped core are generally used for transformer?
7. What is the desired value of L/t for best power factor?
8. Give the effects of change of air gap length in an induction motor.
9. State merits of Computer Aided Design of electrical machines.
10. Explain how the value of SCR affects the design of alternator?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail about major considerations in electrical machine design. (8)

ii) Calculate the mmf required for the airgap of a machine having core length 0.32 m including 4 ducts of 10 mm each. Pole arc = 0.19 m; slot pitch = 65.4 mm; slot opening = 5 mm; airgap length = 5 mm; flux per pole = 52 mwb. Given Carter's coefficient is 0.18 for opening per gap is 1 and is 0.28 opening per gap =2. (8)

(OR)

b) i) Describe about materials used in electrical machines. (8)

ii) Summarize how to design simplex lap-winding? (8)

12. a) Determine the main dimensions of a 4-pole, 36 kW, 230 V, 1500 rpm shunt motor so that a square pole face is obtained. The average gap density is 0.6 wb/m^2 and the ampere conductors per meter are 28500. The ratio of pole arc to pole pitch is 0.7 and the full load efficiency is 90 %. (16)

(OR)

b) A 55 KW,110 V,1000 rpm, 4 pole shunt generator having specific electric and magnetic loading of 26000 ac/m and 0.5 wb/m^2 respectively. Find main dimensions, type of winding preferred and number of armature slots. The pole arc should be 70% of pole pitch and length of core about 1.1 times of pole arc. Allow 10 A for the field current and voltage drop of 4 V for armature circuit. (16)

13. a) Estimate the main dimensions including winding conductor area of a 3-phase delta-star core type transformer rated at 250 kVA, 6600/440V, 50Hz. Suitable core with 3 steps having a circumscribing circle of 0.25 m diameter and leg spacing of 0.45 m is available. EMF/turn = 7.5 V, current density 2.5 A/mm^2, staking factor is 0.9 and window space factor is 0.28. (16)

(OR)

b) A 300 kVA, 6600/400 V, 3-ϕ core types transformer has a total loss of 4800 W at full load. The transformer tank is 1.25 m in height and 1 m x 0.5 m in plan. Design a suitable scheme of cooling tubes if the average temperature rise is limited to 38^{0}C. The diameter of tube is 50 mm and is spaced 75 mm from each other. The average height of the tubes is 1.05 m. Specific heat dissipation due to radiation and convection is respectively 6 and 6.5 W/m^2-^{0}C. Assume that the convection is improved by 35% due to provision of tubes. (16)

14. a) Derive the expression for output equation of induction motor in terms of its main dimensions and also derive the expressions for design of rotor bars and end rings of squirrel cage induction motor. (16)

(OR)

b) Determine the main dimensions, number of radial ventilating ducts, number of stator slots and number of turns/phase of a 3.8 kW, 400 V, 3 slots per pole per phase, 3-ϕ, 4-pole and 50 Hz squirrel cage induction motor to be started by star – delta starter. Assume average flux density in air gap if 0.5 Wb/m^2; Ampere conductor per meter is given as 22500; efficiency = 85% and power factor = 0.84; winding factor = 0.9 and stacking factor = 0.9. Since the machines rated at 3.7 kW, 4-pole is sold at competitive price and therefore chooses the main dimensions to give a cheap design. (16

15. a) Discuss the choice of specific magnetic loading of synchronous machine in detail and Derive the output equation of synchronous machine. (16)

(OR)

b) Compute the main dimensions of a 1200 kVA, 50 Hz, 3ϕ, 375 rpm alternator. The average air gap density is 0.5 wb/m^2 and the ampere conductors per meter are 27500. Use rectangular poles. Assume the ratio of core length to pole pitch equals to 2. Maximum permissible peripheral speed is 50 m/s. K_w = 0.955 The runaway speed is 1.8 times the synchronous speed. (16)

Register No :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE301 – Electrical Machine Design

Time : 3 Hours | Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. What is total electric loading and write its significance?
2. List the required properties of magnetic materials.
3. Give the main parts of DC machine.
4. Define carter's gap coefficient.
5. List the Cooling methods used for transformer.
6. Why the efficiency of transformer is high compared with other machines?
7. Define Stator Slot Pitch.
8. Write the effects of change of air gap length in an induction motor.
9. Distinguish between cylindrical pole and salient pole construction.
10. Justify why damper windings are employed in synchronous machine?

(5 x 16 = 80 Marks)

Part B

Answer ALL Questions

11. a) i) Enumerate the major considerations accounted to evolve a good design of electrical machine and explain in detail? (8)

ii) Explain the concept of determining the thermal resistivity of winding and temperature gradients in conductors placed in slots. (8)

(OR)

b) i) Explain about various types of electrical conducting materials employed for design of machines. (8)

ii) Discuss the various types of insulating materials used in electrical machines. (8)

12. a) i) Derive the output equation of DC machine. (8)

ii) Calculate the specific electric and specific magnetic loading of 100 hp, 3000 V, 3 phase, 50 Hz, 8 pole star connected flame proof induction motor having a stator core length of 0.5 m and stator bore 0.66 m. Turns/phase = 286. Assume full load efficiency = 0.9 and power factor = 0.86. (8)

(OR)

b) i) State and explain the factors which govern the choice of specific magnetic and electric loadings in a DC machine. (8)

ii) Explain about the methods of mmf calculation for teeth. (8)

13. a) i) Draw the cruciform section of the transformer core and give the optimum dimensions in terms of circumscribing circle diameter d. (8)

ii) Determine the main dimensions of the core of a 5 kVA, 11000/400 V, 50 Hz, 1 phase core type distribution transformer. The net conductor area in the window is 0.6 times the net cross section area of iron in the core. The core is of square cross section, maximum flux density is 1 Wb/m^2 . Current density is 1.4 A/mm^2. Window space factor is 0.2. Height of the window is 3 times its width. (8)

(OR)

b) i) Explain the step by step procedure for the design of core, windings and yoke of shell type transformer. (8)

ii) List and explain the factors to be considered for selecting the cooling methods of a transformer. (8)

14. a) i) With neat sketches, discuss about different types of slots used in induction motor and compare the merits and demerits. (8)

ii) Describe the procedure for design of rotor bars and end rings of an induction motor. (8)

(OR)

b) Determine the approximate diameter and length of stator core, the number of stator slots and the number of stator conductors for a 11 kW, 400 V, 3 phase, 4 pole, 1425 rpm, delta connected induction motor. Bav = 0.45 Wb/m^2, ac = 23000 ac/m, full load efficiency = 0.85, power factor = 0.88, $L/\tau = 1$. The stator employs a double layer winding. (16)

15. a) i) Derive output equation of synchronous machine. (8)

ii) Find the main dimensions of a 100 MVA, 11 kV, 50 Hz, 150 rpm, 3 phase water wheel generator. The average gap density of 0.65 Wb/m^2 and ampere conductors per meter are 40,000. The peripheral speed should not exceed 65 m/s at normal running speed in order to limit the run-away peripheral speed. (8)

(OR)

b) i) Find the main dimensions of a 2500 KVA, 187.5 rpm, 50 Hz, 3 phase 3 KV, salient pole alternator. The generator is to be vertical water wheel type. Use circular pole with ratio of core length to pole pitch = 0.65. Specify the type of pole construction used if the runaway speed is about 2 times the normal speed. (8)

ii) Explain the merits of Computer Aided Design of electrical machines. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE502 – Power System Analysis and Stability

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define per unit value of an electrical quantity.
2. List the basic components of power system?
3. What is the advantage Fast Decoupled Load Flow (FDLF) method?
4. When the PV bus is treated as PQ bus in power flow study?
5. Infer the key assumptions made in short circuit analysis.
6. Identify and highlight the significance of sub transient reactance and transient reactance in short circuit studies.
7. Express the unbalanced voltages in terms of symmetrical components.
8. Illustrate the equivalent circuit of synchronous generator under L-G fault.
9. Define power system stability
10. How to improve the transient stability limit of the power system

Part B

(5 x 16 = 80 Marks)

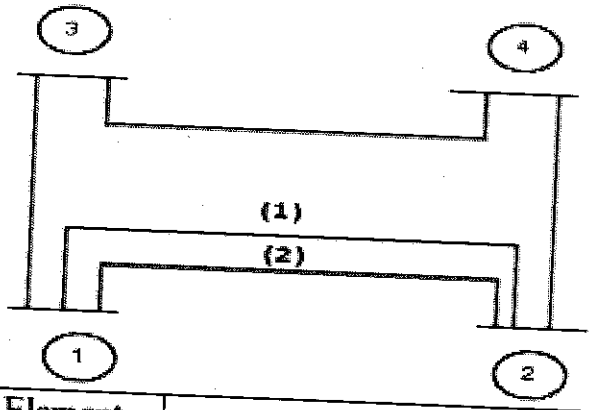
Answer ALL Questions

11. a) Explain how the following power system components are modeled in power system studies i) Generators ii) Transformer iii) Transmission line iv) Load. (16)

(OR)

b) Explain the per phase analysis of three-phase transformer and derive the equivalent circuit of three-winding transformer model. (16)

12. a) Form Y-bus by singular transformation for the network shown in figure.1. The impedance data is given in table. Take (1) as reference node. (16)



Element No.	Self	
	Bus code	Impedance
1	1-2(1)	0.6
2	1-3	0.5
3	3-4	0.5
4	1-2(2)	0.4
5	2-4	0.2

Figure.1

(OR)

b) Perform one iteration of Newton-Raphson load flow method and determine the power flow solution for a given power system. Take base MVA as 100. (16)

Line Data:

Line	Bus		R in p.u	X in p.u	Half line charging admittance
	From	To			
1	1	2	0.0839	0.5183	0.0636

Bus Data:

Bus	P_L	Q_L
1	90	20
2	30	10

13. a) Describe the algorithm for forming the bus impedance matrix and its use in fault analysis. (16)

(OR)

b) Explain the selection criteria for circuit breakers based on fault levels and describe the current limiting reactor. (16)

14. a) A generator without dampers is rated at 30 MVA, 12.8 kV and has a direct axis sub transient reactance of 0.3 per unit. The negative and zero sequence reactances are 0.25 and 0.1 pu respectively. The neutral of the generator is solidly grounded. Determine the sub transient currents and line to line voltages at the faults under subtransient conditions, when a line-to-line fault occurs at the generator terminals. Assume that the generator is unloaded and operating at rated terminal voltage when fault occurs. Neglect resistance. (16)

(OR)

b) Analyze the expression for fault current in double line to ground fault on unloaded generator. Draw an equivalent network showing the inter-connection of networks to simulate double line to ground fault. (16)

15. a) i) Derive the expression for critical clearing time for a SMIB. (10)

ii) Explain the methods of improving transient stability. (6)

(OR)

b) Explain the step wise procedure of determining the swing curve of power system using the modified Euler's method. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE506 – Solar and Wind Energy Conversion Systems

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Which process is responsible for production of energy in sun?
2. Define solar azimuth angle.
3. Define tip speed ratio.
4. Give the reason for blowing of wind.
5. What happens to solar PV system, if load is disconnected?
6. Define energy payback period.
7. What is the purpose of yawing system in wind turbine?
8. List out the different speed schemes in wind turbines.
9. What is fault ride?
10. Mention the merits of hybrid power generation.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the depletion process of solar radiation as it passes through the atmosphere to reach at the earth surface. (16)

(OR)

b) Derive an expression for solar day length. (16)

12. a) i) With the help of block diagram explain the functions of various blocks of a wind energy conversion system. (8)

ii) Explain Betz limit and pitch control. (8)

(OR)

b) With the help of a diagram, discuss the power versus wind speed characteristics of a wind turbine. (16)

13. a) Explain I-V characteristics of a solar cell and define fill factor. What is the significance of fill factor? (16)

(OR)

b) What is the importance of MPPT in SPV system? Explain P & O technique for maximum solar power harvesting. (16)

14. a) Discuss in detail about Doubly fed Induction Generator used in Wind Energy conversion system. Also discuss about its characteristics. (16)

(OR)

b) Discuss about the power converter used in wind generation generators. Also explain the control of converter. (16)

15. a) Discuss in detail about the solar PV and wind farm behavior during grid disturbances. Also discuss the rectifying action for it. (16)

(OR)

b) Explain the main features of solar PV and wind hybrid generating systems. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E./Ph.D Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES/ELECTRICAL AND ELECTRONICS ENGINEERING

22PEE51 – Smart Grid Technology

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State characteristics of a Smart Grid.
2. Recall the major challenges in Smart Grid.
3. Differentiate between Home Area Network and Wide Area Network.
4. List the Communication protocols used in Smart Grid.
5. State the function of a Smart meter.
6. What is the function of a Bay controller?
7. Classify Energy Storage systems.
8. State the role of Energy Storage in Smart Grid.
9. Recall the Sustainable energy options for the Smart Grid.
10. Compose the impact of PHEV on the Smart Grid.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Demonstrate with neat diagram, the basic concept and functions of a Smart Grid.	(8)
		ii)	Discuss briefly Smart Grid Enabling Technologies.	(8)
			(OR)	
	b)	i)	Explain the various stages for Grid modernization.	(8)
		ii)	Discuss briefly the transformation from traditional Grid to Smart Grid.	(8)
12.	a)	i)	Draw the communication infrastructure for Smart Grid.	(6)
		ii)	Discuss the different wireless communication technologies for the Smart Grid.	(10)
			(OR)	

b) i) Summarize the important security objectives to be incorporated in Smart Grid. (8)

ii) Discuss the Cyber Security risks and cyber Security requirements in Smart Grid. (8)

13. a) i) Demonstrate with neat diagram, the Architecture, key component and operation of Smart meter. (10)

ii) Write short notes on services provided by DSI. (6)

(OR)

b) i) Explain with neat diagram, the component and functions of Substation automation. (8)

ii) Demonstrate the working of Intelligent Electronic Devices used in Smart Grid for monitoring and protection. (8)

14. a) i) Illustrate the structure of Energy Storage System. (8)

ii) Demonstrate the power conditioning system for interfacing ESS with Smart Grid. (8)

(OR)

b) i) Describe the Techno-economic characteristics of Energy Storage systems. (8)

ii) Discuss the Smart Grid energy storage applications. (8)

15. a) i) Exemplify with neat diagram, the Solar PV system integration into Smart Grid. (8)

ii) Discuss the penetration and variability issues associated with sustainable energy technology (8)

(OR)

b) i) Illustrate with neat diagram, the operation of Fuel cell. (8)

ii) Illustrate with neat diagram, the impact of Plug in Hybrid Electric Vehicles in Smart Grid. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE304 – Power Electronics

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the V-I characteristics of diode.
2. Define holding current.
3. List the functions of freewheeling diode.
4. Mention the effect of source and load inductance in converters.
5. Define duty cycle.
6. Enumerate the applications of DC chopper.
7. What are the merits and demerits of 120 degree over 180 degree mode inverter?
8. What is modulation index?
9. List the merits of multistage sequence control of AC voltage controller.
10. Write the applications of cyclo converter.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With neat sketch, discuss the operation of SCR with its VI characteristics. (10)

ii) Draw the Gate drive circuit of MOSFET and discuss its function. (6)

(OR)

b) Explain the construction and operation of MOSFET along with its switching characteristics. (16)

12. a) i) With neat sketch, describe the operation of single phase semi converter. Also derive the expression for average output voltage. (10)

ii) A single phase half controlled rectifier supplies a load of R = 10 Ω and L = 10 mH. It is operated from 230 V, 50 Hz ac mains. Calculate average output voltage, average output current when α = 60 (6)

(OR)

b) Explain in detail the working of single phase dual converter in circulating and non circulating mode. (16)

13. a) i) Draw the power circuit and discuss in detail about the operation of boost converter. Also derive the expression for average output voltage. (10)

ii) A step-up chopper has input voltage of 220 V and output voltage of 660 V. If the non-conducting time of thyristor chopper is 100 μs, compute the pulse width of output voltage. In case pulse width is halved for constant frequency operation, find the new output voltage (6)

(OR)

b) i) Describe the operation of a SEPIC converter. Derive the expression for average output voltage. (10)

ii) Explain the control strategies of DC to DC converter. (6)

14. a) Explain the operating principle of single phase voltage source inverter with RL load. Also derive the expression for RMS output voltage. (16)

(OR)

b) Explain the operation of three phase voltage source inverter with 180° switching mode for star connected resistive load. (16)

15. a) Explain in detail about the working of single phase AC voltage controller with RL load. Also derive the expression for average output voltage. (16)

(OR)

b) i) Explain the multistage sequence control AC voltage controller. (8)

ii) Draw and explain the function of matrix converter. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE203 – Measurements and Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the basic functional elements of an instrument?
2. A Voltmeter reads 152 volts for a particular measurements. If the true value of the measurement is 154 volts, Determine the percentage static relative error and static correction.
3. Define Creeping in Energy meter.
4. Point out any two applications of current transformer and Potential transformer.
5. Write the necessary balance condition for a Schering bridge.
6. Give any four applications of AC bridge.
7. Name the main parts of cathode ray tube.
8. Point out the use of digital multimeters.
9. Classify the transducers.
10. Mention any two applications of Smart Sensors.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Elaborate the static and dynamic characteristics of measuring instruments with a neat sketch. (16)

(OR)

b) A circuit was tuned for resonance by eight different students and the values of resonant frequency in kHz were recorded as 532, 548, 543, 535, 546, 531, 543 and 536. Calculate (16)

1. Arithmetic mean
2. Deviation
3. Standard deviation
4. Average deviation

12. a) Describe the constructional and working of an induction type Energy meter with neat diagram. (16)

(OR)

b) Sketch a circuit diagram and explain in detail about the working of single phase electrodynamometer type power factor meter and frequency meter. (16)

13. a) A Maxwell's Capacitance bridge shown below in Figure.1 is used to measure an unknown inductance in comparison with capacitance. The various values at balance: R_2 = 400 Ω, R_3 = 600 Ω, R_4 =1000 Ω, C_4 = 0.5 μF. Calculate the value of
R1 and L1 and also calculate the value of storage
Q Factor of the coil if frequency is 1000Hz. (16)

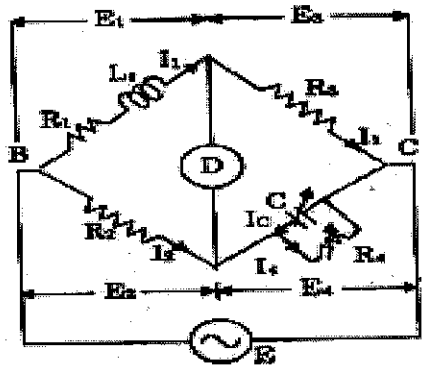


Figure.1

(OR)

b) Interpret the working of Schering bridge with a neat diagram and also derive its bridge balance condition. Mention any four merits of it. (16)

14. a) With a help of functional block diagram and explain the operation of a digital storage Oscilloscope. List out any four applications it. (16)

(OR)

b) Explicate the working of digital voltmeter and digital multimeter with necessary diagram. Give any two merits and demerits of them. (16)

15. a) i) What is called piezo-electric transducer? Explain its working with a neat diagram. (8)

ii) A 5-plate transducer has plates of dimensions 20 mm × 20 mm and separated 0.25 mm apart. The arrangement is to be used for measuring displacement. Determine the sensitivity of the arrangement. Assume air medium. (8)

(OR)

b) i) Explain in detail about the construction and working principle of LVDT. (8)

ii) Describe the concept of smart sensors with relevant diagram. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE403 – Protection and Switchgear

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define fault clearing time.
2. What is meant by zones of protection?
3. What is rupturing capacity?
4. Compare re-striking voltage and recovery voltage.
5. Write the applications of Buchholz's relay.
6. Why the secondary of CT should not be open?
7. What is phase comparator?
8. What are advantages of static relays?
9. Write the sampling theorem.
10. List the functions of numerical relays.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Summarize the importance of protective schemes employed in power system. (10)

ii) Show the essential qualities of protective relay. (6)

(OR)

b) i) Explain the general working of a relay and derive the fundamental torque equation. (8)

ii) Outline the construction details and principle of operation of induction type directional over current relay. (8)

12. a) i) Write the principle of arc extinction. Enumerate the methods of arc extinction and describe them in detail (8)

ii) Describe the constructional details of SF6 circuit breaker and its operation. (8)

(OR)

b) Describe the construction and principle of operation of Air Blast circuit breaker. Also gives its merits and demerits. (16)

13. a) i) Describe the protection of the stator windings of 3-phase alternator against turn-to-turn faults. (8)

ii) Calculate the required value of neutral resistance for a 3-phase 11 kV alternator so as to protect 70% of the winding against earth-fault by a relay with pick-up current of 1 A. The neutral CT has a ratio of 250/5. (8)

(OR)

b) i) Discuss the different types of transformer faults. What are various protective schemes available for transformers? (10)

ii) Discuss the percentage differential protection scheme of a transformer. (6)

14. a) What is the need for static relays? Explain the basic units in a static relay. Enumerate the advantages and disadvantages of static relays. (16)

(OR)

b) i) Explain the working of a static over current relay. (8)

ii) With sketches, discuss the operation of static differential relay. (8)

15. a) i) Deduce the mathematical expression for a square waveform with Fourier analysis and find the magnitude of third order harmonics. (10)

ii) Explain the least error squared technique. (6)

(OR)

b) List out the general characteristics of numerical protection and explain working of microprocessor based over current relay with suitable diagram. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES

22PEC11 – Power Semiconductor Devices and Components

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Justify the need of isolation for power semiconductor devices.
2. Compare BJT and MOSFET and IGBT.
3. List the parameters to be considered for proper mounting of the device with heat sink.
4. What is called thermal impedance?
5. What are the factors that affect the utilization of the window area of a core?
6. Give the Proximity effect factor in a transformer winding.
7. Enlist the features of Linear Inductor.
8. Give the equation of energy in inductance.
9. What are the two types of losses in capacitor?
10. List the application of capacitors in power electronic system.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw and discuss typical output and transfer characteristics of IGBTs. (8)

ii) Briefly Explain about device limits and safe operating area of an IGBT? (8)

(OR)

b) i) What are the different types of MOSFETs? Bring out the differences among different types of MOSFETs. (8)

ii) Explain the different gating requirements for GTO. (8)

12. a) A power device is operating under certain conditions with a certain power dissipation of 100 W and a temperature rise of 80°C between the junction and the ambient. The thermal time constant of the device together with the heatsink is 1s. Under this condition, evaluate the excess pulsed power of duration 0.3 s if the peak temperature rise is not to exceed 100°C. (16)

(OR)

b) Discuss the concept of ZVS and ZCS in converters with neat example. (16)

13. a) Explain the properties of magnetic core materials commonly used in power electronics. Also Compare the Magnetic Material. (16)

(OR)

b) Explain the procedure how to design of ferrite core current transformer. (16)

14. a) Outline the concept of Hanna Curve and describe how to design an inductor in relation with Hanna Curve. (16)

(OR)

b) Design an inductor that can handle 4amps at 100 kHz. (16)

15. a) i) Outline the general properties of Capacitor. Classify liquid and solid dielectric capacitors. (8)

ii) Explain the purpose of EMI suppression capacitors. (8)

(OR)

b) i) Explain the three types of Ceramic capacitor. (8)

ii) Illustrate the material characteristics of ceramic capacitor and its application. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES

22PEE11 – Advanced Microcontroller Based System Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is called shadow registers? Mention its types.
2. Write the functions of Data Space Address Generator Units?
3. Specify the function of Programmable Oscillator postscaler.
4. Identify the applications where Low Voltage Detect in controller option needed?
5. Write the operating modes of Input capture module in dsPIC30F controller.
6. Highlight the significance of ADC in dsPIC30F over the conventional microcontroller.
7. Why dead time is needed in PWM control?
8. What is the significance of PWM Output and Polarity Control?
9. State any four motor control applications with dsPIC30F controller.
10. What is the role of microcontroller in digital voltmeter?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw the functional block diagram of dsPIC30F CPU Core and explain its hardware resources. (16)

(OR)

b) Discuss how flash programming and Data EEPROM Programming operations are carried out in dsPIC30F controller with Programming Algorithm. (16)

12. a) Discuss the special power saving modes, Sleep mode and Idle mode functions in dsPIC30F device. (16)

(OR)

b) Draw the structure of I/O port configuration in dsPIC30F controller and specify the functions of I/O Port Control Registers. (16)

13. a) Draw the block diagram of Type B-Type C pair 32 Timer and explain synchronous counter mode of operation with configuration settings. (16)

(OR)

b) With the help of functional block diagram, describe Simple Pulse Width Modulation mode with configurations for PWM period and duty cycle. (16)

14. a) Draw block diagram of motor control PWM module in dsPIC30F controller and specify its hardware features and supporting registers. (16)

(OR)

b) Discuss the operation of Programmable Digital Noise Filters and Quadrature Decoder in Quadrature Encoder Interface module of dsPIC30F controller. (16)

15. a) Explain how dsPIC30F controller used for generation of PWM's for controlling voltage and frequency in a three phase PWM inverter. (16)

(OR)

b) With the help of schematic diagram, explain how dsPIC30F controller supports for vector control of three phase Induction Motor. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES

22PEE25 – Design of Power Converters

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Why voltage rating is important while selecting diode for the rectifier?
2. Mention the significance of Equivalent Series Resistance (ESR) in a filter capacitor.
3. Reactive power requirements are important in rectifier design. Justify.
4. What factors are considered while selecting inductor for rectifier design?
5. How does space vector modulation differ from conventional PWM in controlling inverters?
6. List out any two application and its control strategy used in inverters.
7. Why are ferrite transformers important in some converter designs?
8. Point out the assumptions made in the design of buck converter.
9. Why is it important to use snubber circuit in high-frequency power electronic applications?
10. How does the heat sink reduce the internal temperature of an electronic device?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss in detail about any one uncontrolled rectifier topology and give the criteria for selection of each elements in the topology. (16)

(OR)

b) i) Mention the practical considerations while selecting and designing inductor for rectifier filter. (8)

ii) What is meant by pulse number in rectifiers? Briefly explain how this pulse number affects the performance of rectifier. (8)

12. a) Discuss the selection of SCR and the design of inductor for the controlled rectifier system. (16)

(OR)

b) With neat schematic, explain the triggering sequence and sequence control for improving power factor operation in rectifier circuit. (16)

13. a) Design an inverter that has a PWM output across an RL series load with R = 10 Ω and L = 20 mH. The fundamental frequency of the output voltage must be 120 V RMS at 60 Hz, and the total harmonic distortion of the load current must be less than 8 percent. Calculate the DC input voltage, the amplitude modulation ratio m_a and the switching frequency (carrier frequency). (16)

(OR)

b) The full-bridge inverter has a switching sequence that produces a square wave voltage across a series RL load. The switching frequency is 60Hz, V_{dc} = 100 V, R = 10 Ω and L = 25 mH. Determine (a) an expression for load current, (b) the power absorbed by the load, and (c) the average current in the dc source. (16)

14. a) Design a buck converter to produce an output voltage of 18 V across a 10 Ω load resistor. The output voltage ripple must not exceed 0.5 percent. The DC supply is 48 V. Design for continuous inductor current. Specify the duty ratio, the switching frequency, the values of the inductor and capacitor, the peak voltage rating of each device, and the R.M.S current in the inductor and capacitor. Assume ideal components. (16)

(OR)

b) Design a boost converter that will have an output of 30 V from a 12 V source. Design for continuous inductor current and an output ripple voltage of less than one percent. Specify the duty ratio, the switching frequency, the values of the inductor and capacitor, the peak voltage rating of each device, and the R.M.S current in the inductor and capacitor. Assume ideal components. The load is a resistance of 50 Ω. Assume ideal components for this design. (16)

15. a) The converter and snubber as shown in figure.1 below has V_s= 100 V and I_L = 5 A. The switching frequency is 100 kHz with a duty ratio of 50 percent, and the transistor turns off in 0.5 μs. (i) Determine the turnoff losses without a snubber if the transistor voltage reaches V_s in 0.1 μs. (ii) Design a snubber using the criterion that the transistor voltage reaches its final value at the same time that the transistor current reaches zero. (iii) Determine the transistor turnoff losses and the resistor power with the snubber added. (16)

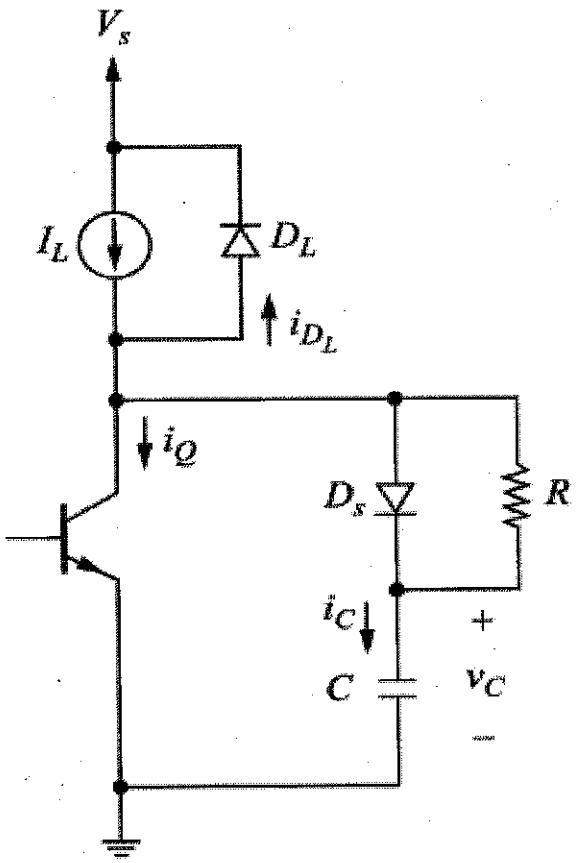


Figure.1

(OR)

b) A MOSFET with no heat sink absorbs a thermal power of 2 W. The thermal resistance from junction to ambient is 40°C/W, if the ambient temperature is 30°C. (i) Determine the junction temperature. (ii) If the maximum junction temperature is 150°C, how much power can be absorbed without requiring a heat sink? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E./Ph.D Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES/ELECTRICAL AND ELECTRONICS ENGINEERING

22PEE61 – Electric Vechicles and Power management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare efficiency of conventional, hybrid, battery, and fuel cell vehicles.
2. Define road rolling resistance.
3. What is meant by brake specific fuel consumption?
4. State the basic operation of fuel cell.
5. Sketch the block diagram for Typical electric Propulsion system.
6. Differentiate BLDC motor and SRM motor.
7. What is the advantage and disadvantage of slow charging system?
8. What is meant by resonant switching in power converter?
9. Differentiate primary and secondary battery.
10. Define depth of discharge in battery.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the effect of aerodynamic drag on vehicle performance in detail. (16)

(OR)

b) Explain the classification of hybrid electric vehicle with block diagram. (16)

12. a) With neat block diagram, explain the components of plug-in hybrid electric vehicle and its operating principle. (16)

(OR)

b) Explain the operation of fuel cell electric vehicle configuration and its control strategies. (16)

13. a) Describe the operation of multi quadrant operation of chopper fed DC drives. (16)

(OR)

b) Explain the operation of vector control of induction motor drives and permanent magnet brush less DC motor diagram with neat diagrams. (16)

14. a) Explain about the different types of charger classification and its standards in detail. (16)

(OR)

b) Elaborate wireless charging methods and resonant inductive charging methods. (16)

15. a) Explain the characteristics of following traction batteries in details (16)
i) Lead acid battery
ii) Nickel-Metal-Hydride battery
iii) Li-ion battery

(OR)

b) Describe about the Battery cell balancing methods and battery charging methods in detail. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE401 - Synchronous and Induction Machines

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Calculate the pitch factor for the given winding with: 36 stator slots, 4 poles and coil span 1 to 8.
2. Define the synchronizing power of an alternator.
3. Why synchronous motor is not self-starting?
4. Mention the use of damper windings in a synchronous machine.
5. Justify the statement "Induction Motor is a rotating transformer".
6. Submit the reason for a very low power factor in the induction motor when it is operated on No-Load.
7. Highlight the need for a starter in three phase induction motor.
8. Differentiate cogging and crawling.
9. Distinguish the terms rotating and pulsating magnetic fields.
10. State the reason for fixing of a centrifugal switch in many single-phase induction motors.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A 1.1 MVA, 2.2 kV, 3-phase, star-connected alternator gave the following test result during OC and SC tests: (16)

Field Current (A)	10	20	30	40	50
Open circuit voltage (kV)	0.88	1.65	2.20	2.585	2.86
Short circuit current (A)	200	400	-	-	-

The effective resistance of the 3-phase winding is 0.22 Ω/ph. Estimate the full-load voltage regulation at 0.8 pf lagging

i) By synchronous impedance method and

ii) Ampere-turn method.

(OR)

b) i) Derive the EMF equation of a 3-phase synchronous machine. (6)

ii) Two similar, 3 phase alternators work in parallel and deliver a total real power of 1800 kW at 11 kV and at 0.85 pf lagging to the load. Each alternator initially supplied half the load power. The excitation of the first alternator is then increased such that its line current becomes 60 A lagging. Find the line current delivered by the second alternator. (10)

12. a) i) Derive the expression for maximum torque developed per phase of synchronous motor. (6)

ii) A 5 kW, three-phase Y-connected 50 Hz, 440 V, cylindrical rotor synchronous motor operates at rated condition with 0.8 pf leading. The motor efficiency excluding field and stator losses is 95% and Xs = 2.5 Ω. Calculate: (10)

i) Mechanical power developed
ii) Armature Current
iii) Back emf
iv) Power angle
v) Maximum or pull out torque of the motor.

(OR)

b) i) Explicate in detail the V curve and inverted V curve of a synchronous motor. (6)

ii) A 3300 V, delta connected motor has a synchronous reactance per phase of 18 ohm. It operates at a leading power factor of 0.707 when drawing 800 kW from the mains. Calculate its excitation emf. (10)

13. a) i) Distinguish between Synchronous motor and Induction motor. (6)

ii) A 50 HP, six Pole, 50 Hz, slip ring induction motor runs at 960 rpm on full load with a rotor current of 40 A. Allow 300 W for copper loss in S.C. and 1200 W for mechanical losses, find R_2 per phase of the 3- phase rotor. (10)

(OR)

b) i) Illustrate the Star-Delta Starter for a three-phase induction motor. (6)

ii) Explain briefly, how the rotating magnetic field is developed in a 3Ø induction motor. (10)

14. a) Draw and explain the equivalent circuit for three phase induction motor. State the difference between exact and approximate equivalent circuit. (16)

(OR)

b) i) Sketch and discuss about the torque slip characteristics of three phase induction motor. Show the stable region in the graph. (8)

ii) A three phase induction motor has a starting torque of 100% and a maximum torque of 200% of the full load torque. Evaluate: (8)

a) Slip at which maximum torque occurs

b) Full load slip

c) Rotor current at starting in per unit of full-load rotor current.

15. a) A 220 V, single phase induction motor gave the following test results: (16)

Blocked rotor test: 120 V, 9.6 A, 460 W

No-load test: 220 V, 4.6 A, 125 W.

The Stator winding resistance is 1.5 Ω and during the blocked rotor test, the starting winding is open. Prepare the Equivalent circuit parameters, core, friction and windage losses.

(OR)

b) i) Describe the constructional details and principle of operation of Hysteresis motor. With neat sketch. (8)

ii) Describe the constructional details and principle of operation of shaded pole induction motor with neat diagram. With neat diagram. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE202 – Synchronous and Induction Machines

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Name the various types of alternators.
2. List the various methods to determine the voltage regulation.
3. How the synchronous motor can be used as synchronous condenser?
4. How the synchronous motor is made self-starting?
5. Why are the slots on the cage rotor of induction motor usually skewed?
6. Describe cogging in an induction motor.
7. Identify the condition of maximum torque developed in three phase induction motor.
8. List the applications of 3-phase induction motor.
9. Summarize why single-phase induction motor is not self- starting.
10. Write the drawback of shaded pole induction motor.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Describe the construction and working of an alternator.	(8)
		ii)	Explain synchronous impedance method for determining regulation of an alternator.	(8)
			(OR)	
	b)	i)	Explain in detail about any one method of synchronization of alternators.	(8)
		ii)	Explain slip test in detail for voltage regulation.	(8)
12.	a)	i)	Explain the working of synchronous motor with different excitations.	(8)
		ii)	Explain the effect of hunting and methods of reducing it in synchronous motor.	(8)
			(OR)	
	b)	i)	Explain V-curves and inverted V-curves.	(8)
		ii)	Explain in detail the method of starting of synchronous motor.	(8)

13. a) Describe how the rotating magnetic field is produced in an induction motor. (16)

(OR)

b) i) Discuss auto transformer starter of induction motor. (12)

ii) List the drawbacks of DOL starter. (4)

14. a) Discuss the performance characteristics of no-load end blocked rotor tests carried out in a 3ϕ induction motor. (16)

(OR)

b) i) Derive the expression for torque under running condition of a 3-phase induction motor and obtain the condition for maximum torque. (8)

ii) Draw and explain the torque-slip characteristics of 3-phase induction motor. (8)

15. a) Illustrate the operation of single-phase induction motor with double field revolving theory. (16)

(OR)

b) Give the classification of single-phase motors. Explain any two types of single-phase induction motors. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE402 – Measurements and Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the types of errors?
2. What are the elements in measurements system?
3. Define driving and braking torques of induction type energy meter.
4. What is tri-vector meter? What are its applications?
5. State the conditions for AC bridge balancing.
6. Draw the circuit diagram for H. V. Schering Bridge and write its uses.
7. What is mainly made by potentiometer?
8. What is the basic operation of oscilloscope?
9. Write the different classification of Transducers.
10. What are smart sensors and applications?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the principle and working of PMMC type instruments and derive the expressions for its deflecting and controlling torque. (8)

ii) Explain with a neat sketch the working of attracting disc type electrostatic volt meter and describe the range extension of E.S. Volt meter. (8)

(OR)

b) i) Explain static characteristics of measurement Instruments. (8)

ii) Explain the working of M. I. instrument. (8)

12. a) i) Explain the construction, principle and operation of single phase three element electro dynamometer type watt meter and derive its torque equation. (10)

ii) Compare C. T with P. T. (6)

(OR)

b) i) Derive the expression for ratio error of a C. T. (10)

ii) Derive the torque equation for an electrodynamometer type of wattmeter. (6)

13. a) Draw the circuit of Kelvin double bridge used for measurement of low resistance. Explain its working principle. (16)

(OR)

b) Compare Maxwell bridge with Schering bridge. (16)

14. a) Compare DSO and CRO. (16)

(OR)

b) With help of a neat diagram explain the working of Crompton type DC potentiometer. (16)

15. a) With help of a neat diagram, explain the principle and working of LVDT along with its applications, merits and demerits. (16)

(OR)

b) Describe with a neat sketch the principle and working of piezoelectric accelerometer and derive the expression for its output. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE403 – Analog and Digital Integrated Circuits

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the ideal characteristics, and draw the equivalent diagram of an OP-AMP.
2. Define virtual ground property of an operational amplifier.
3. Mention the features of an instrumentation amplifier.
4. How does the precision rectifier differ from conventional rectifier?
5. Draw the half and full adder circuit.
6. Why NAND and NOR gates are called Universal gates?
7. What is race around condition in JK flipflop?
8. What is universal shift register?
9. What is the significance of state assignment?
10. Differentiate fundamental mode and pulse mode circuits.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in detail the working of differential amplifier for single and differential outputs. (16)

(OR)

b) Discuss the open loop and closed frequency response of operational amplifiers. (16)

12. a) i) Draw the circuit and explain the working of Schmitt trigger. (8)

ii) With neat waveforms explain briefly the working of zero crossing detector. Also list few applications of Zero Crossing Detector. (8)

(OR)

b) Draw the functional block diagram and explain the working of IC 565. (16)

13. a) Minimize the given boolean function using Quine-McCluskey method and verify using K-map $F(A,B,C,D)=\sum m(0,1,2,4,5,7,8,10,11,12,15)$. (16)

(OR)

b) i) Implement the expression $f(A,B,C,D) = \sum m(0,2,3,5,6,9,12,14)$ using Multiplexer. (8)

ii) Explain the design of half and full adder circuit. (8)

14. a) Explain in detail the design of synchronous counter using JK flipflop. (16)

(OR)

b) With the aid of logic circuit and truth table, explain the working of RS flipflop. (16)

15. a) i) Explain the fundamental and pulse mode circuits in asynchronous sequential logic. (8)

ii) Write a short note on races and hazards in asynchronous sequential circuit. (8)

(OR)

b) Design an asynchronous sequential circuit that has two inputs X_1 and X_2 and one output Z. When $X_1 = 0$, then output Z is 0. The first change in X_2 that occurs while X_1 is 1 will cause output Z to be 1. The output Z will remain 1 until X_1 returns to 0. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE404 – Power Generation, Transmission and Distribution System

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by demand factor?
2. Mention the significance of load curve and load duration curve.
3. Discuss how inductance and capacitance of transmission line are affected by the spacing between the conductors.
4. What is meant by skin effect in transmission line?
5. Define transmission efficiency.
6. How to reduce corona loss?
7. State the advantages of suspension type insulator.
8. What is armouring in an underground cable?
9. How does AC distribution differ from DC distribution?
10. List the equipment used in the substation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)		Draw the schematic diagram of a nuclear power station and discuss its operation in detail.	(16)
			(OR)	
	b)		With neat sketch explain the functioning of hydro-electric power plant in detail.	(16)
12.	a)		Derive the expression for inductance of three phase line with unsymmetrical spacing.	(16)
			(OR)	
	b)	i)	Derive an expression for the capacitance per km of a single phase line taking into account the effect of ground.	(8)

ii) Determine the capacitance and charging current per unit length of the line when arrangement of the conductor is shown in the Figure .1 (8)

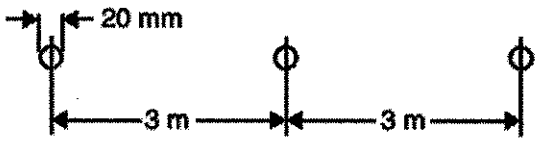


Figure.1.

13. a) i) Classify the transmission line and explain each with their characteristics. (8)

ii) What is Ferranti effect? Explain them with phasor diagram. (8)

(OR)

b) i) Derive the ABCD constants of medium transmission line with π configuration. (8)

ii) With reference to long transmission lines, give the physical interoperation of characteristics impedance, surge impedance, surge impedance loading and propagation constant. (8)

14. a) i) Explain the pin and suspension type insulators with neat sketch. (10)

ii) Define string efficiency of suspension insulator string. List the methods to improve string efficiency. (6)

(OR)

b) i) Describe the general construction of an underground cable with a neat sketch. (10)

ii) A single core cable used on 33 kV, 50 Hz has conductor diameter 10 mm and inner diameter of sheath 25 mm. The relative permittivity of insulating material used in 3.5. Find the (6)

1) capacitance of the cable per km
2) maximum and minimum electrostatic stress in the cable
3) Charging current per km.

15. a) i) Describe different types of bus bar arrangements used in substations with suitable illustrations. (8)

ii) A DC ring main distributor is fed at A and load is tapped at points B, C and D. The distributor length is 400 m long and points B, C, D are 150 m, 250 m and 375 m from A. Loads are 150 A, 40 A and 200 A respectively. If the resistance/100 Ω of single conductor is 0.04 Ω and V_A = 220 V. Calculate i) Current in each distributor ii) voltage at points B ,C and D. (8)

(OR)

b) i) Explain resonant grounding in detail. (8)

ii) Discuss the various methods of neutral grounding. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE402 – Power Generation, Transmission and Distribution System

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the significance of load curve.
2. Why high voltages are preferred for power transmission?
3. What is meant by transposition of line conductors?
4. List the advantages of using double circuit lines.
5. Mention the significance of surge impedance loading in the study of power systems.
6. Define critical disruptive voltage.
7. Write down the desirable properties of insulators.
8. Define string efficiency and list the methods of improving string efficiency.
9. Name the substation equipment and classify the substation depending upon the construction type.
10. List the advantages of neutral grounding.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A generating station has a maximum demand of 15 MW, a load factor of 40%, a plant capacity factor of 48% and a plant use factor of 60%. Find (i) the daily energy produced (ii) the reserve capacity of the plant (iii) the maximum energy that could be produced daily if the plant was running all the time (iv) the maximum energy that could be produced daily if the plant was running fully loaded and operating as per schedule. (8)

ii) Draw the single line diagram and explain the structure of electric power system. (8)

(OR)

b) i) With neat schematic explain the working of Boiling Water Reactor. (12)

ii) List the merits and demerits of Pressurized Water Reactor. (4)

12. a) Derive an expression for capacitance of a single phase transmission system and discuss the effect of earth on capacitance. (16)

(OR)

b) A 220 kV, 50 Hz, 200 km long three phase line has its conductors on the corners of a triangle with sides 6 m, 6 m and 12 m. The conductor radius is 1.81 cm. Find the inductance and capacitance per phase per km. (16)

13. a) Draw the nominal T circuit of a medium length transmission line and derive the expression for sending end voltage and current. Also draw the phasor diagram. (16)

(OR)

b) Using rigorous method, derive expressions for sending end voltage and current for a long transmission line. (16)

14. a) i) Draw the schematic diagram and explain the suspension type and pin type insulators. (12)

ii) List the advantages of string insulators. (4)

(OR)

b) i) Explain with neat diagram the methods of grading of cables. (12)

ii) List the factors to be considered while selecting the cable for a particular service. (4)

15. a) Describe in detail the layout of different types of substation and list few advantages of Gas Insulated Substation. (16)

(OR)

b) Discuss in detail the methods commonly used for grounding the neutral point of a 3-phase system. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE302 – Electromagnetic Fields

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the sources of electromagnetic fields.
2. Give the expression for the curl of a vector and write its significance.
3. List out the properties of electric flux lines.
4. State the boundary conditions between two dielectric media.
5. Write an Expression of Poisson's equation.
6. Distinguish between diamagnetic, paramagnetic and ferromagnetic materials.
7. State Faraday's law.
8. Compare the relationship between field theory and circuit theory.
9. Define skin depth in a conductor.
10. Find the velocity of a plane wave in a lossless medium having $\varepsilon_r = 5$ and $\mu_r = 1$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Obtain the expressions for differential area and volume element in cylindrical coordinate system. Estimate the spherical coordinates of A and Cartesian coordinates of B for the two given points A (x = 2, y = 1, z = 3) and B (ρ = 1, φ = 450, z = 2). (10)

ii) State and prove divergence theorem for a given differential volume element. (6)

(OR)

b) i) State and prove Gauss law. Obtain the point form of gauss law. (10)

ii) State and explain coulomb's law and deduce the vector form of force equation between the two-point charges. (6)

12. a) i) Discover an expression for electric field intensity field intensity due to a uniformly charged line of length 'l'. (8)

ii) Point charges 1 mC and -2 mC are located at (3, 2,-1) and (-1, -1, 4) respectively. Calculate the electric force on a 10nC charge located at (0, 3, 1) and the electric field intensity at the point. (8)

(OR)

b) i) Examine the mathematical expression for Poisson's and Laplace's equations. Give the significant physical differences between Poisson's and Laplace's equations. (8)

ii) Deduce an expression for the capacitance of series and parallel plate capacitor having two identical media. (8)

13. a) i) State and explain Ampere's circuit law and show that the field strength at the end of a long solenoid is one half of that at the centre. (8)

ii) State Biot savarts law. Obtain an expression for the magnetic field intensity due to straight finite conductor carrying current I amperes using Biot Savart's law. (8)

(OR)

b) i) Discuss about magnetic boundary conditions. (8)

ii) Quote the expression for the magnetic vector potential in the cases of an infinitely long straight conductor in free space. (8)

14. a) What are the different ways of emf generation? Explain with governing equation and suitable example for each. Also Obtain the expression for energy stored in the magnetic field. (16)

(OR)

b) Explain each of the four Maxwell's equations in differential and integral forms. (16)

15. a) i) Deduce the expression for electromagnetic wave equation for conducting medium. (8)

ii) Deduce the equation of the propagation of the plane electromagnetic waves in free space. (8)

(OR)

b) i) State and prove Poynting theorem. (8)

ii) Show the mathematical expression for plane wave reflection and refraction coefficient for electromagnetic waves. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE602 – Electrical Drives and Control

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the use of fly wheel mechanism?
2. How the losses are calculated in DC Motor?
3. What is single quadrant drive?
4. Why close loop control is required for DC drive?
5. What is the main characteristic of induction motor?
6. What type of speed control is used in fan?
7. What is scalar control?
8. Define slip regulation.
9. What is the effect of adding rotor resistance on slip ring induction motor?
10. How does a slip ring work?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain briefly about Fundamentals of torque equation?	(8)
		ii)	Briefly explain about armature voltage control method?	(8)
			(OR)	
	b)	i)	What are the components of load torque?	(8)
		ii)	How is a chopper used to control the speed of a DC motor? Explain.	(8)
12.	a)		Explain in detail about four quadrant chopper fed DC drive.	(16)
			(OR)	
	b)	i)	Obtain the transfer function modeling of Chopper.	(8)
		ii)	Briefly explain about the difference between inner loop and outer loop control?	(8)
13.	a)	i)	What is flux-weakening for high-speed operation? Explain	(8)
		ii)	Brief about the temperature characteristics of induction motors?	(8)

(OR)

b) Explain different types of torque- speed characteristics of Induction motor. (16)

14. a) A 3-phase 400 V, 6 pole, 50 Hz, star connected SRIM uses a chopper in its rotor circuit for its speed control. The effective turns ratio from rotor to stator is 0.6. Inductor current is ripple free. Losses in the rectifier, inductor, chopper and no load losses of the motor are neglected. Load torque, proportional to speed squared, is 160 Nm at 850 rpm. For a minimum motor speed of 500 rpm, calculate the value of chopper resistance R. For the value of R obtained if the speed is to be raised to 900 rpm. Calculate a) inductor current b) duty cycle of chopper c) rectified output voltage. (16)

(OR)

b) i) Explain about constant V/F control of Induction motor? (8)

ii) Briefly explain the applications of space vector modulation? (8)

15. a) i) Discuss about slip power recovery scheme in induction motor? (8)

ii) With neat sketch explain the speed control of slip ring Induction Motor. (8)

(OR)

b) i) What are the two types of control in power electronics? Explain. (10)

ii) What is the impact of rotor resistance in speed control for Induction motor? (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE402 – Synchronous and Induction Machines

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the effect of armature reaction for an alternator for zero power factor lagging?
2. State the use of slip test on an alternator.
3. When synchronous motor behaves like a capacitor?
4. What is meant by hunting in synchronous motor? How it is prevented?
5. A 4 pole 3 phase induction motor is supplied from 50 Hz AC supply. On full load, its speed is observed to be 1410 rpm. Calculate its full load slip.
6. Under what conditions is the direct on line starting of three phase cage induction motors preferred?
7. Draw the power flow diagram for three phase induction motor indicating losses in different stages.
8. Write the two types of test to be conducted to draw the circle diagram for three phase induction motor.
9. Draw the equivalent circuit for single phase Induction Motor without considering core loss.
10. Classify types of single phase induction motor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the constructional details of salient pole type synchronous generator. (10)

ii) A 3-phase, 16-pole alternator has a star-connected winding with 144 slots and 10 conductors per slot. The chording is by one slot. The flux per pole is 0.03 weber's sinusoidal distributed and the speed is 375 rpm. Find the frequency, phase voltage and line voltage. (6)

(OR)

b) i) A 100 kVA, 3000 V, 50 Hz 3-phase star-connected alternator has effective armature resistance of 0.2 Ω. The field current of 40 A produces short-circuit current of 200 A and an open-circuit EMF of 1040 V (line value). Calculate the full-load voltage regulation at 0.8 power factor lagging using EMF method. (10)

ii) Two alternators are running in parallel and sharing a load in desired proportion. Explain what will happen if the excitation of alternators are changed while their prime movers input are fixed. (6)

12. a) Explain the principle of operation of synchronous motor. Also derive an expression for power developed in a cylindrical-rotor synchronous motor in terms of load angle and synchronous impedance. (16)

(OR)

b) Explain the effects of varying excitation on armature current and power factor in a synchronous motor. Draw V and inverted V curves at different loading conditions. (16)

13. a) A three phase balanced AC supply is given to the three phase star connected induction motor with distributed winding. What type of magnetic field produced in the motor? Describe the principle of operation of a three phase induction motor. (16)

(OR)

b) A three phase squirrel cage induction motor has maximum torque equal to twice the full load torque. Determine the ratio of motor starting torque to its full load torque, if it is started by (16)

i) direct on line starter

ii) Auto transformer starter with 70% tapping.

The per phase rotor resistance and per phase standstill reactance referred to stator are 0.2 Ω and 2 Ω respectively. Neglect stator impedance.

14. a) Derive the per phase torque equation of three phase delta connected squirrel cage induction motor. Mention its slip values and torque expressions at i) starting ii) running with load iii) delivering rated load iv) at maximum load. (16)

(OR)

b) Draw the circle diagram for a 3.73 KW, 200 V, 50 Hz, 4 pole, 3 phase star connected induction motor from the following test data: (16)
No-load: Line voltage 200 V, line current 5 A; total input 350 W
Blocked rotor: Line voltage 100 V, line current 26 A; total input 1700 W. Estimate from the diagram for full-load condition, the line current, power factor and also the maximum torque in terms of the full-load torque. The rotor copper loss at standstill is half the total copper loss.

15. a) Using double revolving field theory, explain the operation and torque-slip characteristics of a single phase induction motor and prove that it cannot produce any starting torque. (16)

(OR)

b) Write the constructional features of shaded pole single phase Induction Motor and explain its operation with its speed torque characteristics. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE403 – Measurements and Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Calculate the error of an energy meter which reads 153 units as energy consumption for a true value of 150 units in percentage.
2. Recall the three forces involving in the working of an electro mechanical measuring instrument.
3. Examine the relationship between the deflection and measured variable and comment on the scale of moving coil and moving iron instrument's scale.
4. Compare AC &DC.
5. Outline the B-H curve and mark the hysteresis loss.
6. Find the tot mmf of a coil having 120 turns with 10 ampere and 1m length.
7. Define standardization of potentiometer.
8. Analyse the disadvantage of whetstone bridge during low resistance measurement and refer suitable bridge for low resistance measurement.
9. Classify the various transducers with an example for each.
10. Compare thermistor with thermocouple.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain with a block diagram about the elements of a generalised measurement system. (10)

ii) Define static error and classify them with reasons of occurring during measurement. (6)

(OR)

b) i) Explain the construction, working of PMMC meter with a diagram and deduce the torque equation. (10)

ii) Illustrate the air friction and eddy current damping in analog instruments. (6)

12. a) Explain the working of single phase dynamometer type watt meter with a diagram and deduce the torque equation. (16)

(OR)

b) Describe the construction and working principle of energy meter. Also derive the torque equation. (16)

13. a) i) Illustrate the experimental procedure to estimate the flux density of a ring specimen with a sketch. (8)

ii) Describe the "method of reversal" method to obtain the B- H curve. (8)

(OR)

b) i) Illustrate hoe iron losses of a magnetic material is separated using following methods (8)
   1) Frequency variation
   2) Form factor variation.

ii) Explain the Epstein square arrangement to measure the iron losses of a steel material with a diagram. (8)

14. a) i) For the Wheatstone bridge shown in Figure.1, (8)

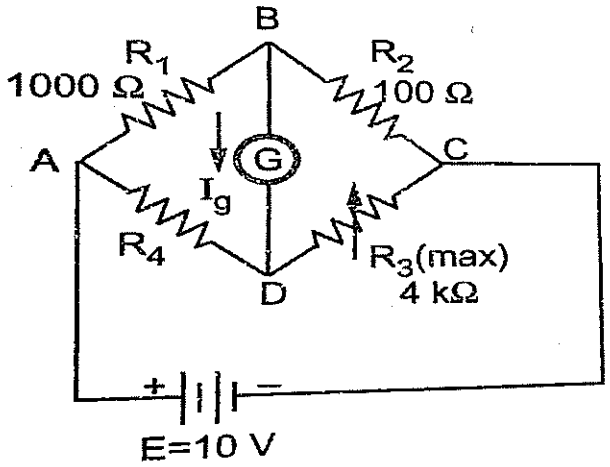


Figure.1

a. Determine the unknown resistance R_4.

b. If the galvanometer internal resistance is 80 Ω and its sensitivity is 70 mm/μA, find the unbalance in the bridge required to cause deflection 3 mm if the unknown resistance is equal to the maximum values is used in the circuit.

ii) Illustrate a Shering bridge to find the unknown capacitor, dielectric loss and power factor. (8)

(OR)

b) i) For the bridge shown in Figure.2, determine the values of Rx and Cx at a frequency of $500/2\pi$ (8)

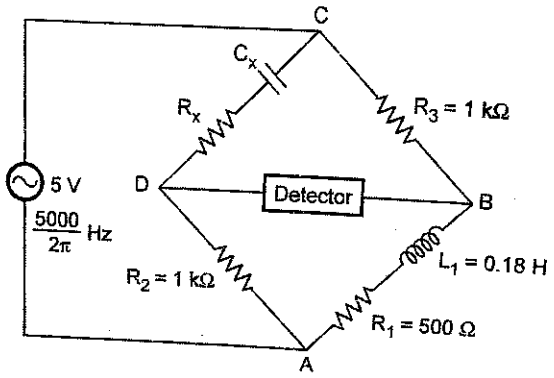


Figure.2

ii) Illustrate Wien bridge to find the unknown frequency and capacitor. (8)

15. a) Describe the construction, working and application of LVDT with its characteristics with suitable diagrams. (16)

(OR)

b) Illustrate the measurement and instrumentation system for measuring the following: (16)

1) Speed of a shaft in noncontact mode
2) Water level measurement of a house tank.
3) Blood flow measurement

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE404 – Analog and Digital Integrated Circuits

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Interpret a circuit using op-amp to generate output: $V_0 = \frac{V_1+V_2+V_3-V_4}{4}$, where V_1, V_2, V_3, V_4 are inverting input signals?
2. In an inverting amplifier, R_f = 100 Kohm, R_1 = 10 Kohm, V_1 = 1 V. Calculate output voltage.
3. Recall the uses of active filters.
4. If R_A = 2.2 Kohm, R_B = 3.9 Kohm and C = 0.1 μF, determine the free running frequency of Astable multivibrator using IC555.
5. Construct a 4 x 16 decoder with two 3 x 8 decoders.
6. Realize OR logic function using 2 x 1 multiplexer.
7. Compare Moore and Mealy sequential circuit models with examples.
8. Convert a JK flip-flop into a T flip-flop.
9. Outline the importance of state and flow table reduction in asynchronous circuit design.
10. What is a critical race in asynchronous circuits?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Design and interpret a practical integrator circuit with a dc gain of 20 to integrate square wave of frequency 25 KHz. (6)

ii) Assess the performance of a multiplier circuit based on an ideal OP-AMP for modulating two sinusoidal signals. (10)

(OR)

b) i) Explain the operation of a symmetrical emitter coupled differential amplifier. (6)

ii) Analyze the DC characteristics of an ideal OP-AMP and discuss their impact on the performance of differential amplifiers in OP-AMP applications. (10)

12. a) i) Design and interpret a first order low pass Butterworth filter with f_c = 1 KHz and the passband gain of 2. (8)

ii) Illustrate the working of a sample-and-hold circuit using OP-AMP. (8)

(OR)

b) i) Explain the working principle of IC 566 Voltage Controlled Oscillator. (8)

ii) Illustrate the working of the IC LM317 voltage regulator and explain how its output voltage can be varied. (8)

13. a) i) Simplify the Booloean function into sum of products and product of sum form F (A, B, C, D) = $\sum$m (0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14). Also implement the expressions in logic circuits only using NOR gates. (10)

ii) Reduce the Boolean function, F(w,x,y,z) = $\sum$m(1,3,10) + $\sum$d(0,2,8,12) (6)

(OR)

b) i) Implement the Boolean function, F (A, B, C, D) = $\sum$m (0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14). Using 8X1 multiplexer. (6)

ii) Design a combinational logic circuit with three input variables that will produce logic 1 output when more than one input variables are logic 1. (10)

14. a) Design a 4-bit synchronous counter with the following features: counts up in binary from 0 to 9, skips 3 and 7, and resets to 0 after 9. Also, illustrate the state diagram, excitation table, and the final flip-flop configuration. (16)

(OR)

b) Design a mixed flip-flop synchronous circuit using SR and D flip-flops to generate a specific sequence (e.g., 1010 in even clock cycles and 0110 in odd clock cycles). Provide detailed steps. (16)

15. a) Design an asynchronous sequential circuit to detect a specific sequence (e.g., 1011). Provide the primitive flow table, reduce states if possible, and show the final circuit implementation. (16)

(OR)

b) Design a pulse-mode asynchronous sequential circuit for a vending machine controller with two inputs (coin detection and product selection) and one output (product release). Include all design steps and handle potential hazards. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18EEM07 – Electrical Machines

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define residual EMF in DC Generator.
2. Identify under which conditions a dc shunt generator fails to excite.
3. Define Back EMF in a D.C. Motor.
4. Why commutator is employed in D.C. machines?
5. List out the merits and demerits of core and shell type transformer.
6. Differentiate two winding transformer and auto transformer.
7. What are the advantages of salient pole type construction used for synchronous machines?
8. Define voltage regulation.
9. Describe why an induction motor is called as a rotating transformer?
10. Summarize the advantages of capacitor start induction motor over split-phase induction motor.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With neat sketch explain the constructional components of DC Machine and its working principle. (16)

(OR)

b) Draw and Explain the Internal and External Characteristics of different types of DC Generators. (16)

12. a) Describe briefly the various methods of controlling the speed of a DC Shunt Motor and bring out their merits and demerits. (16)

(OR)

b) With the help of neat circuit diagram, explain Swinburne's test and Hopkinson's Test. (16)

13. a) Explain the construction, working principle and operation of a transformer. Derive its EMF equation. (16)

(OR)

b) Describe the method of calculating the regulation and efficiency of a single phase transformer by OC and SC tests. (16)

14. a) Describe the parallel operation of three phase alternators with help of a neat diagram. (16)

(OR)

b) Draw the simplified equivalent circuit of synchronous motor and examine the effect of loading in synchronous motor at various power factors with help of phasor diagrams. (16)

15. a) Describe the construction and working principle of 3 phase induction motor with neat sketch. (16)

(OR)

b) Using double field revolving theory, compose why a single phase induction motor is not self-starting. Also obtain the equivalent circuit of single phase induction motor with necessary equations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE501 – Power Generation, Transmission and Distribution System

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the different types of tariffs?
2. Write any four major nuclear power stations available in India.
3. What is called transposition of overhead transmission lines? Mention its significance.
4. State the effect of earth on capacitance calculations in overhead transmission lines?
5. How do you define voltage regulation and efficiency of transmission lines?
6. What is called surge impedance loading? Mention its significance.
7. Define string efficiency? Mention the string efficiency for insulators used in HVDC lines?
8. How do you classify the cables based on voltage level?
9. What is called resonant grounding?
10. Distinguish between feeder and distributor?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw the structure of electric power system and mention the voltage levels at different stages. (8)

ii) The maximum demand of a consumer is 25A at 220 V and his total energy consumption is 9750 kWh. If energy is charged at the rate of 20 paise per kWh for 500 hours use of maximum demand plus 5 paise per unit for all additional units, estimate his annual bill. (8)

(OR)

b) i) Draw the layout of hydro power station and indicate the main components. (8)

ii) Explain the working principle of nuclear power station. (8)

12. a) i) Derive the expression for inductance of three phase overhead transmission lines with unsymmetrical spacing of conductors. (8)

ii) Explain the terms "Skin effect" and "Proximity effect" referred to overhead transmission lines. (8)

(OR)

b) i) Derive the expression for inductance of single-phase AC transmission lines with composite conductors. (8)

ii) Discuss the effects of inductive interference between power and communication lines. (8)

13. a) A 3-phase, 50 Hz transmission line 100 km long delivers 20 MW at 0.9 power factor lagging with 110 KV. The resistance and reactance of the line per phase per km are 0.2 Ω and 0.4 Ω respectively, while capacitive susceptance is 2.5×10^{-6} siemens/km/phase. Calculate i) sending end voltage and power factor ii) voltage regulation iii) transmission efficiency. Use nominal T method. (16)

(OR)

b) i) Derive the expression for sending end voltage and sending end current of long transmission line using rigorous method. (8)

ii) Explain the mechanism of corona and its losses in overhead transmission line with suitable mathematical expressions. (8)

14. a) List out the different types of insulators used in transmission lines. Discuss the potential distribution over suspension type insulator. Explain any one method of improving the string efficiency. (16)

(OR)

b) A single core cable for use on 11 kV, 50 Hz system has conductor area of 0.645 cm^2 and internal diameter of sheath is 2.18 cm. The permittivity of the dielectric used in the cable is 3.5. Find i) the maximum electrostatic stress in the cable ii) minimum electrostatic stress in the cable iii) capacitance of the cable per km length iv) charging current. (16)

15. a) i) What is called neutral grounding? Explain any one method of neutral grounding. (8)

ii) What are the different types of bus-bar arrangements used in substations? Illustrate any one type of bus-bar arrangement with suitable diagram. (8)

(OR)

b) i) Draw the structure of radial, ring main distribution systems and explain. (8)

ii) A single-phase AC distributor AB 300 meters long is fed from end A and is loaded as under: (8)

i) 100 A at 0·707 p.f. lagging 200 m from point A

ii) 200 A at 0·8 p.f. lagging 300 m from point A

The load resistance and reactance of the distributor is 0·2 Ω and 0·1 Ω per kilometer. Calculate the total voltage drop in the distributor. The load power factors refer to the voltage at the far end.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE502 – Control Systems

(Graph Sheets, Semi-log graph Sheet and Polar Graph Sheet are permitted)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define transfer function.
2. Compare open loop system and closed loop system.
3. List out the time domain specifications.
4. The open loop transfer function of a unity feedback control system is given by $G(S) = \frac{10\,(S+2)}{S^2\,(S+5)}$. Calculate the acceleration error constant.
5. Define Gain Margin and Phase Margin.
6. What are constant M and N Circles?
7. Write the necessary and sufficient condition for the stability in Routh Stability Criterion.
8. What is meant by relative stability?
9. What is the need for compensators?
10. Differentiate phase lead and phase lag compensators.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write the differential equation governing the mechanical rotational system shown in the figure.1 below. Draw the electrical equivalent analogy circuits. (8)

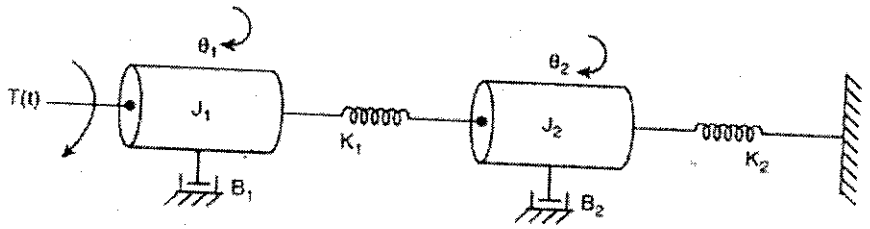


Figure.1.

ii) Derive the transfer function of armature controlled DC servo motor from its basic principles. (8)

(OR)

b) i) Reduce the block diagram shown in figure.2 below and determine the transfer function (8)

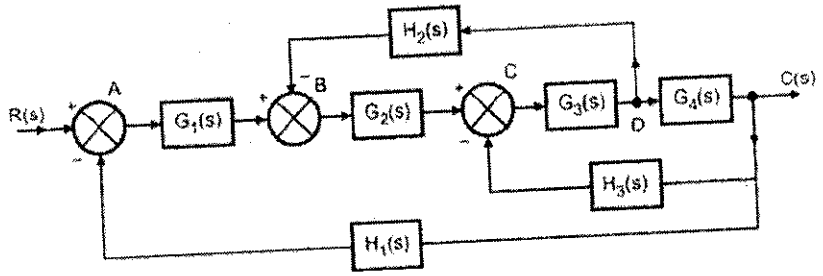


Figure.2.

ii) Derive the transfer function C(s)/R(s) of a given signal flow graph using Masons gain formula. Figure.3. (8)

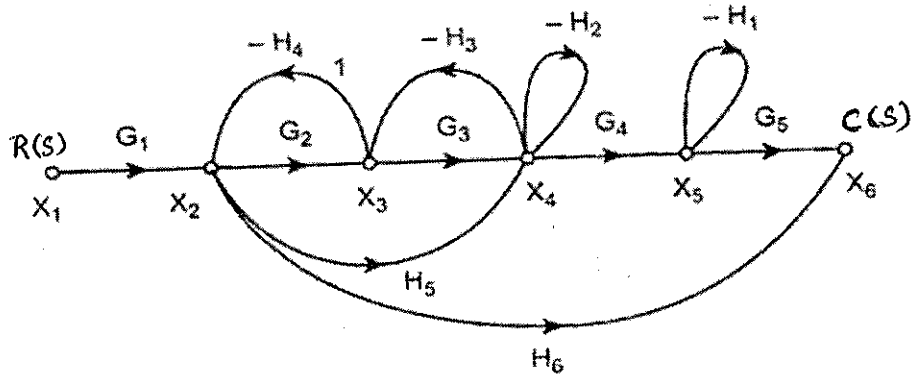


Figure.3.

12. a) i) Derive an expression for the unit step response of under damped second order system. Sketch the response and indicate all the time domain specifications. (10)

ii) For a unity feedback control system the open loop transfer function $G(s) = \frac{10}{S^2(S+1)}$. Determine the position, velocity and acceleration error constants. Also determine the steady state error when the input is $R(S) = \frac{3}{S} - \frac{2}{S^2} + \frac{1}{3S^3}$ (6)

(OR)

b) i) For a unity feedback system, open loop transfer function $G(s) = \frac{36}{s(s+0.72)}$. Determine the characteristics equation and hence calculate damping ratio, peak time, settling time and peak overshoot for unit step input. (10)

ii) A unity feedback control system is characterized by the following open loop transfer function $G(s) = \frac{KS}{(1+s)^2}$. For the input r(t) = 1 + 5t , find the minimum value of K, so that the steady state error is less than 0.1 (6)

13. a) The open loop transfer function of a system is given by $G(S) = \frac{2000\,(S+0.5)}{S\,(S+10)(S+50)}$. Draw the Bode plot for the given system and determine its phase margin and gain margin. (16)

(OR)

b) The open loop transfer function of a unity feedback system is given by $G(s) = \frac{1}{S(1+S)(1+2S)}$. Sketch the polar plot and also determine its phase and gain margin. (16)

14. a) i) Sketch the root locus of the system whose open loop transfer function is $G(S)H(S) = \frac{K}{S(S+2)(S+4)}$ (14)

ii) Discuss the effect of addition of poles on the root locus. (2)

(OR)

b) i) Draw the Nyquist plot for the system with open loop transfer function is $G(s)H(s) = \frac{K}{S(S+2)(S+10)}$. Determine the range of k for which the closed loop system is stable. (14)

ii) State Nyquist stability criterion. (2)

15. a) i) Design a lead compensator to meet the following specifications for a unity feedback system with open loop transfer function $G(s) = \frac{K}{S(S+1)}$. It is desired to have the velocity error constant $k_v = 12\,sec^{-1}$ and phase margin is 40°. (14)

ii) Draw the pole zero diagram of lag lead compensator. (2)

(OR)

b) i) Write down the procedure for designing Lag-Lead compensator using Bode plot. (14)

ii) Brief about cascaded compensation in frequency domain. (2)

Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE503 – Power Electronics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term holding current and latching current.
2. Distinguish between MOSFET and IGBT.
3. Show the effect of source impedance on the performance of converter.
4. What is the working principle of PWM rectifier?
5. Define duty cycle of a chopper.
6. Write down the various control strategies for chopper circuit.
7. Define modulation index and express the equation for output voltage of inverter.
8. Distinguish between sinusoidal modulation and space vector modulation of inverter.
9. Inspect the working of multistag sequence control.
10. List the applications of AC voltage controller.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Illustrate the structure, operation, static and switching characteristics of power diodes with neat sketch. (10)

ii) Draw and explain the switching characteristics of SCR. (6)

(OR)

b) i) Examine the basic structure, working and the turn ON and turn OFF processes of IGBT with its equivalent circuit. (10)

ii) Design a suitable driver circuit for MOSFET which is used as switching device in AC to DC conversion circuit. (6)

12. a) Analyze the construction and operation of a three phase full converter with RLE load using relevant waveforms. Obtain the expressions for its average output voltage and RMS value of output voltage. (16)

(OR)

b) Demonstrate the circuit diagram and its operation of single phase dual convertor with aid of relevant waveforms and obtain the expression of its instantaneous circulating current. Also examine is the cause of circulating current in dual converters. (16)

13. a) i) With neat diagrams, describe the construction and working of buck converter and boost converter along with its steady state analysis. Also give its application. (10)

ii) A step down DC Chopper has input voltage of a 230 V with 10 Ohms load resistor connected, voltage drop across chopper is 2 V when it is on, for duty cycle of 0.5, calculate average and RMS value of output voltage. (6)

(OR)

b) i) Draw the power circuit diagram of a SEPIC converter and explain its operation with equivalent circuit for different modes and its waveforms. (10)

ii) Analyze the design of choosing inductors and capacitors for DC-DC Converters. (6)

14. a) i) Examine the principle of operation of bipolar and unipolar sinusoidal modulation with suitable waveforms. (10)

ii) Analyze the square wave operation of the inverter with necessary waveforms. (6)

(OR)

b) i) Elaborate the construction and principle of operation for power circuit of three phase voltage source inverter with necessary waveforms. (10)

ii) With suitable sketch, Elucidate the operation of space vector modulation of inverter. (6)

15. a) With neat sketch, describe the circuit diagram and its operation of three-phase AC voltage controller with RL load. Also obtain the expression for rms output voltage and load current. (16)

(OR)

b) Depict the construction and operation of matrix converter with neat diagram and waveforms. Also mention the advantages of matrix converter over conventional converter. (16)

Register Number :

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B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE504 – Microprocessor and Microcontroller

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How many cycles constitute one instruction cycle in 8085?
2. Name the vectored and non-vectored interrupts.
3. What are the special function registers in 8051?
4. List the five addressing modes of 8051 microcontroller.
5. What is meant by key bouncing?
6. List the functions to be performed by microcontroller while interfacing an ADC?
7. Write the control word format for BSR mode.
8. Give an application for synchronous serial communication.
9. Why do we put a driver in between the microcontroller and DC motor?
10. Finish the normal four step sequence clockwise if the first step is 1100(binary).

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw and explain the architecture of 8085 microprocessor. (16)

(OR)

b) i) Draw the PIN diagram and explain the various signals of 8085 microprocessor. (8)

ii) Explain the various addressing modes of 8085. (8)

12. a) i) Explain in detail the architecture of 8051. (8)

ii) Explain about the register banks and special function register of 8051 in detail. (8)

(OR)

b) Explain the various modes of operation of timer/counter in 8051. (16)

13. a) Explain the procedure of interfacing A/D and D/A converter circuit. (16)

(OR)

b) i) Draw and explain the LCD interfacing with 8051. (8)

ii) Explain the keyboard interfacing using 8051 in brief. (8)

14. a) i) Describe the working of Serial Peripheral Interface protocol. (8)

ii) Discuss briefly about serial and parallel communication citing examples. (8)

(OR)

b) i) Draw the PIN diagram and explain the various signals of RS 232 standard. (8)

ii) Explain the features of Inter – Integrated circuit (or) I^2C Communication protocol. (8)

15. a) Draw and explain the interfacing of stepper motor with 8051 microcontroller and also write an ALP to run the stepper motor in both forward and reverse direction with delay. (16)

(OR)

b) Explain the procedure of measuring electric power using 8051 microcontroller. Also write an ALP program for the measurement of power. (16)

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B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP01 – Electrical Machine Design

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Give the properties of a good conductor and an insulating material.
2. List the factors which influence the choice of specific electric loads.
3. Write the expression for the power developed in the armature of the DC machine in terms of the maximum gap density.
4. Mention the materials used for brushes in DC machines. How the number of brushes for a DC machine is designed?
5. Define the window space factor for the transformer.
6. Write down the output equation for the 1-phase and 3-phase transformers.
7. Name the factors affecting the size of the induction machine.
8. Compare the wound rotor motor with the squirrel cage motor in terms of design.
9. What is runaway speed in synchronous machines?
10. Write the types of stator slots.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Briefly the classification of insulating materials concerning thermal consideration. Also, give the insulating materials used under different classes. (8)

ii) What determines the power rating of a machine? Discuss the rating of single and three-phase transformers. Mention its standard specification. (8)

(OR)

b) i) Write short notes on the classification of insulating materials based on solid, liquid, and gaseous. (8)

ii) Concise the properties of a magnetic material in detail. (8)

12. a) Determine the main dimensions, number of poles and the length of airgap of a 600 kW, 500 V, 900 rpm generator. Assume the average gap density as 0.6 wb/m^2 and ampere conductors per metre is 35,000. The ratio of pole arc to pole pitch is 0.75 and the efficiency is 91 %. The following are the design constraints: peripheral speed 40 m/s, frequency of flux reversals brush arm 50 Hz, current per 400 A and armature mmf per pole 7500 A. The mmf required for air gap is 50 % of armature mmf per pole and the gap contraction factor is 1.15. (16)

(OR)

b) i) Find the main dimensions of a 200 kW, 250 volts, 6-pole, 1000 rpm DC generator. The maximum value of flux density in the air gap is 0.87 wb/m^2 and the ampere conductors per meter length of armature periphery are 31000. The ratio of pole arc to pole pitch is 0.67 and the efficiency is 91 percent. Assume that the ratio of length of the core to pole pitch = 0.75. (8)

ii) Brief the effect of choice of no of poles on DC machine on the frequency of flux reversal, the weight of iron and weight of copper. (8)

13. a) i) Discuss the different cooling methods of transformers. (8)

ii) Concise the design of the transformer tank with & without cooling tubes. (8)

(OR)

b) i) In brief, explain the design of current and potential transformers. (8)

ii) Calculate the approximate overall dimensions for a 200 kVA, 6600/400 V, 50 Hz, 3-phase core type transformer. The data are: Emf/turn = 9 volts, B_m = 1.3 Wb/m^2, δ = 205 A/mm^2, K_w = 0.3, overall height = overall width, the core is 4 stepped, assume the stacking factor as 0.91. (8)

14. a) i) Determine the main dimensions of a 250 hp 3-phase, 50 Hz, 400 V, 1410 rpm, slip ring induction motor. Assume B_{av} = 0.5 Wb/m^2, ac = 30000 A/m, efficiency = 0.9 and power factor = 0.9, winding factor = 0.955 and current density = 3.5 A/mm^2. (8)

ii) Discuss the factors that influence the air gap length in the induction motor. (8)

(OR)

b) i) Derive the expression for the end ring current for a three-phase induction motor. (8)

ii) Determine the main dimension for a 15 Hp, 400 V, 3 phase, 4 pole and 1425 rpm induction motor. Adopt a specific magnetic loading of 0.45 Weber/m^2 and a specific electric loading of 230 ac/cm. Assume that a full load efficiency of 85 % and a full load power factor of 0.88 will be obtained. (8)

15. a) The field coils of a salient pole alternator are wound with a single layer winding of bare copper strip 30 mm deep with separating insulation 0.15 mm thick. Determine a suitable winding length, number of turns and thickness of conductor to develop an mmf of 12,000 A with a potential difference of 5 V per coil and with a loss of 1200 w/m^2 of total coil surface. The mean length of the turn is 1.2 m. The resistivity of copper is 0.021 Ω/m and mm^2. (16)

(OR)

b) Write an algorithm to design the main dimensions of the alternator with the necessary equations. (16)

Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE601 – Power System Analysis and Stability

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the basic components of power system.
2. Give the formula to calculate base current and base impedance of a three phase system.
3. What is PQ bus?
4. Compare the Gauss-Seidel and Newton-Raphson methods of load flow solutions.
5. Define short circuit capacity of power system.
6. List the various types of symmetrical and unsymmetrical faults.
7. What is meant by fault calculations?
8. Name the various types of unsymmetrical faults.
9. Classify the power system stability.
10. Write down the swing equation in power system.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw the reactance diagram for the power system shown in Figure.1. (16)
Use a base of 50 MVA, 230 kV in 30 Ω line. The ratings of the generator, motor and transformers are
Generator = 20 MVA, 20 kV, X = 20 %
Motor = 35 MVA, 13.2 kV, X = 25 %
T1 = 25 MVA, 18/230 kV (Y/Y), X =10 %
T2 = 45 MVA, 230/13.8 kV (Y/Δ), X =15 %

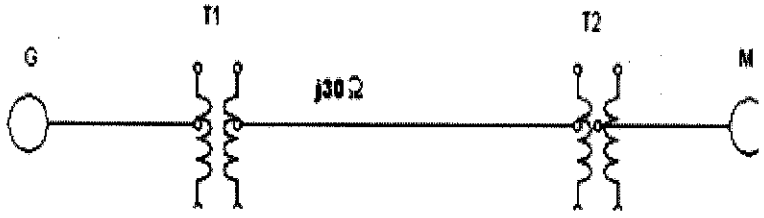

Figure.1

(OR)

b) Explain in detail about the working of single line diagram in Power system. (16)

12. a) Figure.2 shows a three bus power system. (16)

Bus 1: Slack bus, V=1.05∟0°p.u.

Bus 2: PV bus, |V|=1.0 p.u., Pg=3p.u.

Bus 3: PQ bus, PL=4p.u., QL=2p.u.

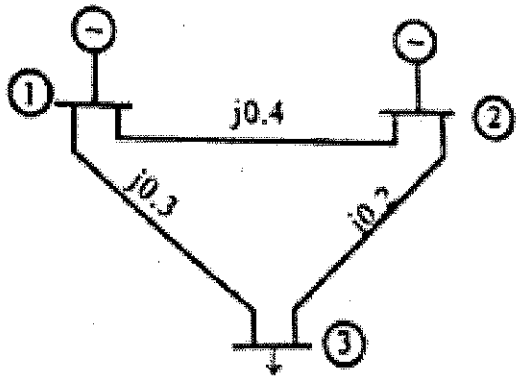

Figure.2

Carry out one iteration of load flow solution by Gauss-Seidel method. Neglect limits on reactive power generation.

(OR)

b) Derive the fast decoupled load flow algorithm and give the procedure for implementing this algorithm. (16)

13. a) For the radial network shown figure.3, a 3Ø fault occurs at F. Determine the fault current and the line voltage at 11 KV bus under fault condition. (16)

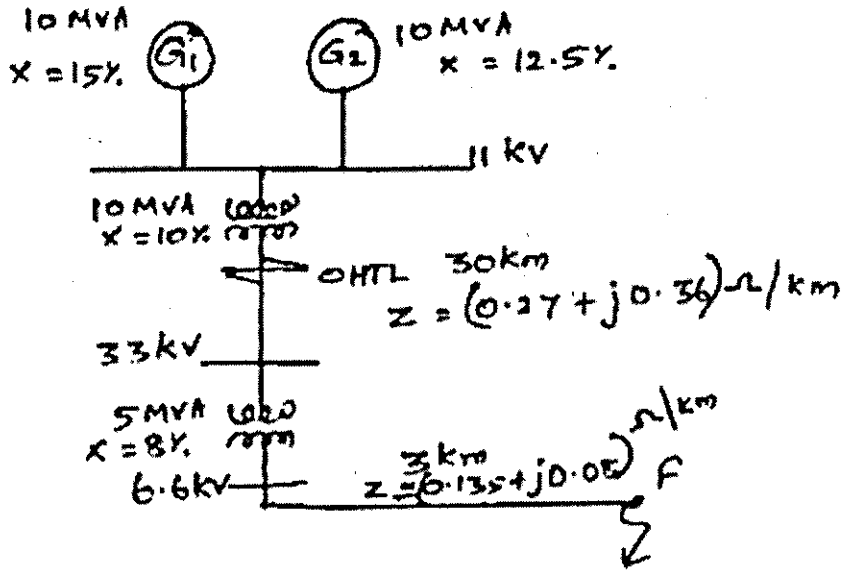

Figure.3.

(OR)

b) With the help of a detailed algorithm and explain how a symmetrical fault can be analyzed using Z_{bus}. (16)

14. a) A 3-phase transmission line operating at 10 kV and having a resistance of 1Ω and reactance of 4 Ω is connected to the generating station bus-bars through 5 MVA step-up transformer having a reactance of 5 %. The bus-bars are supplied by a 10 MVA alternator having 10 % reactance. Calculate the short circuit kVA fed to symmetrical fault between phases if it occurs (16)

(i) at the load end of transmission line

(ii) at the high voltage terminals of the transformer.

Shown in figure.4.

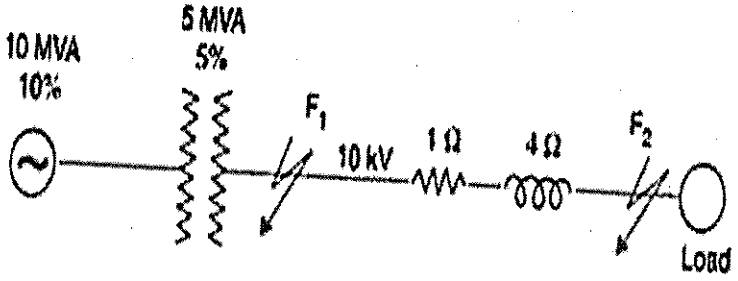

Figure.4

(OR)

b) Obtain the expression for fault current for a line to line fault taken place through impedance Z_b in a power system. (16)

15. a) Derive the equation for solution of swing equation by Runge- Kutta method. (16)

(OR)

b) Describe in detail about the critical clearing angle and time factor affecting stability analysis with necessary diagram. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22EE505 – Power System Analysis and Stability

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State the advantages of per unit analysis.
2. Distinguish between impedance and reactance diagram.
3. How the buses are classified in load flow analysis?
4. Compare Newton Raphson and Gauss Seidal methods of load flow solutions.
5. Define short circuit capacity.
6. Mention the need for current limiting reactors.
7. Identify the fault if $I_B = I_C = 0$, $Va = 0$.
8. State the importance of Thevenin's theorem in fault analysis.
9. Why swing equation is non-linear?
10. Define critical clearing angle.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the modelling of transformer, transmission line, loads and generators for a load flow, short circuit and stability studies. (16)

(OR)

b) Discuss the modeling of transmission lines with detailed derivations for long line model. (16)

12. a) The parameters of 4 bus system are as follows: (16)

Bus Code	Line Impedance (p.u)	Line charging admittance (p.u)
1-2	0.2+j0.8	j0.02
2-3	0.3+j0.9	j0.03
2-4	0.25+j0.1	j0.04
3-4	0.2+j0.8	j0.02
1-3	0.1+j0.4	j0.01

Draw the network and find the bus admittance matrix

(OR)

b) The system data for a load flow solution are given in table. Determine the voltages at the end of first iteration by Gauss-Seidal method. Take $\alpha = 1.6$. (16)

Line admittances:

Bus code	Admittance
1-2	2-j8
1-3	1-j4
2-3	0.666-j2.664
2-4	1-j4
3-4	2-j8

Bus Specifications:

Bus code	P	Q	V	Remarks
1	-	-	$1.06\angle 0^0$	Slack
2	0.5	0.2	-	PQ
3	0.4	0.3	-	PQ
4	0.3	0.1	-	PQ

13. a) A 3-phase 5MVA, 6.6 KV alternators with a reactance of 8% is connected to a feeder of series impedance (0.12+j0.48) ohm/phase/Km through a step up transformer. The transformer is rated at 3 MVA, 6.6 KV/33KV and has a reactance of 5%. Calculate the fault current supplied by the generator operating under no load with a voltage of 6.9 KV when a three phase symmetrical fault occurs at a point 15Km along the feeder. (16)

(OR)

b) For the 3-bus network shown in figure.1 obtain Z bus by building algorithm. (16)

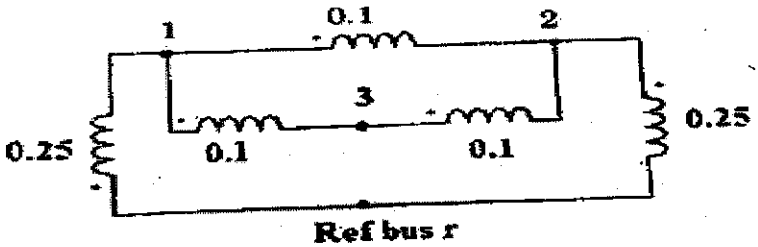

Figure.1

14. a) A 30MVA, 11kV generator has $Z_1 = Z_2 = j0.05$. A line to ground fault occurs at generator terminals. Find the fault current and line voltages during fault conditions. Assume that the generator neutral is solidly grounded and the generator is operating at no load and at rated voltage during occurrence of fault. (16)

(OR)

b) A 50 Hz, 50 MVA, 13.2 kV star grounded alternator is connected to a line through a Δ-Y transformer as shown in figure.2 The positive, negative, zero sequence impedance of the alternator are j0.1, j0.1, j0.05 respectively. The transformer rated at 13.2Kv, Δ / 120 kV, Y, 50 Hz with Y solidly grounded has the sequence impedances of $X'' = X_2 = X_0 = j0.1$ p.u. The line impedances between Q and R are $X_1'' = j0.03$, $X_2 = j0.03$, $X_0 = j0.09$. Assuming that the fault to be takes place at Q, determine the subtransient fault current for a (i) 3Φ fault (ii) L-G fault (iii) L-L fault (iv) L-L-G fault. Draw the connection diagram for the sequence diagram in each fault. (16)

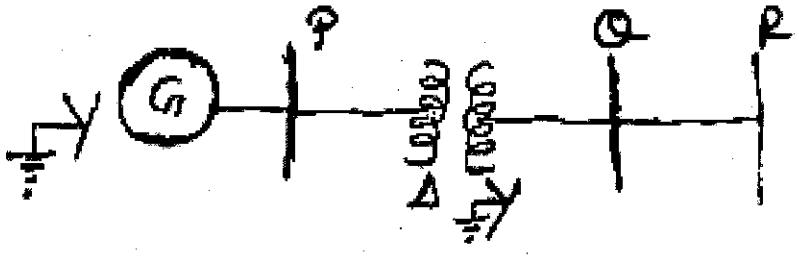

Figure.2

15. a) Derive the swing equation of single machine connected to a infinite bus system and draw the swing curve. (16)

(OR)

b) Explain the equal area criteria for the following applications (a) Sustained fault (b) Fault with subsequent clearing. (16)

Register Number :

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B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE304 – Electron Devices and Circuits

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the difference between Clipping and Clamping?
2. Draw the V-I characteristics of ideal PN diode.
3. Why is BJT as current controlled Transistor?
4. Define the Stability factor.
5. What are the advantages of FET over BJT?
6. What is called source follower?
7. Define CMRR and mention its significance.
8. Draw h-parameter model for CE amplifier.
9. What is the difference between Colpitts and Hartley oscillators?
10. What are the advantages of negative feedback in amplifier?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Derive expressions for ripple factor of a Full Wave Rectifier with and without a capacitive filter. (10)

ii) Explain the operation of negative clamping circuit. (6)

(OR)

b) i) Explain the operation of forward biased and reverse biased PN junction Diode. (8)

ii) Discuss the operation of voltage regulator using Zener diode. (8)

12. a) i) Determine IC, IE and α for a transistor circuit having IB = 15 μA and β = 150. (8)

ii) Differentiate between a BJT and FET. (8)

(OR)

b) i) Draw the symbol and equivalent circuit of a UJT. Explain the operation of UJT with the help of its V – I characteristics. (8)

ii) With neat sketches, necessary equations explain the drain and transfer characteristics of MOSFET in depletion mode. (8)

13. a) Derive the equations for voltage gain, current gain, input impedance and output admittance for a BJT using low frequency h-parameter model for CC configuration. (16)

(OR)

b) With circuit diagram and small signal equivalent circuit, explain the common source amplifier using MOSFET. (16)

14. a) Explain the operation of differential amplifier in detail and derive its expressions. (16)

(OR)

b) Write notes on (16)

i) Single tuned amplifier.

ii) Compare Class A, B, AB and C amplifiers.

15. a) Explain the operation of voltage series and current series feedback amplifier in detail. (16)

(OR)

b) Explain the operation of Wien bridge oscillator in detail and derive its frequency of oscillation. (16)

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B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE606 – Energy Management System and SCADA

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the significance of load management in power system.
2. What are the different phases of an energy audit process?
3. What is the purpose of buy-back rates in electricity pricing?
4. Differentiate between residential rate schedules and general service rate schedules.
5. Mention how cogeneration improves energy efficiency and reduces energy consumption.
6. What standards or certifications are associated with energy-efficient motors?
7. Give some common applications of Human-Machine Interface unit.
8. List the features of SCADA system.
9. Name some standard communication protocols used in SCADA system architecture.
10. What is the benefit of using IEC61850 ring configuration in smart grid integration?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss in detail about the load management and demand control techniques. Also mention how can these techniques contribute to improving the energy efficiency of a utility. (16)

(OR)

b) i) Discuss the key components of an energy audit process in detail. (8)

ii) Point out the need for an effective energy management system. (8)

12. a) i) How do monthly energy bill analysis help in optimizing energy usage and reduce the tariff? (8)

ii) Discuss the different types of rate schedules and explain briefly how these schedules vary across different customer classes. (8)

(OR)

b) Analyze the role played by regulatory agencies in setting the electricity rate structure in the energy management system. (16)

13. a) Elaborately discuss about how the choice of energy efficient machines and variable speed drives influences the energy conservation and efficient utilization in the energy management scenario. (16)

(OR)

b) i) Analyse the concept of cogeneration and its benefits in energy management system. (8)

ii) Discuss the functional blocks of Energy Management System in brief. (8)

14. a) Discuss the historical perspective of SCADA and explain the functional elements of SCADA system in detail. (16)

(OR)

b) Mention the role played by the Intelligent Electronic Devices as the component of SCADA system. Also discuss briefly about RTU standards and SCADA protocols. (16)

15. a) Discuss how SCADA systems are used to monitor and control the power system network in power generation, transmission, and distribution. Provide examples of real-time monitoring, fault detection and load balancing. (16)

(OR)

b) i) Explain the IEC 61850 standard and its significance in substation automation systems (SAS). (8)

ii) Describe the functions of various components housed in SAS cubicles and the cubicle types. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP05 – High Voltage Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State the principle of insulation coordination.
2. What are the requirements of a ground wire for protecting lines?
3. State Paschen's law.
4. What are the various theories of breakdown of commercial liquids dielectrics?
5. What is a Tesla coil? Give its advantages.
6. Why is controlled tripping necessary for impulse generator?
7. Why capacitance voltage divider is preferred for measuring high AC voltages?
8. What are the limitations of series resistance micro-ammeter method?
9. Define 'Disruptive discharge voltage'.
10. What are atmospheric correction factor? Mention their significance.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What are the causes of power frequency over voltages in a power system? Explain how they are controlled. (8)

    ii) Discuss about the causes of switching over voltages in a power system. (8)

(OR)

    b) i) Explain two theories of charge formation in a thundercloud. (8)

    ii) Explain the various steps to draw Bewley-Lattice diagram of successive reflections. (8)

12. a) Discuss the Streamer theory and Meeks theory of breakdown mechanism in gaseous dielectrics. (16)

(OR)

    b) Discuss briefly about various breakdown mechanism involved in soild dielectrics. (16)

13. a) i) Explain the working principle of Cockcroft-Walton voltage multiplier circuit with waveforms. (8)

ii) Derive an expression for total voltage drop and total ripple voltage of n-stage voltage multiplier circuit and hence deduce the condition for optimum number of stages. (8)

(OR)

b) i) Discuss the principle of operation of three-stage cascaded transformer for producing high AC voltages. (8)

ii) Draw a typical impulse current generator circuit and explain its operation and application. (8)

14. a) i) Explain the construction and working of Electrostatic voltmeter for measuring high voltages. (8)

ii) With phasor diagram, explain how a tuned capacitance voltage transformer can be used for measuring high alternating voltages in power system. (8)

(OR)

b) i) With circuit arrangements, discuss the procedure for measuring peak value of high voltage using standard sphere gaps. (8)

ii) What are the different types of resistive shunts used for impulse current measurements? Discuss their characteristics and limitations. (8)

15. a) i) Discuss with a circuit diagrams, the detailed procedure for conducting impulse voltage testing of HV power transformers. (10)

ii) Explain the procedure adopted for detection and location of fault during impulse testing. (6)

(OR)

b) i) With a neat circuit diagram, explain the procedure of synthetic testing of circuit breakers. (10)

ii) Discuss in brief the power frequency tests conducted in testing of bushings. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP06 – HVDC Transmission Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare AC and DC transmission system.
2. List the applications of MTDC systems.
3. Mention the converters used in HVDC Systems.
4. Write the advantages of higher pulse number in HVDC converters?
5. What are the conditions for VSC based HVDC Link?
6. Write the principle of constant extinction angle.
7. Identify any four sources of reactive power.
8. State the effects of harmonics injected into AC line?
9. Draw the Norton's Equivalent circuit for a converter and write the equation.
10. List the different methods for power flow analysis.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With a neat diagram, explain the HVDC Transmission based on voltage source converters. (16)

(OR)

b) Explain the following types of MTDC Systems (16)

i) Series MTDC Systems

ii) Parallel MTDC Systems

12. a) A six-pulse Graetz converter is used in an industrial application where the overlap angle is measured to be less than 60°. Apply your understanding of the three models of the converter to analyze the operation for this overlap angle. Use suitable circuit diagrams and expressions to support your analysis (16)

(OR)

b) Design a 12-pulse converter circuit for a high-voltage DC application and analyze its operation. Calculate the following parameters based on the given specifications: (16)

i) Average DC output voltage for an input AC voltage of 400 V (RMS).

ii) Current harmonics, expressing them with suitable equations.

Illustrate your analysis with necessary waveforms and diagrams.

13. a) Describe the following types of Firing Angle Control (FAC) scheme i) Individual Phase Control (IPC) ii) Equidistant Pulse Control. (16)

(OR)

b) Draw the block diagram of VSC Controller. Explain the control of VSC Based HVDC Link and obtain the mathematical expression. (16)

14. a) A STATCOM is being implemented to stabilize the voltage in a distribution network. Using a suitable circuit representation, apply your understanding to analyze its operation. Represent and explain its characteristics such as voltage regulation, reactive power compensation, and transient response. (16)

(OR)

b) Design an AC filter for a power system that experiences significant harmonic distortion. Explain the steps you would take to meet the design criteria, such as harmonic attenuation and impedance matching. Also, select and justify the choice of a circuit configuration based on the system requirements, and analyze its impedance characteristics. (16)

15. a) Describe the modeling of DC systems in power system. Discuss how DC loads, DC sources, and transmission lines are represented mathematically in system models. Use a simple DC network to illustrate the modeling process. (16)

(OR)

b) Discuss the steps involved in performing a power flow analysis for DC systems. Explain the iterative techniques commonly used (e.g., Newton-Raphson or Gauss-Seidel) and their application to a DC network. Use a numerical example to demonstrate the analysis process. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP10 – Utilization of Electrical Energy

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Enumerate the advantages of non-conventional energy sources.
2. Define load factor and write its significance.
3. Specify any four energy efficient lamps.
4. What are the requirements of good lighting?
5. Compare DC welding and AC welding.
6. Define squeeze time.
7. List any four requirements of an ideal traction system.
8. List the advantages of Electric Traction.
9. List the advantages of electric drive.
10. What is regenerative braking?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain any four desirable characteristics of tariff. (8)

ii) A factory has a maximum demand of 300 kVA with a load factor of 0.6. The following tariffs are offered: a) Two-part tariff - Rs 125/kVA of M.D./year + Rs 5.50 per kWh. b) A flat rate of Rs 6.90 /kWh. Calculate tariff in both cases and recommend one of them with justification. (8)

(OR)

b) i) With neat diagrams, explain the operation of a nuclear power plant. (8)

ii) Discuss the methods and principles of energy conservation. (8)

12. a) i) Explain in detail about the principle of operation of fluorescent lamp. (8)

ii) Explain the working of a high pressure mercury vapour lamp with a neat sketch. (8)

(OR)

b) i) Define Lux and obtain the relationship between the Lux and Lumen per ft^2 (8)

ii) An illumination on the working plane of 75 lux is required in a room 72 m x 15 m in size. The lamps are required to be hung 4m above the work benches. Assuming a suitable space ratio, a utilization factor of 0.5, a lamp efficiency of 14 lumens per watt and a candle power depreciation of 20 %, estimate the number, rating and disposition of the lamps. (8)

13. a) i) What are the different types of resistance welding? Describe any one type. List the advantages of electric heating. (8)

ii) Describe the operation of electric arc furnace in detail. (8)

(OR)

b) i) Enumerate the properties of heating element material and Explain the causes of failure of heating elements? (8)

ii) Discuss about dielectric heating in detail. (8)

14. a) i) Sketch the typical speed-time curve for main line service and sub urban services in electric traction. (8)

ii) Explain about the types of supply system used in traction system. (8)

(OR)

b) i) Explain in detail about different methods of traction motor control with necessary sketches. (16)

15. a) i) With neat diagrams, explain the functional blocks of an electric drive. (8)

ii) List the factors affecting selection of motor and explain in detail. (8)

(OR)

b) i) List the factors affecting selection of drives and explain in detail. (8)

ii) Briefly explain various methods of electrical braking with thyristors (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP14 – Wind and Solar Energy Systems

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Relate Tip speed ratio with Cp.
2. Compare Stall control and Pitch control.
3. List the demerits of Fixed speed wind turbine.
4. Specify the advantages of power electronic converters in optimal power generation.
5. Compare azimuth angle in horizontal plane and tilted plane.
6. Why does the declination angle vary from place to place?
7. Recall the structuring of PV array from single cell.
8. Mention the benefits of MPPT.
9. List the grid code technical requirements.
10. Why is it necessary to maintain the voltage and frequency operating limits?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the physics behind the wind power generation and relate the Wind Power with Cp. (16)

(OR)

b) Examine the Wind speed statistics based on the Weibull's and Rayleigh's distribution function. (16)

12. a) Explain the wind power extraction techniques through Doubly fed Induction Generators. (16)

(OR)

b) Apply the power electronic controller and discuss the optimization of power generation in the rotor side of PMSG enabled Wind Power System. (16)

13. a) i) Sketch the solar radiation spectra and recall the range of favorable spectrum for solar PV power generation. (10)

ii) Compare Hour angle and Declination angle. (6)

(OR)

b) i) With a suitable example, explain the estimation of solar radiation at any place. (10)

ii) Compare the zenith and azimuth anlge. (6)

14. a) A low voltage solar PV panel needs to be upgraded to higher voltage. Discuss the operation of suitable power electronic converter and sketch its output waveforms. (16)

(OR)

b) Illustrate any two MPPT techniques for optimal power extraction and recall the algorithm to present it in a flowchart. (16)

15. a) Describe the different methods of overcoming the fault ride-through for windfarms while integrating with grid network. (16)

(OR)

b) Explain the hybrid solar PV and Wind Power system. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE701 – Power System Protection and Switch Gear

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the applications of over current relay?
2. Which type of relay is best suited for long distance high voltage transmission lines.
3. Determine the maximum voltage which may appear across the gap of the breaker when the magnetising current of 25.83 A (peak value) is interrupted. The stray capacitance is 2500 mF. The inductance is 30 H.
4. Define making capacity of the circuit breaker.
5. State the causes of over speed and how alternators are protected from it?
6. Explain the secondary of CT should not be open.
7. Summarize the advantages of static relays.
8. Compare Amplitude Comparator and Phase Comparator.
9. Identify the different methods of Numerical distant protection of transmission lines.
10. List the functions of numerical relays.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Two relays R1 and R2 are connected in two sections for a feeder as shown in Figure.1. (10)

Relay R_1: CT ratio = 300/5, plug setting = 50%, TMS = 0.3

Relay R_2: CT ratio = 500/5, plug setting = 75%.

A fault at F results in a fault current of 3000 A. Find TMS of R_2 to give time-grading margin of 0.5 sec between the relays.

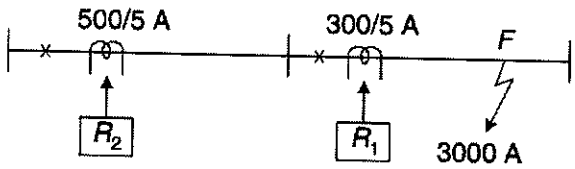


Figure.1

The operating time characteristic of relays is given in the Table.

PSM	2	4	5	8	10	20
Operating time (Seconds)	10	5	4	3	2.8	2.4

ii) Explain the operating principal of the distance relay. (6)

(OR)

b) i) Describe the construction and operation of the HRC cartridge fuse. What are its advantages and disadvantages? (10)

ii) Discuss the Transley scheme of wire pilot protection. (6)

12. a) i) Describe with neat sketches the working of the cross-jet explosion pot of an oil circuit breaker. Compare its merits and demerits. (12)

ii) Discuss the chemical properties of SF6 which make it most suitable to be used in circuit breakers. (4)

(OR)

b) Explain the different methods of testing of circuit breakers? Discuss their merits and demerits. Which method is more suitable for testing the circuit breakers of large capacity? (16)

13. a) i) Explain the non- directional time graded current protection of feeders. (8)

ii) What type of protective scheme is employed for the loss excitation of alternator? Explain in detail. (8)

(OR)

b) i) Explain the Merz-price circulation current scheme for protection of power transformer. (8)

ii) Explain the distance protection of a transmission line using impedance relay. (8)

14. a) Explain with neat block diagram the operation of static relay and list the advantages and disadvantages. (16)

(OR)

b) Discuss with Neat Block diagram of Differential Protection using static differential relay. (16)

15. a) With the flow chart, explain the numerical over current protection. (16)

(OR)

b) With neat Block diagram explain the different methods of Numerical Distance Protection of Transmission Line. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE702 – Industrial Management and Economics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What do you mean by span of control?
2. State the functions of management.
3. Brief on Quality circles.
4. Compare Joint sector and Co-operative sector.
5. Compare Batch and Mass production.
6. Give your basic ideas on construction of network.
7. Write a note on taxation.
8. Brief on the causes of inflation.
9. Brief on the impact of MNCs in Indian Economy.
10. Write a note on Privatisation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)		Elaborate on the line and Functional organizational structure.	(16)
			(OR)	
	b)		Discuss in detail about management by objectives.	(16)
12.	a)		Explain about the labour welfare, recruitment, selection and training of workers.	(16)
			(OR)	
	b)		Give a detailed view on the formation of companies.	(16)
13.	a)	i)	Write a note on EOQ.	(10)
		ii)	Compare PERT and CPM.	(6)
			(OR)	
	b)	i)	Write a note on Channels of Distribution.	(6)
		ii)	Write a note on Market Research and advertising.	(10)

14. a) Give a detailed view on the theory of Demand and supply. (16)

(OR)

b) Elaborate on the factors of production: land, labour, capital and organization. (16)

15. a) Discuss on the Development Financial Institutions. (16)

(OR)

b) Discuss on the RBI and its functions, commercial Banking system. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP21 – Total Quality Management

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the various dimensions of quality.
2. Why is quality especially important in today's business?
3. Compare: Reward and Recognition.
4. How will the employee involvement improved in an organization?
5. Write the concept of six sigma.
6. Write the function of statistical process control in TQM.
7. Write the different stages in benchmarking process.
8. Write the importance of house of quality (HOQ) tool in quality management.
9. Mention the benefits of ISO 9000:2000 quality system.
10. Write the important requirements of QS9000.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the fourteen steps of Deming's philosophy for improving quality, productivity and competitiveness. (16)

(OR)

b) i) Analyze the role of senior level management in TQM implementation. (8)

ii) Examine the barriers to TQM implementation in food industry. (8)

12. a) Discuss how will be PDCA cycle practiced for continuous improvement process in manufacturing industry with a suitable example. (16)

(OR)

b) i) Discuss the methods of receiving customer complaints. (8)

ii) Describe the various steps involved in supplier selection. (8)

13. a) Analyze the different methodologies adopted in six sigma practices for process improvement with suitable example. (16)

(OR)

b) i) Describe the function of seven traditional tools of quality. (8)

ii) Discuss the features of new management tools used in SPC. (8)

14. a) Analyze how will you use FMEA in an organization to increase process reliability with suitable example. (16)

(OR)

b) i) Discuss the stages involved in developing a Total productive Maintenance (TPM). (8)

ii) Describe the benefits of Quality Function Deployment (QFD.) (8)

15. a) i) Discuss the documentation procedures to be prepared for QMS. (8)

ii) Describe the concept and benefits of QS9000. (8)

(OR)

b) i) Illustrate the steps to be followed in implementing quality system ISO 9001:2000. (8)

ii) Analyze the various aspects of ISO 14000 environment management system. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

23PTEE102 – DC Machines and Transformers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Summarize any two similarities and dissimilarities between Electric and Magnetic circuits.
2. Why do all practical energy conversion devices make use of the magnetic field as a coupling medium rather than an electric field?
3. How will you reduce the armature core loss in a DC machine?
4. What is meant by i) Critical resistance and ii) Critical speed in DC generator?
5. What is the significance of back EMF in a DC motor?
6. List the characteristics and any two applications of cumulative compound DC motor.
7. What are the characteristics of an ideal transformer?
8. Recall the most commonly used 3-phase transformer connections.
9. In a Hopkinson's test on two 220 V, 100 kW generators, the circulating current is equal to the full load current and, in addition, 90 A is taken from the supply. Obtain the efficiency of each machine.
10. Why is All-day efficiency of a transformer less than commercial efficiency?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the concept of statically and dynamically induced EMFs with suitable diagram. (6)

ii) The $\lambda - i$ characteristic of a nonlinear singly-excited magnetic circuit is given by $\lambda = \frac{2.8i}{0.12+i}$. Find the field energy and co-energy for the magnetic circuit corresponding to a current of 0.10 A. (10)

(OR)

b) i) Calculate the current required to produce a flux of 1.75 mWb in the iron ring if the relative permeability of the iron is 900, number of turns N = 600, and radius (r) of cross-section = 3.5 cm. (6)

ii) Derive the expressions for energy stored and electromagnetic torque in double excited magnetic field system. (10)

12. a) i) A 4-pole, lap-wound, long-shunt, DC compound generator has useful flux per pole of 0.07Wb. The armature winding consists of 220 turns and the resistance per turn is 0.004 Ω. The resistances of shunt and series field are 100 Ω and 0.02 Ω respectively. Calculate the terminal voltage when the generator is running at 900 rpm with armature current of 50 A. Also calculate the power output in kW of the generator. (8)

ii) Draw the external characteristics of various types of DC generators in one figure on the assumption of same rated terminal voltage and the same rated load current. Discuss the nature of these characteristics and compare them. (8)

(OR)

b) i) A 6-pole, 148 A DC shunt generator has 480 conductors and is wave wound. Its field current is 2 A. Find the demagnetizing and cross-magnetizing ampere turns per pole at full load if 1) brushes are on GNA 2) brushes are shifted from GNA by 5^0 electrical. (8)

ii) Two separately excited DC generators are connected in parallel. Discuss in detail about how they share a load. (8)

13. a) i) Determine the developed torque and shaft torque of 220 V, 4-pole DC series motor with 800 wave-connected conductors supplying a load of 8.2 kW by taking 45 A from the mains. The flux per pole is 25 mWb and its armature circuit resistance is 0.6 Ω. (6)

ii) Explain the two important methods of speed control of DC shunt motors. (10)

(OR)

b) i) A DC shunt motor is connected to a 3-point starter. Explain what would happen if (6)

1) the starter handle is moved rapidly from OFF to ON position,
2) the field circuit is open and an attempt is made to start the motor,
3) there is a sudden overload of 100%.

ii) Derive the speed-torque characteristics of DC shunt, series and compound motors. Comment on the nature of these characteristics. (10)

14. a) i) Explain the constructional features and principle of operation of a single phase core type transformer. (10)

ii) The primary and secondary windings of a 40 kVA, 6600 V / 250 V, single phase transformer have resistances of 10 Ω and 0.02 Ω respectively. The total leakage reactance is 35 Ω as referred to the primary winding. Find full load regulation at a power factor of 0.8 lagging. (6)

(OR)

b) i) Draw and explain the phasor diagrams of a single phase transformer on i) no-load ii) lagging power factor load and iii) leading power factor load conditions. (10)

ii) Discuss the relative merits, demerits and applications of autotransformers. (6)

15. a) i) What are the losses occurring in a DC motor? Derive the condition for maximum efficiency of a DC machine. (8)

ii) A 10 kVA, 200 V / 400 V, 50 Hz, single phase transformer gave the following test results : (8)

OC test (HV winding open): 200 V, 1.3 A, 120 W.

SC test (LV winding short circuited): 22 V, 30 A, 200 W.

Find the parameters of equivalent circuit as referred to LV winding.

(OR)

b) i) A 220 V, DC machine at no load takes a current of 2.5 A. The resistances of the armature and shunt field are 0.8 Ω and 200 Ω respectively. Estimate the efficiency of the DC machine as motor when the input current is 20 A. (8)

ii) Explain the procedure for conducting Sumpner's test on two identical single phase transformers. How is the efficiency of individual transformer calculated at various load conditions using Sumpner's test data? (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2023 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

23PTEE201 – Electromagnetic Theory

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Recall the Divergence theorem.
2. Recall Coulomb's law for electrostatic field.
3. Interpret the boundary conditions for electric fields at the interface.
4. Examine whether the field, V= (rCosθ +Z) satisfies Laplace equation or not.
5. Find the inductance of a solenoid 8 cm in length, 2 cm in radius, having $\mu_r = 100$, and carrying 900 turns of wire.
6. Define scalar and vector magnetic potentials.
7. Compare field theory with circuit theory.
8. What is called displacement current?
9. Find the velocity of propagation of a uniform plane wave in a medium whose $\varepsilon_r = 10, \mu_r = 3$.
10. Recall Poynting vector and list its significances.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Express the following vector $\vec{A}$ in spherical coordinate and evaluate $\vec{A}$ at $\left(10, \frac{\pi}{2}, \frac{3\pi}{4}\right)$. where, (8)

$$\vec{A} = \left(\rho z Sin\varphi \vec{a_\rho} + \rho Cos\varphi \vec{a_\varphi} + \rho Cos\varphi Sin\varphi \vec{a_z}\right)$$

ii) Determine and interpret the divergence of the following vector fields (8)

$\vec{B} = \rho z^2 \cos\varphi \vec{a_\phi} + z\sin^2\varphi \vec{a_z}$ and $\vec{T} = \frac{1}{r^2}\cos\theta \vec{a_r} + r\sin\theta \vec{a_\varphi} + \cos\theta \vec{a_\varphi}$.

(OR)

b) i) Point charges 1mC and -2mC are located at (3,2,-1) and (-1,-1,-4) respectively. Estimate the electric force on a 10nC charge located at (0,3,1) and the electric field intensity at that point. (8)

ii) Interpret the curl of a vector F at P(1,1,1)m, given the vector $F=\left(x^2 y\overrightarrow{a_x} + xyz\overrightarrow{a_z}\right)$ (8)

12. a) i) Derive and interpret the expression for the potential due to electric dipole. (8)

ii) Derive Poisson's equation from Gauss's law. (8)

(OR)

b) i) Interpet an expression for the capacitance of a coaxial cable of inner conductor radius 'b', outer conductor radius 'c' and length 'L'. (8)

ii) Show an expression for the energy stared in the electrostatic filed. (8)

13. a) Make use of Biot-Savart's law to develop an expression for the field intensity, H at the centre of circular wire carrying a current I in anti-clockwise direction. The radius of the circle 'a' and the wire is in XY plane. (16)

(OR)

b) Derive and infer an expression for magnetic vector potential. Hence, derive the potential for sinusoidal oscillations. (16)

14. a) Starting from first principles, interpret Maxwell's equations in integral form and in point form. (16)

(OR)

b) Given the conduction current density in a lossy dielectric as J_C = (0.02Sin10^9t) A/m^2. Determine and infer the displacement current density, if $\sigma = 10^3 mho/m$ and $\varepsilon_r = 6.5$. (16)

15. a) i) Explain the characteristics of uniform plane waves, in detail. (8)

ii) Given a uniform plane wave in air as $E_0 = 40\cos(\omega t - \beta z)\overrightarrow{a_x} + 30\sin(\omega t - \beta z)\overrightarrow{a_y} V/m$. Compute H and time-averaging poynting vectors for Z ≤ 0 and Z = 0. (8)

(OR)

b) i) Derive the equations for the motion of a uniform plane wave. (8)

ii) Show that for uniform plane waves in a perfect dielectric medium $\vec{E}$ and $\vec{H}$ are normal to each other and the ratio of their magnitude is constant of the medium. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2023 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

23PTEE203 – Analog and Digital Integrated Circuits

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the characteristics of operational amplifier.
2. Define Common Mode Rejection Ratio.
3. Draw the pin diagram of IC 555 timer.
4. Write the limitations of an ideal integrator.
5. Give the truth table for half adder and full adder circuit.
6. Why NAND and NOR gates are called Universal gates?
7. List the types of shift registers.
8. Write the truth table of SR flipflop.
9. List the two types of asynchronous sequential circuits.
10. What is dynamic hazard in digital logic circuits?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With neat block explain the voltage series and voltage shunt feedback amplifiers. (16)

(OR)

b) Explain in detail the working of differential amplifier for single and differential outputs. (16)

12. a) i) Explain briefly the working of instrumentation amplifier. (8)

ii) Describe the working of precision rectifier circuit and mention the significant features. (8)

(OR)

b) Draw the functional block diagram and explain the working of IC 566 voltage controlled oscillator. (16)

13. a) Solve the boolean function using tabulation method and verify using K-Map. (16)

$$F = \sum m(0,1,2,3,6,9,11,14,15)+d(4,8,12)$$

(OR)

b) i) Implement the expression $f(A,B,C,D) = \sum m(0,2,3,6,8,9,12,14)$ using Multiplexer. (8)

ii) Explain the design of encoder and decoder circuit with its truth table (8)

14. a) With the aid of logic circuit and truth table, explain the working of JK flipflop. (16)

(OR)

b) Explain in detail the design of synchronous counter using JK flipflop. (16)

15. a) Design an asynchronous sequential circuit that has two inputs X_1 and X_2 and one output Z. When $X_1 = 0$, then output Z is 0. The first change in X_2 that occurs while X_1 is 1 will cause output Z to be 1. The output Z will remain 1 until X_1 returns to 0. (16)

(OR)

b) i) Explain the fundamental and pulse mode circuits in asynchronous sequential logic. (8)

ii) Briefly explain about the removal of hazards using hazard covers in k-map. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

23PTEE303 – Electrical Machine Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between soft and hard magnetic materials with their applications.
2. Explain how is the reduction of eddy current loss achieved in magnetic materials in the electrical machines?
3. List the factors affecting the choice of specific magnetic loading.
4. Mention the important considerations in choosing the number of poles in D.C machine.
5. Why circular coils are preferred over rectangular coils for winding of a transformer?
6. Write the output equation of single phase and three phase transformer.
7. "A 3-phase Induction Motor with high value of specific electric loading has a lower overload capacity". Justify the statement.
8. Why the length of air gap in induction motor is kept minimum possible whereas in a D.C machine it is larger?
9. Define Short Circuit Ratio (SCR) and explain its effects on machine performance.
10. Why the damper windings are provided in synchronous machines?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe briefly the methods of determination of MMF in teeth. (8)

    ii) Discuss the probable reasons why procedure for accurate determination of MMF in airgap cannot be generalized. (8)

(OR)

    b) i) Discuss the basic considerations and limitations involved in the design of electrical machine. (8)

    ii) Mention the differences between fringing flux and leakage flux. (8)

12. a) Discuss in detail about the factors that influence the choice of specific electric and magnetic loadings in the design of rotating machine. (16)

(OR)

b) Calculate the main dimensions of a 12 kW, 220 V, 4-pole, 1200 R.P.M shunt generator. The specific electric loading is 18,000 average flux density is 0.46 Wb/m^2, full load efficiency is 0.86 and pole arc to pole pitch ratio is 0.68. The length of pole arc is equal to the length of the armature core. Friction and windage losses are neglected. (16)

13. a) Estimate the main core dimensions of a 25 kVA, 3-phase, 6600/440 volts, delta/star. 50 Hz, core type transformer with the following data: (16)

Stepped core for which area factor = 0.56

Spaces factor for window = 0.25

Voltage per turn = 21.0 V

Current density = 2.36 A/mm^2

Flux density = 1.1 tesla

(OR)

b) Design a suitable cooling system for a 500 kVA, 6600/440 V 50 Hz, three phase transformer with a total full load loss of 7 kW. The transformer main dimensions are 1m in height, 0.96 m in length and 0.47 m in breadth. Use cooling tubes of diameter 50 mm to limit the average temperature rise to 35°C. Use clearance of 50, 14 and 13 cm on the height, length and width sides. (16)

14. a) Calculate the following design parameters for a 30 kW, 440 V, 3-phase, 6 pole, 50 Hz delta connected squirrel cage induction motor: (16)

(i) Main dimensions of stator frame.

(ii) Number of turns per phase in stator winding.

(iii) Number of stator slots.

Assume

Specific magnetic loading = 0.48 tesla

Specific electric loading = 26,000 ampere-conductor/m

Full load efficiency, $\eta = 0.88$

Full load power factor = 0.86

Winding factor = 0.955

(OR)

b) A 15 kW, 3φ, 50 Hz, 415 V, 6-pole Δ-connected induction motor has a diameter of 32 cm and axial length of 13 cm, 72 stator slots with 20 conductors/slot. The air gap length is 0.56 mm and the gap contraction factor is 1.21. By taking the MMF of iron parts as 40 % of air gap, and coil span as 11 slots, calculate the magnetizing current per phase. (16)

15. a) List the specifications of a three phase synchronous machine based on which the machine is built and derive the output equation. (16)

(OR)

b) i) Discuss in brief the design of field winding of the synchronous machine. (8)

ii) Why the damper windings are provided in synchronous machines? Derive the expressions in connection with design of damper winding of synchronous machine. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

23PTEE302 - Power Electronics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Why SCR is called as a semi controlled device?
2. What is meant by natural commutation?
3. Define ripple factor.
4. What is the role of anti parallel diode connected across a load?
5. What is load commutated chopper?
6. What is the effect of load inductance on load current waveform in the DC chopper?
7. List the advantages of using space vector modulation.
8. Compare VSI and CSI.
9. Compare integral cycle control and phase control AC voltage controllers.
10. What are all the advantages of Matrix converter.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw and explain the switching characteristics of SCR. (16)

(OR)

b) Explain the driver and snubber circuit for MOSFET. (16)

12. a) Describe the working of single phase – fully controlled bridge converter in the Rectifying mode and inversion mode. Derive the expressions for average output voltage and RMS output voltage. (16)

(OR)

b) Explain the operation of 3 phase fully controlled bridge rectifier with necessary waveforms. (16)

13. a) i) For a Type A step down chopper of dc source voltage = 230 V, load resistance = 10 Ω. Take a voltage drop of 2 V across chopper when it is ON. For a duty cycle of 0.4, calculate i) average and rms values of output voltage. (8)

ii) Explain the steady state analysis of step down chopper. (8)

(OR)

b) i) For a current commutated chopper, peak commutating current is twice the maximum possible load current. The source voltage is 230 V dc and main SCR turn-off time is 30 μsec. For a maximum load current of 200 A, find the value of the commutating inductor and capacitor. (8)

ii) Describe the working of four quadrant chopper. (8)

14. a) With neat sketch and necessary waveforms, explain the working of 3 phase inverter in 180° mode of operation. (16)

(OR)

b) With neat sketch and necessary waveforms, explain the working principle of 3 phase auto sequentially commutated Current Source Inverter. (16)

15. a) i) A single phase voltage controller has input voltage of 230 V 50 Hz and a load of R = 15 Ohm. For 6 cycles ON and 4 cycles OFF. Calculate i) RMS output voltage ii) Input power factor iii) Average and RMS thyristor currents. (8)

ii) Explain the principle of operation of single phase AC voltage controller with neat diagram. (8)

(OR)

b) i) A resistive load of 5 Ohm is fed through a single phase full wave AC voltage controller from 230 V, 50 Hz source. If the firing angle of thyristor is 120 degree. Calculate the i) Output RMS voltage ii) Input power factor iii) Average current of thyristor. (8)

ii) Write a short note on Matrix converter. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2023 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

23PTEE301 – Control Systems

(Semi-log and ordinary graph sheets to be Permitted)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. The open loop gain of a system increases by 25%. Calculate the change in the closed loop gain assuming unity feedback.
2. What is meant by aligned position of a Synchro pair?
3. Given that the transfer function $G(s)=\frac{K}{s^2(1+sT)}$ H(s) =1, State the 'Type' and 'Order' of the system.
4. Why is the derivative control not used in control systems?
5. Sketch the approximate shape of polar plot for the transfer function $G(s)=\frac{K}{(1+sT)}$.
6. How is the closed loop frequency response determined from the open loop frequency response using Nichols chart?
7. Distinguish between absolute stability and relative stability of a system.
8. What is significance of asymptotes in root locus technique?
9. Mention the effects of lag-lead compensator.
10. What major advantage does compensator design by frequency response method have over root locus design?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What are the basic elements of a feedback control system? Explain briefly the function of each element. (6)

ii) Construct a block diagram for the simple electrical network shown in Figure.1and hence obtain the signal flow graph and the transfer function $\frac{E_0(s)}{E_i(s)}$. (10)

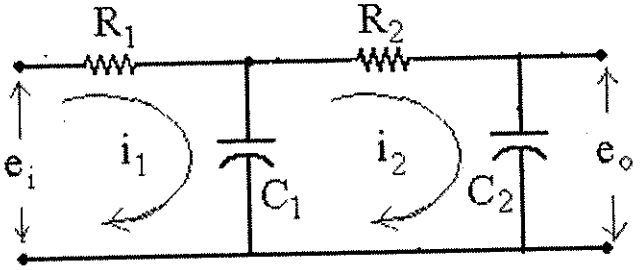


Figure.1.

(OR)

b) i) For the mechanical translational system shown in Figure.2, write the mathematical model and draw the torque-voltage analogous electrical circuit. (6)

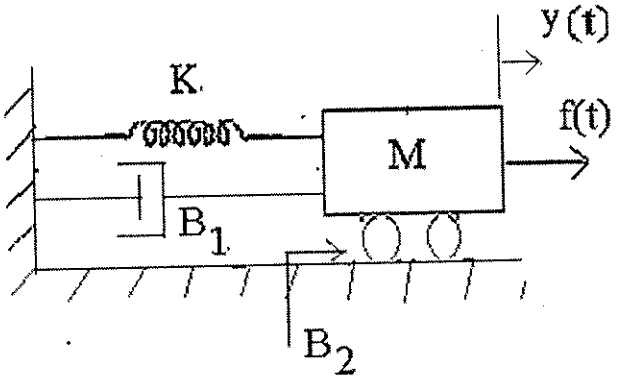


Figure.2.

ii) Derive the transfer function of an armature controlled DC servomotor. (10)

12. a) The open loop transfer function of a unity negative feedback system energized by a unit step input is given by $G(s) = \frac{16}{s(s+4)}$. Obtain step response, rise time, peak time, maximum overshoot and settling time. (16)

(OR)

b) i) Derive the Unit impulse response of a first order system. (8)

ii) The open-loop transfer function of a unity feedback system is given by $G(s) = \frac{100}{s^2(s+4)(s^2+5s+25)}$. Find the static error coefficients and the steady state error of the system when it is subjected to an input $r(t) = 2 + 4t + 2t^2$. (8)

13. a) Construct Bode plot for the system whose open loop transfer function is given below and determine i) the gain crossover frequency ii) the phase crossover frequency iii) the gain margin and iv) phase margin. (16)

$$G(s)=\frac{4}{s(1+0.5s)(1+0.08s)}$$

(OR)

b) Sketch the polar of Type-0, Type-1, Type-2 systems. (16)

14. a) The open loop transfer function of a unity feedback system is given by $G(s)H(s)=\frac{K}{(s+2)(s+4)(s^2+6s+25)}$. By applying the Routh criterion, find the range of values of K for which the closed loop system is stable. Determine the values of K which will cause sustained oscillations in the closed loop system. What are the corresponding oscillation frequencies? (16)

(OR)

b) i) Sketch the Nyquist plot for the system whose open loop transfer function is given below and examine the closed loop stability of the system. (12)

$$G(s)H(s)=\frac{(s+2)}{(s+1)(s-1)}.$$

ii) For the loop transfer function $G(s)H(s)=\frac{K(s+6)}{(s+3)(s+5)}$, find the Centroid of the root locus diagram. (4)

15. a) Explain the electric network realization and frequency characteristics of i) Lead compensator, and ii) Lag compensator. (16)

(OR)

b) Draw the functional block diagram of a PID controller. Illustrate the design of PID controller using Ziegler-Nichols tuning method based on process reaction curve. 16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEEE14 – Biomedical Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Give the nature of cancer.
2. Compare transducer with sensor.
3. Draw the ECG of a Normal waveform.
4. What are the challenges with bio signal analysis?
5. Compare radiography and fluoroscopy.
6. Give the working principle of photometer.
7. What is diathermy?
8. What is SpO_2 ? Give the range of SpO_2 for healthy individual.
9. Compare Microschock and Macroschock.
10. What is computer tomography?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Elaborate on transport of ions through cell membrane. (16)

(OR)

b) Explain about physiology of human body with respect to brain, body and lungs. (16)

12. a) Give the characteristics of EEG, ERG, EOG and EMG. (16)

(OR)

b) Design a bridge amplifier and line drive amplifier. Explain their working. (16)

13. a) Brief about (16)

i) Blood cell counter

ii) Electron microscope

(OR)

b) Discuss in detail about the working of the X ray. (16)

14. a) Elaborate on any two diathermy techniques. (16)

(OR)

b) Explain in detail on the elements in the intensive care units. (16)

15. a) Brief about (16)

i) Endoscope

ii) Cryogenic surgery

iii) Lasers in medicine

(OR)

b) Explain the working of (16)

i) MRI

ii) Positron emission tomography

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEEE24 – Power System Operation and Control

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define daily load curve.
2. What is meant by spinning reserve?
3. How do you define a control area in power system?
4. Mention the need for load frequency control.
5. What is automatic voltage regulator?
6. How does STATCOM support for power system operations?
7. Define incremental cost.
8. What is meant by power balance constraint?
9. What is the main purpose of the energy management system?
10. How does remote terminal unit support for power system operation and control?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Elaborate the Indian power scenario. Also detail the contribution of various power sources to meet electric power demand and various control strategies adopted in Indian power sector. (8)

ii) Explain how reserve requirements can be made to enhance power system operations. (8)

(OR)

b) i) Elaborate on how daily, weekly, monthly, and annual load curves can be constructed. Also detail the difference between load curve and load duration curve. (8)

ii) What is tariff? Detail the characteristics and types of tariff. (8)

12. a) With suitable diagram, explain the operation of speed governing mechanism. (16)

(OR)

b) Elaborate the static load frequency control for single area system. (16)

13. a) Explain the various excitation systems in power system. Write in detail on brushless AC excitation system. (16)

(OR)

b) Explain the methods of reactive power injection. Elaborate on how tap changing transformer, and SVC can support for voltage control. (16)

14. a) Derive the coordination equations with and without loss for a thermal power plant. How can these equations be used for achieving economic dispatch in a thermal power plant? (16)

(OR)

b) Derive the problem formulation of thermal unit commitment. Detail the forward dynamic programming method for solving thermal unit commitment problem. (16)

15. a) With a suitable illustration, explain the various components in a energy control centre. Also detail the functions of energy control centre. (16)

(OR)

b) Elaborate the various operating states in a power system. Explain how the state estimation is used to determine the operating states in a power system. (16)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE102 – DC Machines and Transformers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define co-energy.
2. Write the applications of singly & doubly excited magnetic system.
3. State the applications of various types of DC generators.
4. Define armature reaction.
5. What is back EMF?
6. Mention any four applications of DC series motor.
7. Why transformers are rated in KVA?
8. What are the typical uses of auto transformer?
9. State the different losses in transformer.
10. Define all day efficiency.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive an expression for field energy produced in a single excited magnetic field system. (16)

(OR)

b) Explain with neat diagram and sufficient expressions, the multiple excited magnetic field systems. (16)

12. a) i) Explain the constructional details of DC generator. (8)

ii) With the aid of a circuit diagram, describe the procedure for paralleling two DC generators and for transferring the load from one machine to the other. (8)

(OR)

b) i) Derive from the first principles the expression for EMF in DC generator. (8)

ii) A 4 pole lap wound DC shunt generator has a useful flux per pole of 0.6 Wb. The armature winding consists of 200 turns, each turn having a resistance of 0.003 Ω. Calculate the terminal voltage when running at 100 rpm if armature current is 45 A. (8)

13. a) Explain the operation of three point starter with a neat sketch. (16)

(OR)

b) Explain any two methods of speed control of DC shunt motor. (16)

14. a) Explain the operation of transformer in no load and loaded conditions with phasor diagrams. (16)

(OR)

b) Explain the working of auto transformer and prove that when transformation ratio approaches unity. (16)

15. a) Explain Swinburn's test for finding efficiency of a DC machine. (16)

(OR)

b) Draw and explain the circuit diagram for conducting OC and SC tests on a single phase transformer. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE201 – Electromagnetic Theory

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Coulomb's law.
2. What is the electric field intensity at a distance of 20 cm from a charge of 2 μC in vacuum?
3. State the difference between Poisson's equation and Laplace's equation.
4. Write the expression for energy stored and energy density in a capacitor.
5. State Ampere's circuital law.
6. What is energy density in magnetic field?
7. Distinguish between transformer e.m.f. and motional e.m.f.
8. State Faraday's Law
9. Determine the wavelength of an electromagnetic wave travelling in the free space at 30 GHz.
10. What is meant by depth of penetration?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Apply Coulomb's law to find the electric field intensity at any point P due to a straight, uniformly charged wire of linear charge density $+\lambda$ C/m. The point P is at a distance of 'h' m above the wire. (10)

ii) Write a note on stoke's theorem. (6)

(OR)

b) i) State and prove Divergence theorem. (10)

ii) Find the force on a charge Q1 of 20 μC at (0, 1, 2) m due to Q2 of 300 μC at (2, 0, 0) m. (6)

12. a) At an interface separating dielectric 1(ε_{r1}) and dielectric 2(ε_{r2}), show that the tangential component of $\bar{E}$ is continuous across the boundary, whereas the normal component of $\bar{E}$ is discontinuous at the boundary. (16)

(OR)

b) Explain briefly the polarization in dielectrics. Derive laplace's and poisson's equations from gauss law for a linear material medium. (16)

13. a) i) Obtain the expression of flux density produced by an infinitely long straight wire carrying a current I, at any point distant 'a' normal to the wire. (10)

ii) Calculate the inductance of a ring-shaped coil of mean diameter 20 cm, wound on a wooden core of 2 cm diameter containing 200 turns. (6)

(OR)

b) i) State and explain Biot-Savart law. (10)

ii) Derive expression for inductance of a toroidal coil. (6)

14. a) From the basics, derive the expressions for Maxwell's equation in differential and integral form. (16)

(OR)

b) Explain the relationship between the field theory and circuit theory using a simple RLC series circuit. (16)

15. a) State and prove Poynting Vector and Poynting Theorem. (16)

(OR)

b) Deduce the wave equations for conducting medium. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE304 – Power Electronics

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is a TRIAC? Sketch its static V-I characteristics.
2. Compare the features of IGBT and IGCT devices.
3. Mention the effect of source inductance on the performance of a fully controlled converter.
4. What is the main feature of multipulse rectifier? How is it achieved?
5. What is Time Ratio Control in DC choppers?
6. List the Various type of switched mode regulators.
7. What is the objective of Space Vector Modulation?
8. Mention the main differences between voltage source and current source inverters.
9. Why half-wave AC voltage controller is not used?
10. State the advantages of cycloconverters.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the different modes of operation of thyristor with the help of its static I-V characteristics. (8)

ii) Explain the working of any one Driver and Snubber circuit for MOSFET device. (8)

(OR)

b) i) Describe the structural features and static I-V characteristics of power diodes. (8)

ii) Explain the switching characteristics of an IGBT. (8)

12. a) A single-phase full converter, connected to 230 V, 50 Hz AC source, is feeding a load R = 10 Ω in series with a large inductance that makes the load current ripple free. For a firing angle of 45°, calculate the input and output performance parameters of this converter. (16)

(OR)

b) With necessary power circuit and waveforms, explain the working of 3-phase fully controlled bridge rectifier with Resistive load. (16)

13. a) Explain the analysis and waveforms at steady state for a DC-DC buck converter with R-L load. (16)

(OR)

b) With a neat power circuit diagram, explain the operation of DC-DC boost converter with Resistive load. Draw the load voltage and load current waveforms and derive the expression for the output voltage. (16)

14. a) i) With neat circuit and waveforms, explain the principle of operation of single phase bridge voltage source inverter. (10)

ii) Explain briefly the principle of sinusoidal PWM for voltage control of 3-phase voltage source inverter. (6)

(OR)

b) i) Explain briefly the functioning of 3-phase voltage source inverter in 120 degrees mode. (10)

ii) Describe briefly the basic concept of multilevel inverters. (6)

15. a) i) Discuss the working of two stage sequence control of AC voltage controller. (12)

ii) Draw the schematic diagram and basic circuit configuration with IG reactor of a 3-phase to 1-phase cycloconverter. (4)

(OR)

b) i) Describe the principle of working of single-phase to single- phase step-down cycloconverter for continuous conduction mode. (12)

ii) State the advantages and limitations of Matrix converters. (4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE403 – Digital Logic Circuits

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the characteristics of ECL gates.
2. State DeMorgan's theorem.
3. Distinguish between combinational logic and sequential logic circuit.
4. What is meant by look ahead carry?
5. Draw the logic circuit of decoder.
6. Mention the application of multiplexers.
7. Realize a T flip flop using JK flip flop.
8. Differentiate moore model from mealy model.
9. Define primitive flow table.
10. Compare critical race with non critical race condition.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Minimize the following Boolean function using Karnaugh map. (16)
$F(W,X,Y,Z) = \sum m(0,4,6,8,9,10,12) + \sum d(2,13)$

(OR)

b) Simplify the Boolean expression using the Quine-McCluskey tabulation method $\sum m(0,1,2,4,5,8,10,11)$ and check the result by K-map. (16)

12. a) i) Realize a full adder circuit using NAND gates. (8)

ii) Explain how a full-subtractor can be implemented using two half-subtractor. (8)

(OR)

b) i) Design a BCD adder to add two BCD digits. (8)

ii) Design a 4bit magnitude comparator and draw its circuit. (8)

13. a) i) Design a 4 to 1 line multiplexer using NAND gates. (8)

ii) Design a BCD to seven segment decoder using logic gates. (8)

(OR)

b) i) Design a binary to gray code converter. (8)

ii) Discuss about the architecture of PLA with neat diagram (8)

14. a) i) Draw the circuit of SR flip flop and explain its operation. Also derive its characteristic equation. (8)

ii) With neat diagram explain the working of a master slave JK flip flop. List its advantages. (8)

(OR)

b) i) Explain the operation of 4 bit universal shift register. (8)

ii) Explain the operation of ring counter with neat timing diagram. (8)

15. a) Design an asynchronous sequential circuit that has two inputs X_2 and X_1 and one output Z. When $X_1 = 0$, the output Z is 0. The first change in X_2 that occurs while X_1 is 1 will cause output Z to be 1. The output Z will remain 1 until X_1 returns to 0. (16)

(OR)

b) Explain various types of hazards in asynchronous sequential circuit and the ways to prevent it. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE404 – Solid State Drives

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the main factors which decide the choice of electrical drive for a given application?
2. What are the conditions to be satisfied for the regenerative braking operation to take place?
3. What are the necessity of DC choke coil and freewheeling diode in a converter circuit?
4. When is discontinuous conduction expected with the operation of converter fed DC drives?
5. Compare CSI fed drives and VSI fed drives.
6. What are the advantages of v/f control in induction motor drives?
7. Justify why a self controlled synchronous motor is free from hunting oscillations?
8. When can a synchronous motor be load commutated?
9. Mention the key factors to be considered for the selection of Power converters.
10. Mention any 5 components of a solar-powered pump drive system.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Label the essential parts of electric drive. Explain its function. (8)

ii) Discuss about the steady state stability of electric drives. (8)

(OR)

b) i) Draw and explain the speed-torque characteristics of various types of loads. (8)

ii) Explain, How the following speed transitions are carried out for increase & decrease of speed in same direction. (8)

12. a) i) Solve a 220 V, 1500 rpm, 10 A separately excited DC motor has an armature resistance of 1.2 Ω. It is fed from a single phase fully controlled rectifier with a source voltage of 230 V 50 Hz. Assuming continuous load current. Compute (8)

1) Motor speed at the firing angle of 30 ° and torque of 5 Nm.

2) Developed torque at the firing angle of 45 ° and speed of 1000 rpm.

ii) Explain the operation of four quadrant DC chopper drive. (8)

(OR)

b) i) Solve a 220 V, 20 A, 1000 rpm separately excited DC motor has an armature resistance of 2.5 Ω. The motor is controlled by a step-down chopper with a frequency of 1 kHz. The input DC voltage to the chopper is 250 V. Identify what will be the duty cycle of the chopper for the motor to operate at a speed of 600 rpm delivering the rated torque? (8)

ii) Define in detail about the regenerative operation of three phase fully controlled rectifier control of separately excited DC motor. (8)

13. a) Explain the four modes of operation of a static Scherbius drive. (16)

(OR)

b) Analyze the operation and performance of VSI fed Induction motor drive in detail of DC motor. (16)

14. a) Discuss the construction and working of permanent magnet synchronous motor with neat diagram. (16)

(OR)

b) Explain the method of vector control of synchronous motor with field weakening mode. (16)

15. a) i) What are the main factors affecting the power factor in power converters? And explain the techniques to improve the power factor in power converters. (8)

ii) How do energy-efficient motors differ from standard motors and key benefits of using energy-efficient motors in industrial applications? (8)

(OR)

b) i) Explain design steps for a solar-powered pump drive system and its implementation consideration. (8)

ii) Evaluate the advantages and challenges of battery-powered vehicles compared to internal combustion engine vehicles. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE502 – Power System Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define per unit quantity.
2. A generator rated at 10 MVA, 13.2 kV, reactance is 15%. Determine the reactance for the base values of 50 MVA, 13.8 kV.
3. What is meant by driving point admittance and transfer admittance?
4. What are the assumptions followed in fast decoupled load flow?
5. What are the reasons for occurring faults in power system?
6. What is short circuit capacity?
7. Classify asymmetric faults in power system.
8. Mention the properties of bus impedance matrix.
9. What is meant by transient stability?
10. What is clearing angle?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A three phase generator with rating 1000 kVA, 33 kV has its armature resistance and synchronous reactance as 20 ohm/phase and 70 ohm/phase. Calculate p.u impedance of the generator. Also find the p.u impedance for the new base values of 2000 kVA and 33 kV. (8)

ii) A three phase Y-Δ transformer is constructed using three identical single phase transformers rating 200 kVA, 63.51 kV/11 kV. The impedances of primary and secondary are 20+j45 ohm and 0.1+j0.2 ohm respectively. Calculate the p.u. impedance of the transformer. (8)

(OR)

b) A 50 kW, three phase, Y connected load is fed by a 200 kVA transformer with voltage rating 11 kV/400 V through a feeder. The length of the feeder is o.5km and the impedance of the feeder is 0.1+j0.2 ohm/km. If the load power factor is 0.8, calculate the p.u impedance of the load and feeder. (16)

12. a) i) Determine bus admittance matrix for the given topology. (8)

Start Bus- End Bus	Impedance (pu)	Line Charging Admittance (pu)
1–2	0.08 + j0.24	0.0
1–3	0.02 + j0.06	0.0
2–3	0.06 + j0.18	0.0

ii) Compare the Gauss-seidel, Newton-Raphson, and fast decoupled load flow analysis methods. (8)

(OR)

b) i) The bus admittance of a power system is: (8)

$$Y_{Bus} = \begin{bmatrix} 3+j12 & -2+j8 & -1+j4 & 0 \\ -2+j8 & 3.66+j14.66 & -0.66+j2.66 & -1+j4 \\ -1+j4 & -0.66+j2.66 & 3.66+j14.66 & -2+j8 \\ 0 & -1+j4 & -2+j8 & 3-j12 \end{bmatrix}$$

The schedule of real and reactive powers are:

Bus Code	P (MW)	Q (MVAr)	V (pu)	Remarks
1	-	-	1.06	Slack
2	0.5	0.2	1+j0	PQ
3	0.4	0.3	1+j0	PQ
4	0.3	0.1	1+j0	PQ

Determine the voltages at the end of first iteration using Gauss-Seidel method.

ii) Develop load flow equations suitable for solution by (8)

i) Gauss-Seidel method

ii) Newton-Raphson method, using nodal admittance approach.

13. a) A three-phase fault occurs at F in the given network. Determine the fault current and the line voltage at 11 kV bus under fault conditions. Shown in figure.1 (16)

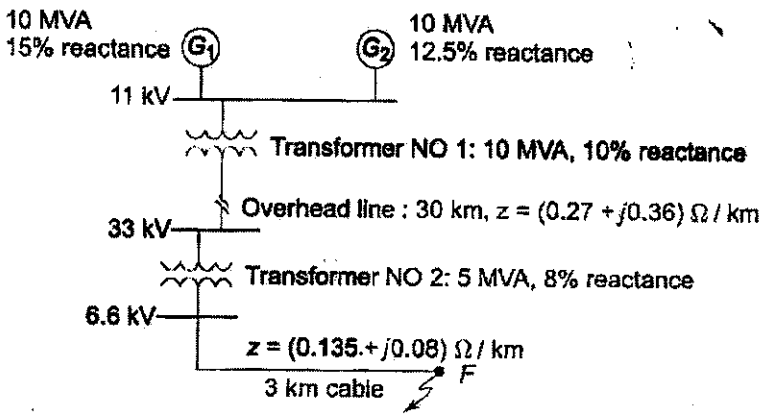


Figure.1

(OR)

b) Detetmine ZBus using bus building algorithm. Shown in figure.2. (16)

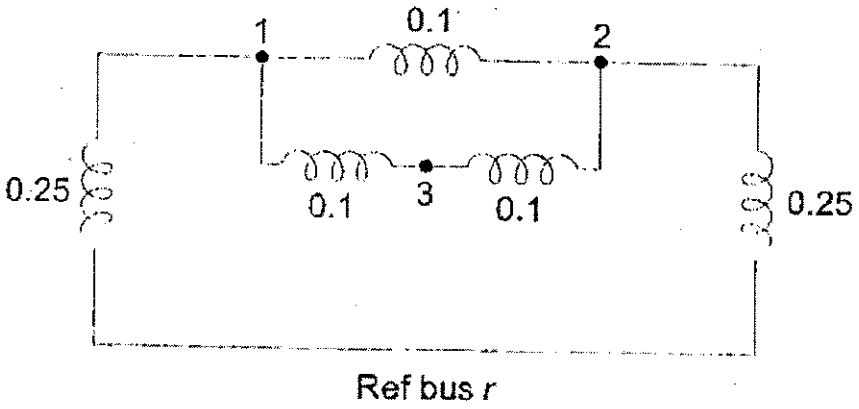


Figure.2

14. a) i) In a fault study, the following currents are measured I_R = 0 A, I_Y = 10 A, and I_B = -10 A. Find the symmetrical components. (8)

ii) Derive the expression to determine fault current magnitude if a line-ground fault occurs on phase "A". Also sketch the sequence network connection. (8)

(OR)

b) i) Draw the sequence networks for the power system network given below. Shown in figure.3. (8)

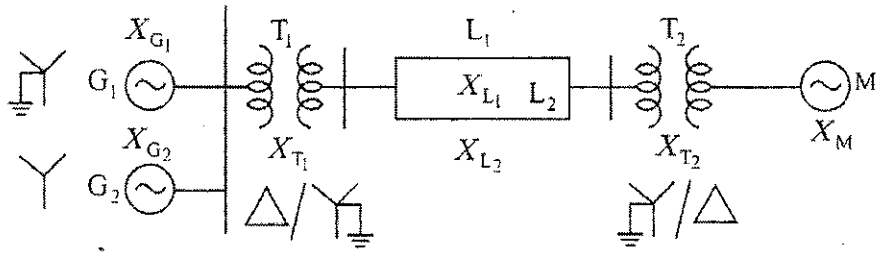


Figure.3

ii) Express the fault current magnitude in terms of sequence currents if a double line-ground fault occurs on phases "A" and "B". Also sketch the sequence network connection. (8)

15. a) Derive the swing equation of a single machine connected to an infinite bus. (16)

(OR)

b) Detail the Runge – Kutta method to determine the solution for swing equation. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE503 – Total Quality Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the analysis techniques of quality cost.
2. Write about the principles of TQM.
3. What is PDSA cycle?
4. Write about Kaizen.
5. What do you mean by central tendency and dispersion?
6. Write the concept of six sigma.
7. Brief on the Benchmarking process.
8. List the stages of FMEA.
9. Give your views on quality systems.
10. What is quality audit?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Elaborate on quality council, quality statement, strategic planning and role of senior management. (16)

(OR)

b) Elaborate the Deming Philosophy. (16)

12. a) Give a detailed view on Employee involvement – motivation, rewards, recognition, teams, empowerment, appraisel and benefits. (16)

(OR)

b) Give a detailed view on the supplier partnership – relationship development, sourcing, supplier selection and rating. (16)

13. a) Discuss about the new seven management tools. (16)

(OR)

b) Discuss on the control charts for variables and attributes. (16)

14. a) Discuss about the QFD process. (16)

(OR)

b) Discuss on Taguchi quality loss function. (16)

15. a) Write short notes on the need for ISO 9000. (16)

(OR)

b) Discuss about the implementation of the quality systems. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEEE03 – Renewable Energy Sources

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are limitations of solar energy?
2. Express the advantage of solar concentrators.
3. Classify the application of solar PV System.
4. Classify the types of solar water heating.
5. Illustrate the site selection factor for wind turbine.
6. Compare the VAWT and HAWT.
7. Point out the factors affecting biogas generation.
8. Compare bio mass and bio gas.
9. Explain the factors determine the maximum length and height of ocean waves.
10. Mention the factors affecting the fuel cell performance.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Examine the environmental impact of solar power generation. (8)

ii) Tabulate the different types of solar energy measuring instruments. (8)

(OR)

b) i) Define solar constant. What are the reasons for variation in solar radiation reaching the earth than received at the outside of the atmosphere? (8)

ii) Explain and derive expression for beam and diffuse radiation. (8)

12. a) Evaluate the series and parallel connection of solar photovoltaic system with neat sketch. (16)

(OR)

b) Write short notes on (16)

i) Solar energy for agriculture and industrial process

ii) Solar distillation

iii) Solar pumping

iv) Solar cooker.

13. a) i) Summarize the working principle of Wind Energy Conversion System (WECS). (8)

ii) Define tip speed ratio and derive the necessary equation. (8)

(OR)

b) i) Explain about the various types of Wind Power Plant (WPPs). (8)

ii) What is wind power and derive the equation of power in wind? (8)

14. a) i) List out the classification of biogas plants and explain any one with neat sketch. (8)

ii) Explain the working of KVIC digester. (8)

(OR)

b) i) Discuss energy forming. List the main advantages of anaerobic digesor of biomass. (8)

ii) Describe in detail the various factors affecting bio digestion of a gas. (8)

15. a) i) Discuss the OTEC closed (Anderson) cycle. (8)

ii) Explain the design principle and operation of fuel cells. (8)

(OR)

b) i) Explain the different methods used for hydrogen storage. (8)

ii) Explain the operation of double basin type tidal power plant. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE601 – Microprocessor and Microcontroller

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State the function of given 8085 instructions: JP, JPE, JPO, JNZ.
2. Differentiate memory mapped I/O and I/O mapped I/O.
3. How is the memory segment accessed by 8086 microprocessor identified?
4. What is meant by pipelining?
5. Distinguish between microprocessor & microcontroller.
6. How the selection of a particular register bank is done in 8051 microcontroller?
7. What is the use of a watch dog timer?
8. Compare polling and interrupts.
9. Find the necessity of handshake signals in mode-2 configuration of 8255.
10. Mention the applications of programmable interval timer.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the architecture, data flow and instruction execution of 8085 microprocessor. (8)

ii) With timing diagram, explain the memory read operation in 8085 microprocessor. (8)

(OR)

b) i) Sketch the pin details of 8085 microprocessor and explain the purpose of each pin. (8)

ii) Explain in detail about the interrupts of 8085 microprocessor. (8)

12. a) i) Write a program to add the elements of two matrices using the 8086 instruction set. (8)

ii) Illustrate the functional description of 8086 microprocessor with a neat sketch. (8)

(OR)

b) Explain the various addressing modes of 8086 with an example. (16)

13. a) Sketch the architecture of 8051 microcontroller and describe the blocks in detail. (16)

(OR)

b) i) Discuss in detail on timers used in 8051 microcontroller. (8)

ii) Write a test program for the 8051 chip to toggle all the bits of P0, P1 and P2 after a delay. (8)

14. a) i) With the help of a neat diagram, show the interfacing of ADC with 8051 μC and explain its operation. (8)

ii) Draw the interfacing of a 4 x 4 matrix keypad with 8051 μC and explain the same. (8)

(OR)

b) i) Illustrate how to interface an LCD display with microcontroller. (8)

ii) Write an assembly language program to generate a triangular waveform at the output of DAC by interfacing it with 8051 microcontroller. (8)

15. a) i) Describe the 8255 programmable peripheral interface and its operating modes. (8)

ii) Point out the features and explain the operation of 8254 Programmable Interval Timer with necessary diagram. (8)

(OR)

b) i) Discuss how 8257 is interfaced with a microprocessor and also explain the various register formats. (8)

ii) Interface eight 7 segment digits to a microprocessor through 8279 and write an 8086 ALP to display 1 to 8. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEEE07 – Special Electrical Machines

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the primary design considerations of synchronous reluctance motor?
2. Mention the applications of synchronous reluctance motor.
3. How stepper motors are classified?
4. What is meant by full step operation?
5. What is SRM and state the reluctance principle?
6. Why synchronous reluctance machines are popular in adjustable speed drives?
7. State the advantages and disadvantages of brushless DC motor drives.
8. Why the PMBLDC motor is called electronically commutated motor?
9. What are the assumptions made in deriving the torque equation of PMSM?
10. Write the significance of power controllers of PMSM.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the constructional features of synchronous reluctance motor. (8)

ii) Describe the steady-state phasor diagram of synchronous reluctance motor. (8)

(OR)

b) i) Explain the torque- speed characteristics of synchronous reluctance motor. (8)

ii) Explain the constructional features of Vernier motor. (8)

12. a) i) Explain the construction and various modes of excitation of variable reluctance stepper motor. (10)

ii) Mention the applications of stepper motor. (6)

(OR)

	b)	i)	Explain the operation of driver system and control circuitry for stepper motor.	(10)
		ii)	Mention the advantages and disadvantages of stepper motor.	(6)
13.	a)	i)	Explain the operation of SRM with a neat diagram.	(10)
		ii)	Draw and explain the torque-speed characteristics of SRM.	(6)
			(OR)	
	b)	i)	Derive the voltage and torque equation of SRM.	(10)
		ii)	Describe microprocessor based control of SRM drive.	(6)
14.	a)	i)	Brief the construction of PMBLDC motor.	(10)
		ii)	Compare the electronic commutator and mechanical commutator.	(6)
			(OR)	
	b)	i)	Write the torque equation of PMBLDC motor and explain the characteristics.	(10)
		ii)	Write a note on power controllers used in PMBLDC motor.	(6)
15.	a)	i)	Explain the self-control mode of PMSM.	(8)
		ii)	Mention the salient features and applications of PMSM.	(8)
			(OR)	
	b)	i)	Discuss the different rotor configurations of PMSM.	(8)
		ii)	Derive the expression for torque developed in PMSM.	(8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEEE10 - High Voltage Direct Current Transmission

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Specify the application of DC transmission.
2. Mention the highest DC transmission voltage level in India.
3. List the choice of converter configurations.
4. Mention the different firing schemes.
5. Differentiate firing angle and extinction angle control.
6. Mention the importance of higher level controllers.
7. Why reactive power compensation is necessary?
8. List the benefits of Active filters.
9. Suggest the per unit systems for DC quantities.
10. Mention the constraints in the modeling of DC systems.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Compare AC and DC transmission and elaborate the modern trends in HVDC technology. (16)

(OR)

b) Illustrate the different types and applications of MTDC systems. (16)

12. a) Explain in detail about the Graetz circuit and analyze it with overlap. (16)

(OR)

b) Design a 12 pulse converter and discuss the converter characteristics for different firing schemes. (16)

13. a) Explain the principles of DC link control and its converter control characteristics. (16)

(OR)

b) Illustrate the HVDC link transmission based on VSC control. (16)

14. a) Specify the elements of STATCOM and explain its effectiveness in reactive power control. (16)

(OR)

b) Explain in detail about the design of AC and DC filters. (16)

15. a) Discuss the modeling of DC systems for Power flow analysis with necessary constraints. (16)

(OR)

b) Illustrate the power flow analysis with a suitable case study. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEEE11 – Energy Management System and SCADA

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant energy management?
2. Mention a few load control techniques.
3. How do reactor support for energy management?
4. What are the salient features of electronic meters?
5. What is the use of ballast?
6. What are the benefits of interconnection between electrical systems?
7. Define SCADA.
8. What are the benefits of using IEDs?
9. What is meant by interoperability?
10. What is the standard adopted in implementing SCADA in substations?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Write in detail about designing and starting an energy management program in an industry. (16)

(OR)

b) Write in detail about energy management in heating, ventilating, and colling system. (16)

12. a) i) Elaborate on how the energy efficiency can be improved in electric motors and transformers. (8)

ii) Discuss the importance of placing meters in the appropriate locations in an industry. Also, mention the requirements for meters. (8)

(OR)

b) i) Describe the evolution of utility meters. Elaborate the functions of demand meters. (8)

ii) What is multitasking in solid state meters? Distinguish their advantages against the conventional meters. (8)

13. a) Discuss the methods to improve the lighting system. Also detail the various light control schemes. (16)

(OR)

b) What is cogeneration? With suitable illustration, describe the operation of various cogeneration systems. (16)

14. a) i) Explain the functional requirements of SCADA. (8)

ii) Write in detail about (a) Remote terminal unit (RTU), and (b) Human – machine interface (HMI). (8)

(OR)

b) i) With suitable illustration, explain the SCADA architecture. (8)

ii) Discuss about the roles of data logger systems, and communication networks in modern SCADA system. (8)

15. a) Describe how SCADA can be used in transmission and distribution sector? (16)

(OR)

b) Describe the system installation, testing, and commissioning of SCADA system in substation. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE701 – Electrical Energy Utilization, Conservation and Energy Auditing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the problems associated with the renewable energy sources.
2. How do the load factor and diversity factor influence the cost of generation?
3. State Lambert's cosine law.
4. Define luminous efficacy.
5. What are the different methods of electric heating?
6. Mention the applications of electric arc welding.
7. What are the requirements for ideal traction systems?
8. Which DC motor is preferred for electric traction? Why?
9. List out the advantages of electric drives.
10. What is meant by regenerative braking?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain the electric power generation from wind power with suitable illustrations.	(8)
		ii)	Discuss about the different types of tariff.	(8)
			(OR)	
	b)	i)	With neat diagram, explain about the geo thermal power generation.	(8)
		ii)	Why energy conversion is needed? Explain in detail.	(8)
12.	a)	i)	Explain two laws of illumination in detail.	(8)
		ii)	Write in detail about energy efficient lamps.	(8)
			(OR)	
	b)	i)	Elaborate the various steps involved in calculation of illumination for residential lighting design.	(8)
		ii)	With neat diagram, explain the construction and working of mercury vapour lamp.	(8)

13. a) i) Describe in detail about the process of dielectric heating. (8)

ii) Explain in detail about Ajax Wyatt furnace. (8)

(OR)

b) i) Elaborate the principle of indirect resistance heating. (8)

ii) Distinguish between AC welding and DC welding. (8)

14. a) Describe the different types of supply system used for railway electrification. (16)

(OR)

b) i) Explain the multiple unit control in traction system. (8)

ii) Write in brief about recent trends in electric traction. (8)

15. a) i) Draw and analyse the operative characteristics of electric drive motors. (8)

ii) Explain any one modern speed control method for DC drives. (8)

(OR)

b) i) Analyse about the various factors influencing the selection of motors. (8)

ii) Explain dynamic braking and regenerative breaking of electric drives briefly. (8)

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEEE16 – Power Quality

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How voltage sag differs from under voltage?
2. What is called Voltage Imbalance?
3. Specify the sources of voltage sag?
4. List out any two mitigation techniques used for Flicker control?
5. How do you define ferro-resonance?
6. Write any two computer tools used for transient analysis.
7. What is called triplen harmonics?
8. Specify the IEEE 519 standard for harmonic current limit.
9. What are the factors to be considered for power quality monitoring?
10. What is called Distributed Generation?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Define and explain the following power quality terms (8)

(a) Transients

(b) Power frequency variations.

ii) Discuss the major power quality issues associated with long duration voltage variations. (8)

(OR)

b) i) Draw the CBEMA curve and specify the significance of different power quality terms associated with CBEMA curve. (8)

ii) Why waveform distortion occurs in AC power system and explains the major sources for waveform distortion? (8)

12. a) i) Describe the procedure to estimate the voltage sag performance. (8)

ii) Justify why voltage sag occurs during induction motor starting? (8)

(OR)

b) i) List out the devices used for voltage regulation and explain the principle of voltage regulating device. (8)

ii) Explain how capacitor used for voltage regulation in distribution network? (8)

13. a) i) Describe how capacitor switching creates the transient overvoltage? (8)

ii) List out the devices used for mitigation of transient over voltages and explain the operation of any one device. (8)

(OR)

b) i) Explain how utility system protected against lightning surges? (8)

ii) Identify the methods used for managing ferroresonance. (8)

14. a) i) Identify the major harmonic sources from commercial loads connected to distribution system. (8)

ii) Write short notes on harmonic phase sequences. (8)

(OR)

b) i) How power system response characteristics modified due to harmonics in power system network? (8)

ii) With neat diagram, brief the principle of operation of a Harmonic control device. (8)

15. a) i) Explain the functionality of Harmonic analyzer used for power quality measurement. (8)

ii) Draw the functional block diagram for Flicker meter and mention its uses. (8)

(OR)

b) i) Discuss the power quality issues from distributed generation. (8)

ii) Identify the major distributed generation technologies used in power system and mention its function. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEEE04 – Bio-Medical Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the advantages of electrode paste used for coupling electrodes to the patient's skin.
2. What is the need of transducers?
3. Draw a standard ECG waveform and label its components.
4. Indicate an practical application of isolation amplifier.
5. Classify oximeters based on their operating principle.
6. Interpret the function of defibrillators.
7. State the significance of collimators used in X-ray imaging.
8. Differentiate the function of colorimeters and photo meters.
9. Mention the application of laser in medicines.
10. Infer about tomography and thermography.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With a typical cell potential waveform diagram, explain origin of bioelectric potential. The phenomena of resting and action potential. (16)

(OR)

b) Explain about the function of electrodes, their types, advantages and disadvantages. (16)

12. a) i) Give the characteristics of different physiological signals. (6)

ii) Explain the operation of the lead system in recording methods of EEG. (10)

(OR)

b) i) Explain the physiological effects of currents at commercial frequencies. (6)

ii) With neat block diagram explain the working of ECG machine. (10)

13. a) i) Elaborate pacemakers and associated components in details. (8)

ii) Brief about diathermy and its types (8)

(OR)

b) i) Elaborate the operation of blood gas analyzer in detail. (8)

ii) Draw the block diagram of ventilators along with its accessories and explain its function. (8)

14. a) i) Draw the block diagram of an X-ray machine and describe the function of all components. (12)

ii) Brief about radiation detectors. (4)

(OR)

b) i) Show the block diagram of bio telemetry system and its design. Describe the function of its components. (12)

ii) List the applications of biotelemetry. (4)

15. a) Illustrate the working principle of Magnetic Resonance Imaging and ultrasonic imaging system. (16)

(OR)

b) Explain about micro and macro shock, electrical accidents in hospitals and devices to protect electrical hazards. (16)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCEE03 – Ground Water Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by the base flow?
2. List the characteristics of perched aquifer.
3. State the Darcy`s law.
4. Define coefficient of permeability and storage coefficient.
5. Write down the names of geophysical tests.
6. Brief a note on the well logging.
7. State the permissible limit of fluoride in the drinking water.
8. Mention the trace elements in groundwater.
9. Recall the definition of the term watershed.
10. Quote the advantages of the conjunctive use.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What is meant by hydrologic cycle? Quote its components. Explain the role of groundwater in hydrologic cycle. (8)

ii) Explain about the groundwater potential in India. (8)

(OR)

b) i) Mention the different types of aquifer. Explain with diagrams. (8)

ii) Describe about the determination of the permeability by falling head permeability test in the laboratory. (8)

12. a) A 30 cm well completely penetrates an unconfined aquifer of saturated depth 40 m. After the long period of pumping at a steady rate of 1500 l.p.m., the drawdown in two observations wells 25 m and 75 m from the pumping well were found to be 3.5 m and 2 m respectively. Determine the transmissibility of the aquifer. Also determine the drawdown at the well. (16)

(OR)

b) i) Brief about the Theis method. (6)

ii) In an artesian aquifer of thickness 8m, a 10 cm diameter well is pumped at a constant rate of 100 l.p.m. the steady state drawdown observed in two wells located at 10 m and 50 m distances from the center of the well were 3 m and 0.05 m respectively. Determine (10)

1. The transmissivity
2. The hydraulic conductivity of the aquifer.

13. a) Explain about the Electrical Resistivity method and its applications. (16)

(OR)

b) i) Describe about the principle of seismic reflection and refraction method. (12)

ii) Write short notes on collector wells and infiltration galleries. (4)

14. a) i) State drinking water quality standards on Bureau of Indian Standard (BIS) and World Health Organization (WHO). (8)

ii) How do you classify Irrigation water based on Hardness and Total Dissolved Solids (TDS)? (8)

(OR)

b) i) Brief the causes of seawater intrusion. (4)

ii) Explain about the methods suggested to prevent sea water intrusion. (12)

15. a) i) Explain about the concept of watershed management. (8)

ii) Brief the various techniques of rain water harvesting. (8)

(OR)

b) i) Explain about the conditions favourable for natural or artificial recharge. (8)

ii) What is the necessity of rainwater harvesting? Suggest suitable rain water harvesting methods for your locality. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE401 – Linear Integrated Circuit

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by monolithic IC?
2. Distinguish between Dry etching & Wet etching.
3. Define offset voltage and current.
4. What is differential amplifier?
5. Differentiate between clippers and clampers.
6. What is Pull- in time?
7. Why the 555 timer is called so?
8. Define lock in range in PLL.
9. What is an isolation amplifier used for?
10. What is the use of MA 7840?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail the fabrication of ICs using silicon planar technology. (8)

ii) Use appropriate block diagram, explain the general stages of an op-amp IC. (8)

(OR)

b) List the levels of integration in ICs. Explain with neat diagrams the various steps involved in the fabrication of monolithic BJT, resistor and capacitor. (16)

12. a) i) List and explain the non-ideal DC characteristics of an operational amplifier. (8)

ii) Explain the AC characteristics of an operational amplifier. (8)

(OR)

b) With circuit and waveforms explain the application of op-amp as (i) Summer (ii) Differentiator (iii) Integrator. (16)

13. a) i) Estimate the working of R- 2R ladder type DAC. (8)

ii) Explain in detail on the operational features of 4-bit weighted resistor type D/A converter. (8)

(OR)

b) Describe in detail about the single slope type ADC with neat sketch. (16)

14. a) Discuss the following applications of Analog Multiplier ICs (16)
i) Voltage squarer ii) voltage divider iii) square rooter iv) Phase angle detector.

(OR)

b) i) In a astable multivibrator using 555 timer Ra = 6.8K, Rb = 3.3 K, C = 0.1 uF. Calculate the free running frequency. (8)

ii) Determine how the IC 565 PLL can be used as a Frequency multiplier/divider. (8)

15. a) Design an adjustable voltage regulator circuit using LM 317 for the following specifications: Input dc voltage = 13.5 V; Output dc voltage = 5 to 9 V; Load current (maximum) = 1 A. (16)

(OR)

b) i) Develop the basic principle of function generator? Draw the schematic of ICL 8038 function generator and discuss its features. (10)

ii) List any two important features of linear voltage regulator IC723. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTEEG201 – Electrical Technology

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define thermal overloading in drive motors.
2. Differentiate the continuous and intermittent duty.
3. List the types of braking methods used in electrical motors.
4. Why speed-torque characteristics are important for drive applications?
5. List the types of DC motor starters.
6. How would you use an auto-transformer to start a squirrel cage induction motor?
7. Recall the working principle of the Ward Leonard control system.
8. Compare armature and field control methods in DC motors.
9. Justify the use of inverters for speed control in energy-efficient AC drives.
10. Define voltage control for speed regulation in three-phase induction motors.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the heating and cooling curves of an electric drive. (10)

ii) Outline the factors influencing the choice of electrical drives with examples. (6)

(OR)

b) i) Compare and contrast the different loading conditions and their impact on the performance of drive motors. (10)

ii) Analyze how the classes of duty affect the energy efficiency of electric drives? (6)

12. a) Compare and contrast the speed-torque characteristics of DC shunt and series electrical motors with neat sketches. Explain the characteristics. (16)

(OR)

b) Discuss the dynamic braking and regenerative braking in electrical machines. (16)

13. a) i) Describe the working principles of 3-point DC motor starter with diagram. (8)

ii) Explain the operation of Star-Delta starter. (8)

(OR)

b) i) Explain the starting methods of squirrel cage motor with relevant circuit diagram. (8)

ii) Analyze the impact of starting torque on motor performance in various starting methods for three-phase induction motors. (8)

14. a) Explain the operation of DC choppers used in electric drives. (16)

(OR)

b) Explain the conventional methods of speed control of DC shunt motor with neat diagrams. (16)

15. a) i) Describe the V/f control method for AC motor drives and illustrate its working with relevant equations and graphs. (10)

ii) Compare the performance of V/f control and slip power recovery scheme. (6)

(OR)

b) i) Discuss the working principles of the slip power recovery scheme and mention its advantages over conventional speed control methods. (10)

ii) Outline the role of AC voltage regulators in the speed control of AC drives. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E./Ph.D. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES

22MLC01 – Research Methodology and IPR

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What do you mean by research?
2. List the various methods of collecting primary data?
3. What is Hypothesis?
4. How can you ensure that your research report is free from plagiarism before submission?
5. Give a detailed account on content of a research report?
6. How do you propose the review committee for your research proposal?
7. What kind of information is presented in a typical patent document?
8. What is a trademark?
9. What is a Geographical Indication?
10. Why copy rights are preferred rather than patents in case of software?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the quantitative. and qualitative research techniques? Explain with suitable examples? (16)

(OR)

b) i) Explain essentials that are to be considered by a researcher while formulating Research Problem. (8)

ii) What is a Research Problem? Explain Components of Research Problem? (8)

12. a) Discuss the importance of critical literature review and its uses in planning innovation research? (16)

(OR)

b) What is ethics in research? Why it is important? Explain five principles of research ethics. (16)

13. a) Explain various sources of obtaining data for the selected research proposal and the format of the research proposal? (16)

(OR)

b) Explain the purpose of research report? What are various stages of report writing and explain criteria for good research report. (16)

14. a) Point out the objective, benefits, features of patent and write note on the significance of inventive step. (16)

(OR)

b) List and elaborate the different geographical indications tagged products in India. (16)

15. a) Demonstrate the role of IPR and protection Biodiversity. Point the role WIPO and IPR establishments? (16)

(OR)

b) Elaborate on the types of patent application, process of E filling and Grant of patent. (16)

EEE

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEEE20 – Smart Grid Technologies

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the need for smart electric grid.
2. What is meant by self-healing grid?
3. What is called smart substation?
4. What are the functions of distribution management systems?
5. Mention the advantages of smart meters against the conventional meters?
6. How do you classify phasor measurement unit based on the application?
7. Why is the power quality considered in smart grid?
8. What are the advantages of web based power quality monitoring?
9. What are the limitations of local area network?
10. Why is the cybersecurity important in smart electric power grid?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Elaborate the drivers for smart electric grid. (8)

ii) Detail the smart grid policy in India. Also list out the smart grid initiatives in India. (8)

(OR)

b) i) Distinguish between conventional electric grid and smart electric grid? (8)

ii) Detail the opportunities and benefits while transforming conventional grid to smart electric grid. (8)

12. a) i) With suitable illustration, detail the structure of substation automation? (8)

ii) Explain the concepts of outage management in smart grid. (8)

(OR)

b) i) Elaborate the importance of wide area monitoring, protection, and control (WAMPAC) in smart grid. (8)

ii) With suitable illustrations, detail the modern devices used for Var control in smart grid. (8)

13. a) i) Elucidate the drivers for advanced metering infrastructure. (8)

ii) Detail the role of intelligent electronic devices which are employed in smart grid. (8)

(OR)

b) i) Detail the benefits of AMI protocols. (8)

ii) Elucidate the applications of PMU and IED for monitoring and protection in smart grid. (8)

14. a) Elaborate the power quality issues of grid connected renewable energy sources. (16)

(OR)

b) Explain the applications of power quality conditioners placed in smart grid. (16)

15. a) i) Write short notes on (8)

(a) Home Area Network and

(b) Wide area Network.

ii) How does the cloud computing system support smart grid operations? (8)

(OR)

b) i) How do you classify the communication subnetworks used in smart grid? Discuss the technical details about each sub network. (8)

ii) How can the cyberthreats be handled in smart grid? (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D. Degree Examinations – Nov/Dec 2024

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PEE14 – Artificial Intelligence and Machine Learning

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the advantages of Breadth First Search?
2. List down the characteristics of intelligent agent.
3. Difference between predicate and propositional logic
4. For the given sentence "All Pompians were Romans" write a well formed formula in predicate logic.
5. Compare production based system with frame based system.
6. Give the Baye's rule equation.
7. Compare Supervised and Unsupervised learning.
8. Mention few differences and similarities between problem solving and planning?
9. List out the problem areas addressed by Expert systems.
10. Sketch the Components of an Expert System Shell.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss constraint satisfaction problem with an algorithm for solving a Cryptarithmetic problem. (16)

(OR)

b) Explain in detail about Generate and Test and Simple Hill Climbing and Heuristic Functions. (16)

12. a) i) Explain Alpha-Beta algorithm & pruning. (8)

ii) Illustrate the method of MIN MAX procedure in game playing. (8)

(OR)

b) i) Convert the following well-formed formula into clause from with sequence of steps. $\forall x$: [Roman(x) $\wedge$ know(x,Marcus)] $\rightarrow$ [hate(x,Caesar) $\vee$ ($\forall x$: $\exists z$: hate(y,z) $\rightarrow$ thinkcrazy(x,y))].: (8)

ii) Perform Resolution for "India Wins the match" example. (8)

13. a) Explain in detail about forward chaining and backward chaining algorithms with example. (16)

(OR)

b) Explain the production based knowledge representation techniques? (16)

14. a) i) Illustrate about nonlinear planning using constraint positioning with an example. (8)

ii) Discuss in detail about advanced plan generation systems. (8)

(OR)

b) i) Explain learning in Decision Tree with an example. (8)

ii) Discuss in detail about ID3. (8)

15. a) Explain about heuristics, the role of knowledge engineer, domain expert and an end user in an expert system. (16)

(OR)

b) Explain the expert system architectures: (16)

1) Rule-based system architecture
2) Associative or semantic Network Architecture
3) Network architecture
4) Blackboard system Architectures

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2022 Regulations)

CIVIL/CSE/MECHANICAL ENGINEERING

22EE101 - Basic Electrical and Electronics Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State Ohm's Law.
2. State Norton's theorem.
3. Give the difference between series and parallel circuit.
4. What do you mean by real power and reactive power?
5. List the applications of DC Motor.
6. Compare Single Phase and Three Phase Transformer.
7. Compare Inverting and Non-inverting amplifier.
8. What are the two types of semiconductors?
9. What is the purpose of earthing?
10. Compare UPS and SMPS.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Elaborate on electrical circuit elements in DC circuits with diagrams and Voltage, Current, Power relations. (16)

(OR)

b) State Superposition theorem with an example. (16)

12. a) Analyse the following Single phase AC circuits: (16)
    1) RL Circuit
    2) RC Circuit

(OR)

b) Analyse the voltage and current relations in star and delta connections. (16)

13. a) i) Elaborate on the working of Singe phase induction motor. (10)

    ii) List the application of induction motor. (6)

(OR)

b) i) Explain about Ideal transformer. (6)

ii) Elaborate on the losses and efficiency of transformer. (10)

14. a) Give a detailed view on the operations, characteristics and applications of Op-amp (16)

(OR)

b) Explain the Characteristics of PN Junction Diode, zener diode. (16)

15. a) Explain about the types of house wiring. (16)

(OR)

b) Explain in detail about the principle, characteristics, types and applications of batteries. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D. Degree Examinations – Nov/Dec 2024

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PEE63 – Energy Storage Technologies

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. Mention the factors determining the demand for energy.
2. Specify the demand for portable energy.
3. Compare the energy stored in flywheels (mechanical) and compressed spring.
4. A battery of 20 V is connected to 3 capacitors in series, Two capacitors are of 20 μF each, and one is of 10 μF. Calculate the energy stored in the capacitors in the steady state.
5. Suggest few methods to prevent battery explosions.
6. How is the energy capture rate and efficiency defined?
7. A 12 V battery capacity of 500 Ah (initially full charge) that is supplying a load of 0.6 ohm. Find the state of charge of the battery after 3 hours.
8. What is the significance of the energy storage system in electric and hybrid vehicles?
9. Compare fuel cell and hydrogen.
10. What are the advantages of super capacitor over battery?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Examine the effects of seasonal fluctuations in electricity demand and energy supply and its impact on transmission congestion. (8)

ii) Discuss about global development trends in energy sector (8)

(OR)

b) i) Describe in detail the historical perspective of energy storage and interruptions in energy supply systems. (8)

ii) Summarize the issues in "Environmental sustainability". (8)

12. a) i) Compare Chemical Energy and Electrochemical Energy. (8)

ii) Illustrate the pumped hydro storage plant. (8)

(OR)

b) i) Discuss the electromagnetic energy storage using superconducting magnets. (8)

ii) Elaborate on the many kinds of energy storage technologies. (8)

13. a) i) Discuss the various risk factors in a battery storage system. (8)

ii) Elaborate on the battery performance characteristics. (8)

(OR)

b) i) Compare the merits and demerits of different types of energy storage. (8)

ii) Explain about recycling and recovery of energy storage system. (8)

14. a) i) A 12 V lead acid solar system battery with capacity of 300 Ah having an identical resistance of 0.2 ohm. The battery is theoretically discharged up to its cut-off voltage in 20 hours. Find the C-rate and efficiency of the battery. (8)

ii) Elaborate on Coulomb's Counting Method for estimating the SoC of the Battery. (8)

(OR)

b) i) Calculate the battery capacity to supply the 70 Watts, 12 V load for 10 hours. The battery efficiency and Depth of Discharge (DoD) is 80 % and 50 % respectively. The number of non-sunny days is 1. (8)

ii) Establish the battery capacity and structure of battery bank. (8)

15. a) Discuss the need, operation and merits of hybrid power generation with combination of Bacitor & fuel cells. (16)

(OR)

b) Discuss the energy storage techniques in hybrid electric vehicles? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES

22PEC12 – Analysis of Power Converters

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. Differentiate half-controlled and fully controlled converters.
2. List the role of free-wheeling diodes in converters.
3. Estimate the step-down converter with 100 V input voltage and R = 12 ohms, if the switching frequency is 1.5 KHz, what should be the ON time to get a output voltage of 80 V?
4. Name two applications for boost converters.
5. List the performance parameters of single-phase inverters.
6. Compare offline UPS and online UPS with their applications.
7. List the types of multilevel inverters.
8. Define space vector modulation technique.
9. Compare current source inverters and voltage source inverters.
10. What is a six-step thyristor inverter?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the working of a single-phase fully controlled bridge converter with an RL load in continuous and discontinuous mode of operations. Drive an expression of output voltage and currents. (16)

(OR)

b) Derive the general expression for the output voltage of a three-phase half-controlled converter with an RLE load and explain its operation. (16)

12. a) The buck –boost regulator has an input voltage V_s = 12 V. The duty cycle is k = 0.25 and The switching frequency is 25 kHz. The inductance L = 150 µH and filter capacitance C = 220 µF. The average load current I_0 = 1.25 A. Calculate (16)

1) Average output voltage
2) Peak to peak output voltage ripple
3) Peak to peak ripple current of inductor
4) Peak current of the transistor
5) Critical values of L and C.

(OR)

b) The input voltage of cuk converter V_s = 12 V.The duty cycle is k = 0.25 and The switching frequency is 25 kHz. The filter inductance L_2 = 150 µH and filter capacitance C_2 = 220 µF.The energy transfer capacitance is C_1 = 200 µF and inductance L_1 = 180 µH. The average load current I_a = 1.25 A. Calculate the following (16)

1) Average output voltage
2) Average input current
3) Peak to peak ripple current of inductor L1 ,ΔI_1
4) Peak to peak ripple voltage of capacitor C1, ΔVC_1
5) Peak to peak ripple current of inductor L_2 ,ΔI_2
6) Peak to peak ripple voltage of capacitor C2, ΔVC_2.

13. a) i) Explain the principle of operation of a single phase half bridge inverter with Resistive load. (8)

ii) The single phase, half - bridge inverter has a resistive load of R = 2.4 Ω and the input voltage V_s = 48 V. Determine (8)

1) RMS output voltage.
2) Output power
3) Average and peak currents of each thyrister.
4) The THD
5) Distortion Factor.

(OR)

b) i) A single-phase full bridge inverter is connected to a DC source of Vs. Resolve the output voltage waveshape into Fourier series. (8)

ii) A single-phase full-bridge inverter, using transistors and diodes, feeding a load of R = 3 Ohms with input DC voltage of 60 V. Calculate: (8)

1) RMS value of (i) output voltage and (ii) fundamental component of output voltage
2) Output power
3) Fundamental frequency output power
4) Average and peak currents of each transistor

14. a) i) Explain the operation of a three-phase voltage source inverter in 180-degree conduction mode with a star-connected load. (10)

ii) Compare 180-degree and 120-degree conduction modes in three-phase inverters. (6)

(OR)

b) i) Discuss the working of diode clamped multilevel inverters with suitable diagrams. (10)

ii) Compare flying capacitor, and cascaded type multilevel inverters in terms of structure and performance. (6)

15. a) Illustrate and describe the waveforms for the different operation modes of a six-step thyristor inverter. (16)

(OR)

b) Explain how different PWM techniques are applied in current source inverters to control output current and voltage. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

23PTEE103 – Electron Devices and Circuits

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the function of a diode in a rectifier circuit?
2. What is the main difference between Zener and regular diodes?
3. Define the term "cutoff region" in a transistor.
4. What is the function of the gate terminal in a JFET?
5. Briefly define voltage gain and input impedance in a small-signal amplifier.
6. Define Common Mode Rejection Ratio (CMRR) in differential amplifiers.
7. Briefly differentiate between single-ended and push-pull amplifier configurations.
8. Explain the role of heat sinks in power amplifiers.
9. Differentiate between positive and negative feedback.
10. Name two types of oscillators commonly used in electronic circuits.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Analyze the relationship between voltage and current in a p-n junction diode. Explain how the diode equation governs the behavior of forward current and reverse current. (16)

(OR)

b) Describe the application of diodes in clipper circuits. Explain the different types of clipper circuits with diagrams. (16)

12. a) Describe the working principle of a common-emitter amplifier circuit. Explain how the gain of the amplifier is determined. (16)

(OR)

b) What is a UJT and how does it work? Explain its VI characteristics and discuss its application in triggering circuits. (16)

13. a) Describe the working principle of a single-stage common-emitter BJT amplifier. Discuss its input and output characteristics, voltage gain, and the effect of bypass and coupling capacitors. Include relevant diagrams and equations. (16)

(OR)

b) Explain the working of a Darlington amplifier. Discuss its voltage and current gain, input and output impedance and typical applications. Provide a detailed circuit diagram and analysis. (16)

14. a) Explain the operation of a push-pull amplifier configuration. Discuss how it minimizes distortion and improves efficiency. Include detailed circuit diagrams and an analysis of its performance. (16)

(OR)

b) Discuss the working principle and characteristics of a Class A amplifier. Include a discussion on its efficiency, linearity and thermal considerations with appropriate diagrams and equations. (16)

15. a) Explain the working principle of a feedback amplifier. Discuss the differences between series-shunt, series-series, shunt-shunt, and shunt-series feedback configurations with appropriate diagrams and examples. (16)

(OR)

b) Analyze the operation of a Wien bridge oscillator. Discuss how it generates a stable sinusoidal output and the role of amplitude stabilization methods. Include circuit diagrams and relevant equations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

23PTEE304 – Measurements and Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the dynamic characteristics of any measurement system.
2. Define limiting errors and instrumental errors.
3. Why controlling torque is absent in Energy Meter?
4. Name the errors that occur in dynamometer type wattmeter.
5. Give the range of measurement of resistances using Kelvin's double bridge and Wheatstone's bridge.
6. What is the purpose of a null detector in bridge circuits?
7. Distinguish dual trace and dual beam CRO.
8. List the advantages of Digital Storage Oscilloscope.
9. Give examples for active and passive transducers.
10. Mention the factors to be considered while selecting a transducer.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe in detail the construction and working of Permanent Magnet Moving Coil instrument and derive the equation for deflection. (16)

(OR)

b) i) Compare Moving Iron and Moving Coil instrument types (8)

ii) Describe in brief the different types of dynamic errors in a measurement system. (8)

12. a) i) Explain the functional blocks of digital frequency meter (8)

ii) Discuss the working principle of single phase induction type energy meter. (8)

(OR)

b) With a neat sketch, describe the construction and working of electrodynamometer type wattmeter and derive its torque equation. (16)

13. a) Explain the working of Anderson's bridge and derive the bridge balance equation. Also point out the merits. (16)

(OR)

b) Explain the working of Schering's bridge and derive the bridge balance equation. List few applications of the Schering's bridge. (16)

14. a) Describe the construction and working of Digital Storage Oscilloscope. Also give the advantages. (16)

(OR)

b) Discuss in detail the construction and working principle of Gall Tinsley Co-ordinate Type Potentiometer. (16)

15. a) i) Describe the piezoelectric transducer and give the formula for coupling coefficient. Also list few applications of piezoelectric transducer. (8)

ii) Discuss the advantages and disadvantages of using smart sensors in modern applications. (8)

(OR)

b) i) Briefly discuss the types of temperature transducers. (8)

ii) With neat diagram, describe the working of Linear Variable Differential Transformer (LVDT). (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2023 Regulations)

MECHANICAL ENGINEERING

23PTEE205 – Basic Electrical and Electronics Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Ohm's Law. Mention the limitations of Ohm's Law.
2. How will you express the Norton's equivalent circuit from Thevenin's equivalent circuit?
3. Define the terms (i) Peak value (ii) Average value.
4. Draw the phasor diagram of voltages derived from a 3 phase source.
5. Compare the difference between squirrel cage and slip ring induction motor.
6. Classify the various types of losses occurs in transformer.
7. Distinguish between CB, CC and CE configuration of BJT.
8. Sketch the circuit diagram for differential amplifier.
9. Categorize the components of LT Switchgear.
10. Mention the types of house wiring tools and components.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) State and verify the Kirchoff's laws. (8)

ii) Distinguish between series and parallel circuits. The Three resistors resistances of 3 Ohm, 4 Ohm, 8 Ohm are connected as shown in Figure.1. Across 24 Volts battery. Formulate (1) Total Effective Resistance in the circuit (2) Current supplied by the battery (3) Current flow through each resistor. (8)

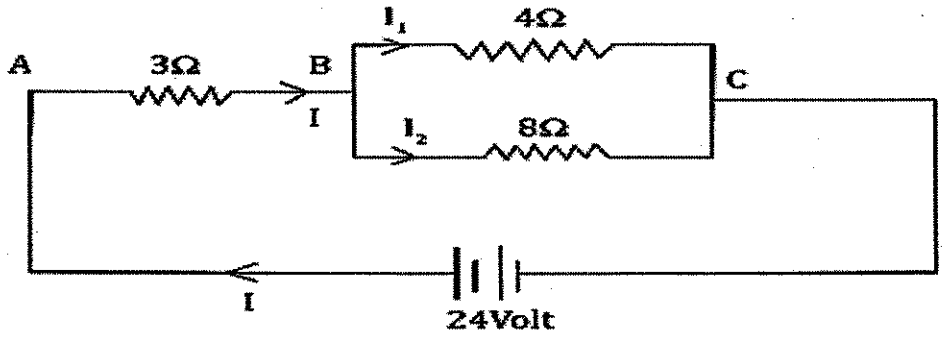


Figure.1

(OR)

b) i) Find the magnitude and direction of current flow through 6 Ohm Resistor by using Superposition Theorem as shown in Figure.2. (8)

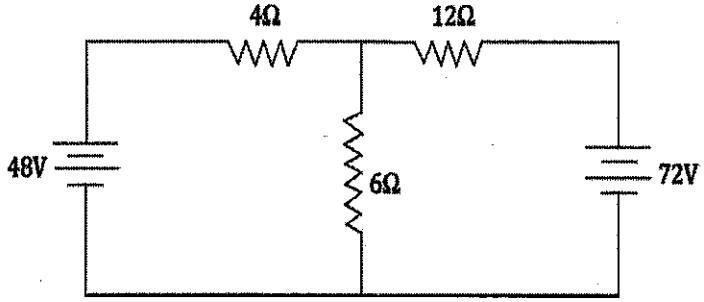


Figure.2

ii) Using Thevenin's theorem, Evaluate the current through R_L = 10 Ohm as shown in Figure.3 and Find power developed by Load.. (8)

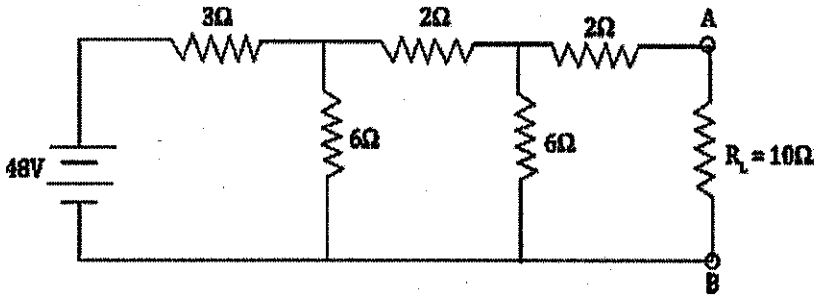


Figure.3

12. a) i) Obtain the mathematical expression for impedance, phase angle, power, power factor, apparent power, real and reactive power for RLC series circuit connected across the single phase sinusoidal AC source and also draw its power triangle diagram. (12)

ii) Define RMS value. Derive the mathematical expression for RMS value. (4)

(OR)

b) i) Discuss in detail about the three phase 3-wire circuits with (i) Star connected balanced loads (ii) Delta balanced Loads. (12)

ii) Determine the line current, power factor and total power when a 3-phase 400 V supply is given to a balanced load of impedance (8 + j6) Ω in each branch is connected in star. (4)

13. a) i) With the neat sketch, explain the construction and working principle of DC motor. (10)

ii) Examine the different methods for speed control of DC Motor in brief. (6)

(OR)

b) i) Illustrate the construction, working principle of a single phase transformer with neat sketch. (10)

ii) Give the classification of single phase motors. Elucidate the construction and working principle of any one type of single phase induction motor in brief. (6)

14. a) Elaborate the construction diagram and working of PN junction diode in forward and reverse bias condition with the help of V-I characteristics. Also compare the difference between the PN junction diode and Zener diode. (16)

(OR)

b) With a suitable circuit diagram, Demonstrate the construction and principle of operation of an inverting and non-inverting amplifier and derive its gain. (16)

15. a) i) Describe the principle of operation for MCB and MCCB with suitable neat sketch. (8)

ii) Define earthing. Categorize the types of earthing. Explain any two types of earthing methods in brief. (8)

(OR)

b) i) Classify the types of batteries. Examine the principle of operation and its characteristics of any one battery with suitable chemical equation. (8)

ii) Illustrate the working principle of switched-mode power supply (SMPS) with neat sketch. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

23PTEE101 – Electric Circuit Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Kirchoff's current law?
2. Define Power factor?
3. Define Superposition theorem.
4. Define Reciprocity theorem?
5. What is called Quality factor and Bandwidth in resonance circuit?
6. Write any four applications of tuned circuits.
7. What is the time constant for RL and RC circuit?
8. Distinguish between the steady state and transient state.
9. List out the advantages of three phase system over single-phase system?
10. A three phase 400 V is given to balanced star connected load of impedance 8 + 6 jΩ. Calculate line current?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Use mesh analysis in the Figure.1 and find a)i_A b) i_B c) i_C? (16)

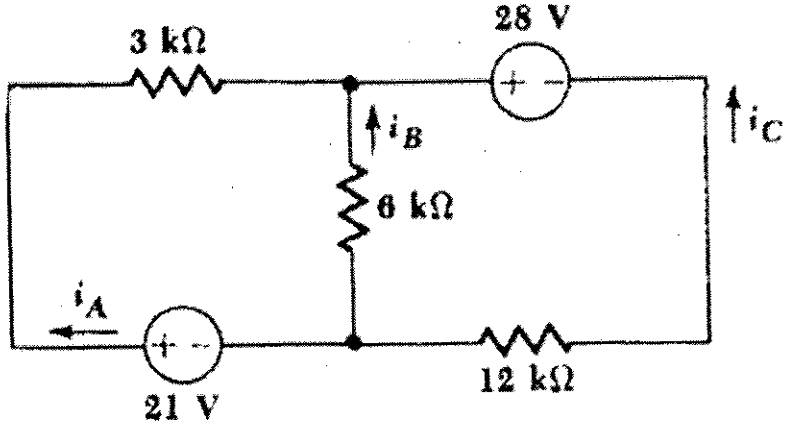


Figure.1

(OR)

b) What must be the resistance R in the circuit of Figure.2? (16)

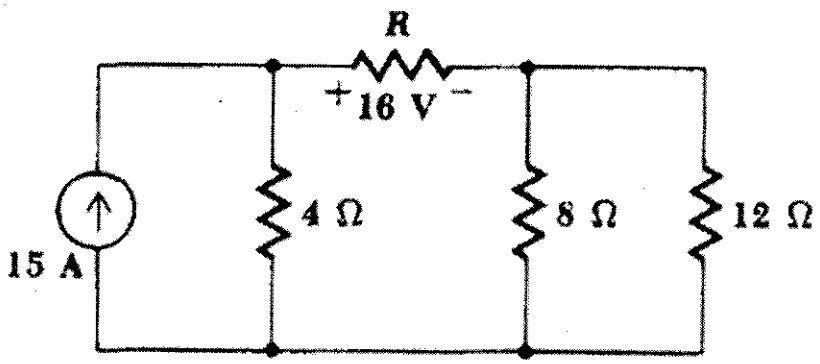


Figure.2

12. a) Use superposition theorem to find the voltage v in the Figure.3? (16)

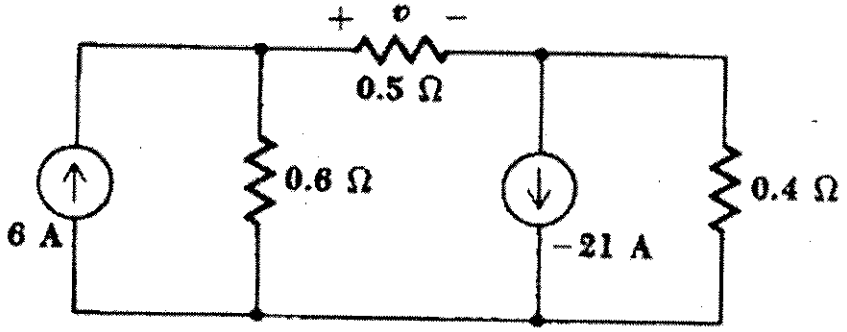


Figure.3

(OR)

b) Find the Thevenin equivalent circuit in the Figure.4 at terminals a-b? (16)

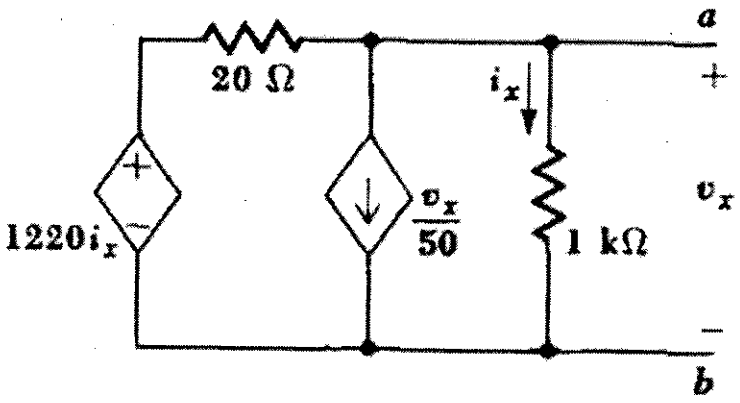


Figure.4

13. a) Derive the Mutual inductance and the coupling coefficient of the transformer with necessary illustration. (16)

(OR)

b) Determine the resonant frequency, bandwidth and quality factor of the coil for the series resonant circuit considering R = 10 Ω, L = 0.1 H and C = 10 μF. Derive the formula used for bandwidth. (16)

14. a) Find i and v as functions of time for t>0 for the circuit shown in the Figure.5. (16)

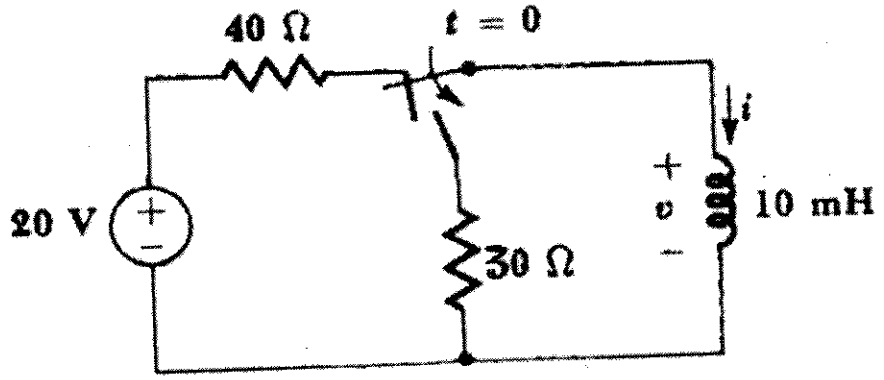


Figure.5

(OR)

b) Derive the equation for transient response of RC and RL circuits for DC input? (16)

15. a) Derive the total power for three phase AC system with 3-wire circuits with star connected balanced loads. (16)

(OR)

b) Explain in detail the phasor diagram of the voltages and currents of a three phase unbalanced circuits. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2023 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

23PTEE202 – Synchronous and Induction Machines

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate salient pole and cylindrical rotor.
2. An alternator on open-circuit generates 360 V at 60 Hz when the field current is 3.6 A. Neglecting saturation, determine the open-circuit E.M.F when the frequency is 40 Hz and the field current is 2.4 A.
3. Mention any two methods of starting a synchronous motor.
4. Give the expression for gross mechanical power developed by synchronous motor.
5. Suggest the need for starter in starting an electric motor.
6. List the applications of three phase induction motor.
7. Define slip of an induction motor.
8. Write the condition for maximum torque developed by three phase induction motor.
9. Why single phase induction motor is not self-starting?
10. List the advantage of capacitor start induction motor over split phase induction motor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain briefly the construction and working of alternator. (10)

ii) Derive the EMF equation of alternator. (6)

(OR)

b) Discuss in detail the EMF method of regulation with OC and SC curves in detail. (16)

12. a) i) Discuss briefly any two starting methods of synchronous motor. (8)

ii) Explain V curve and inverted V-curves of synchronous motor. (8)

(OR)

b) i) Why synchronous motor is not self-starting? Discuss the working principle of synchronous motor. (8)

ii) Mention the causes and effects of hunting. What are the methods of preventing hunting? (8)

13. a) With neat diagram, explain in detail the working of rotor resistance starter and auto-transformer starter. (16)

(OR)

b) Explain in detail the construction and working principle of three phase induction motor. (16)

14. a) Derive the expression for torque and with neat characteristic curve, explain the torque-slip characteristics of induction motor. (16)

(OR)

b) Discuss in detail the no-load and blocked rotor tests conducted on the three phase induction motor. (16)

15. a) i) Explain the constructional details of single phase induction motor. (8)

ii) Discuss briefly the double field revolving theory of single phase induction motor. (8)

(OR)

b) With neat circuit, explain the different methods of starting the single phase induction motor. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18EEM09 – Electric Vehicles and Control

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Classify the EVs based on energy sources.
2. List the drawbacks of parallel hybrid electric drive train.
3. Mention the significant drawback of fuel cell EV.
4. Give an example for a plug-in hybrid electric vehicle.
5. How the effect of torque ripple is minimized in SRM drive?
6. Mention the advantages of field oriented control of induction motor drive.
7. Explain State of Charge and Depth of Discharge of a battery.
8. Draw the graph for the CC and CV charging methods of EV batteries.
9. What is the significance of energy management system in EVs?
10. Name two types of rule-based control strategies in Energy Management Systems.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain different configuration of Electric Vehicle and analyse its performance parameters. (16)

(OR)

b) Draw and explain the power flow in series and parallel hybrid drive train in HEVs. (16)

12. a) Describe the components of PHEV and explain the operating principle along with its control strategies. (16)

(OR)

b) Discuss the fuel cell based EV configuration with its control strategy. Point out the drawbacks of fuel Cell based EV. (16)

13. a) Discuss in detail the vector control theory of induction motor drives used in EVs. (16)

(OR)

b) Explain the operation and control of BLDC motor for Electric Vehicle application. (16)

14. a) Discuss the charging, discharging modes of Li-Ion battery and explain any five important battery parameters in detail. (16)

(OR)

b) Describe the operation of Ultra-Capacitors and analyze its performance in EVs. (16)

15. a) Discuss about the Fuzzy logic and Neural Network based control of Energy Management System in EVs. (16)

(OR)

b) Discuss in detail about the semi-active and fully-active types of hybrid energy storage system based Energy management system in EVs. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2018 Regulations)

CIVIL/COMPUTER SCIENCE AND ENGINEERING

18EE101 – Basic Electrical and Electronics Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. An electric iron is rated 1000 W, 240 V. Find the current drawn and the resistance of the heating element.
2. Calculate the resistances of the delta network, which are equivalent to that of the star network as shown in the following figure.1

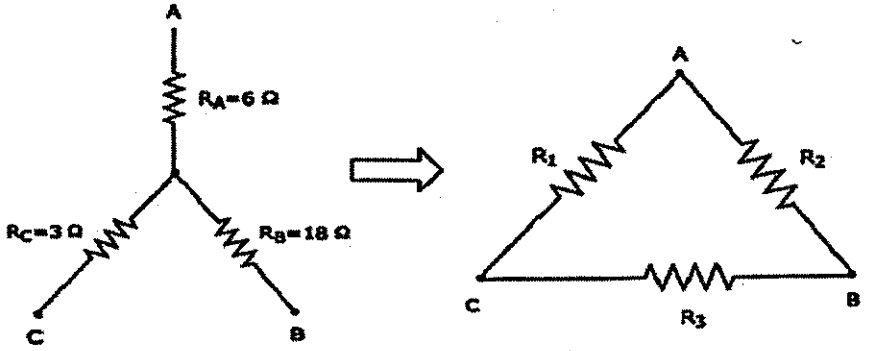


Figure.1.

3. Define the power factor.
4. Write the instantaneous voltage expression for a 230 V and 50 Hz AC supply.
5. State the principle of operation of a transformer.
6. Why single phase induction motor is not self starring?
7. Name the applications of Op Amp.
8. Draw the V – I characteristics of a PN junction diode.
9. Mention the types of electrical wiring for the house.
10. Confer the need of MCB.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Use Thevenin's theorem to find current through 6-ohm resistance in the circuit shown in figure.1. (8)

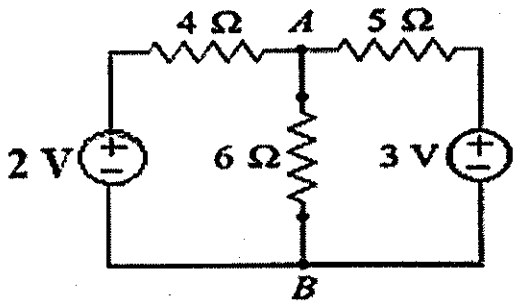


Figure.2.

ii) For the circuit in the figure.3. use the superposition theorem to find V_o. (8)

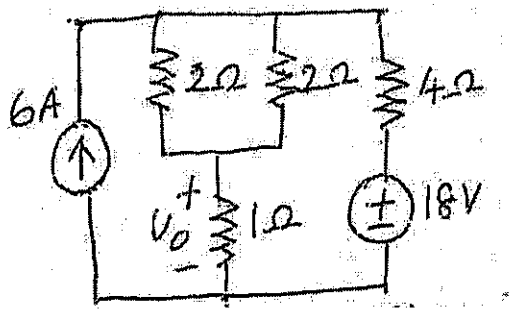


Figure.3.

(OR)

b) i) Draw the Norton equivalent circuit. shown in figure.4 (8)

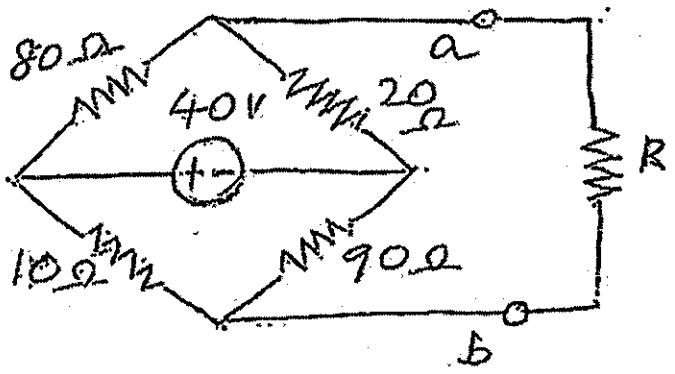


Figure. 4

ii) For the circuit shown in figure.5. find the nodal voltages v_1 and v_2. (8)

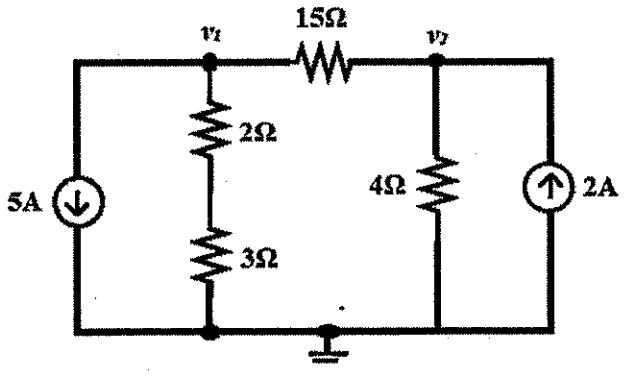


Figure.5.

12. a) i) A circuit draws a current of 10A at a voltage of 200V, and its power factor is 0.8 lagging. Find a) Real Power b) Reactive Power c) Apparent Power d) Draw a power triangle. (8)

ii) Differentiate single-phase and three-phase AC supplies? Discuss the benefits of choosing these supplies with their application. (8)

(OR)

b) i) With the power triangle, explain the real power, reactive power, apparent power and power factor. (8)

ii) Three 100 Ω resistors are connected in star across 415 V, 3-phase supply. Calculate the line and phase currents in each case and the power taken from the source. Shown in Figure.6 (8)

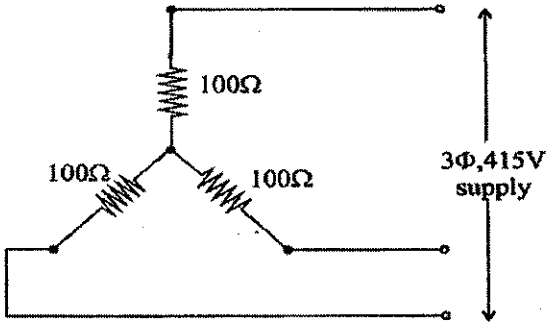


Figure.6.

13. a) i) With a neat sketch, brief in detail the working of the DC motor. (8)

ii) Draw and explain the no-load phasor diagram of a single-phase transformer. (8)

(OR)

b) i) Briefly describe the construction of the single-phase induction motor. (8)

ii) Concisely describe the speed control methods of the DC shunt motor. (8)

14. a) i) Enlighten the construction and operation of BJT in common emitter mode. (8)

ii) Describe the functions of building blocks of an Op-Amp. (8)

(OR)

b) i) What is the Zener diode? Briefly explain its VI characteristics. Mention its applications. (8)

ii) Write brief notes on the application of OPAMP as summing amplifier. (8)

15. a) i) Discuss the types of earthing and its importance. (8)

ii) Illustrate the different types of electrical cables. (8)

(OR)

b) i) Discuss the any two types of batteries, along with their benefits and drawbacks. (8)

ii) Illustrate the function of earth leakage circuit breaker. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18EE203 – Basic Electrical Engineering for Metallurgy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State ohms law and its limitations.
2. The resistance of a heater is 117.56 ohms. Find out the wattage of the heater if it draws 1956 mA from the supply mains.
3. Define real power and reactive power.
4. A coil having a resistance of 6Ω and inductor of 0.03 H is connected across a 100 V, 50 Hz supply. Calculate current drawn by the circuit.
5. Draw the B-H curve of a magnetic material and mention any two important characteristics.
6. What are the advantages and disadvantages of the auto transformer?
7. State Fleming's left hand rule.
8. Why single phase induction machine is not self starting?
9. Differentiate MCB and ELCB.
10. Why earthing is necessary for the electrical installations?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Use Thevenin's theorem to find the current throurgh 5 Ω resistance shown in Figure.1. (16)

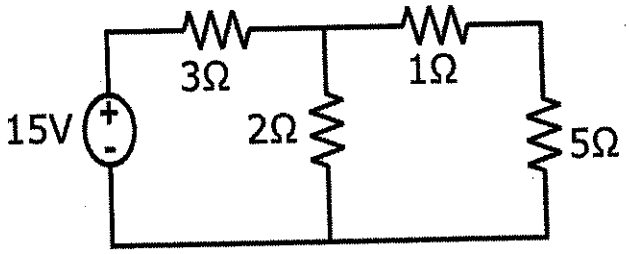


Figure. 1.

(OR)

b) Explain the time domain analysis of first order RL and RC circuit in detail with circuit diagram and wave forms. (16)

12. a) i) Derive the expression for average value, RMS value, form factor and peak factor for sinusoidal wave form. (10)

ii) A coil of resistance 10 Ω and an inductance of 0.1 H are connected in series with a capacitance of 150μF across a 200 V, 50 Hz supply. Calculate i) the inductive reactance ii) the capacitive reactance iii) the net reactance iv) the current v) the power factor of the circuit. (6)

(OR)

b) i) Derive the relation between line and phase voltages and line and phase currents in balanced star and delta connected three phase systems. (10)

ii) Obtain the expression for resonance frequency in series RLC circuit. (6)

13. a) i) Obtain the equivalent circuit of a transformer referring to primary side. (10)

ii) List the different types of losses in transformer and explain the methods to reduce them. (6)

(OR)

b) i) With suitable derivation show that auto transformer saves copper in windings. (10)

ii) A 40 KVA transformer has iron loss of 500 W and full load copper loss of 800 W. If the power factor of the load is 0.8 lagging, calculate i) full load efficiency ii) the load at which maximum efficiency occurs. (6)

14. a) Explain the construction and operating principle of DC machine with neat diagram. (16)

(OR)

b) Elaborate the starting and speed control methods of three phase induction motor with suitable diagrams. (16)

15. a) i) Explain the working of MCCB and ELCB in details with neat diagram. (10)

ii) Explain the different types of earthing arrangements in electrical installation. (6)

(OR)

b) i) Mention the different types of batteries and elaborate any three of them in detail. (10)

ii) Discuss about the method to improve power circuit in electrical installations. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2012 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

12EE504 – Digital Logic Circuits

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the truth table of AND gate.
2. State De Morgan's theorem.
3. What is the difference between a BCD adder and a binary adder?
4. Write the logic expression for the sum output of a half-adder.
5. Compare the difference between multiplecer and demultiplacer.
6. Classify the Various types of code converters in digital systems.
7. Define race around condition.
8. Compare combinational circuit and sequential circuit.
9. List the different techniques used for state assignment.
10. How can the hazards in combinational circuit be removed?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Make a K map for the function (16)

F = AB + AC' + C + AD + ABC + AB'C.

Express F in standard SOP form. Minimize it and realize the minimized expression using NAND gates.

(OR)

b) Reduce the following function using Quine Mc Cluskey method (16)

$f(A, B, C, D, E) = \Sigma m(1, 4, 8, 10, 11, 20, 22, 24)+d(0, 12, 16, 17)$

12. a) Design and implement the full adder and full subtractor circuit. (16)

(OR)

b) Explain the design and working of a 4-bit magnitude comparator. Provide the truth table, logic circuit and boolean expressions. (16)

13. a) i) Design a BCD to Excess-3 code converter. (8)

ii) Implement the given function using multiplexer $F(x, y, z) = \sum(0, 2, 6, 7)$ (8)

(OR)

b) i) Implement full subtractor using demultiplexer. (8)

ii) Implement a full adder circuit with decoder. (8)

14. a) Explain the working of JK flip-flop and illustrate it with its truth table, logic diagram and characteristic equation. (16)

(OR)

b) Design and implement a mod-5 synchronous counter with the aid of state diagram and state table. (16)

15. a) Design an asynchronous sequential circuit that has two inputs X_2 and X_1 and one output Z. When $X_1 = 0$, the output Z is 0. The first change in X_2 that occurs while X_1 is 1 will cause output Z to be 1. The output Z will remain 1 until X_1 returns to 0. (16)

(OR)

b) i) Explain about races and hazards in asynchronous sequential circuit. (8)

ii) Briefly discuss the types of hazards in sequential circuit design with examples. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EEH304 – Design of Electric Vehicle Charging System

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare power level categories of Electric Vehicle (EV) chargers.
2. What are the advantages of DC bus-based architecture for EV charging?
3. State the drawbacks of Vienna rectifier.
4. What is the role of neutral-point clamped converter in Electric Vehicles?
5. What is the significance of control of AC-DC converters in Electric Vehicles?
6. Mention the Indian standards for EV charging.
7. Distinguish between Power density and Energy density of a battery.
8. Name the charging methods for battery used in EV.
9. List the safety precautions for EV charging stations.
10. What are the reference standards for charging cables for EV?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With neat block diagram, explain the integration of on-board chargers into an EV. (10)

ii) Draw and explain briefly the AC bus-coupled charging station architecture for EV. (6)

(OR)

b) i) Sketch and explain the basic architectures of 1) Single-stage on-board charger and 2) Two-stage on-board charger. (10)

ii) What are the challenges and benefits of on-board and off-board chargers for EV? (6)

12. a) i) With neat power circuit diagram, explain the operation of a non-isolated multichannel interleaved buck converter. (10)

ii) Explain briefly the role of grid-connected cascaded H-bridge converter in Electric Vehicles. (6)

(OR)

b) i) Describe briefly the operating principle and analysis of a phase-shifted ZVS full-bridge converter with neat sketch. (10)

ii) Draw and explain briefly the schematic of a battery-integrated modular multilevel converter. (6)

13. a) Describe the voltage oriented control scheme applied to a three-phase bidirectional AC-DC converter with neat diagram. State the drawbacks of the voltage oriented control scheme. (16)

(OR)

b) Explain in detail the implementation of direct power control technique in three-phase AC-DC converter. (16)

14. a) i) Compare the features and applications of Nickel-Cadmium and Nickel-Metal Hydride batteries. (8)

ii) With a neat schematic, explain the concept of Battery Management System (BMS). (8)

(OR)

b) i) With a neat schematic, explain the working principle of Lithium-ion battery. (8)

ii) Describe the construction, working principle, and uses of a flow battery. (8)

15. a) i) Explain the various modes and operating principle of inductive charging. (10)

ii) Explain briefly about EV cable communication protocols. (6)

(OR)

b) i) Describe the key aspects and components of Vehicle-to-Grid (V2G) and Vehicle-to-Home (V2H) technologies. (10)

ii) Write a brief note on 'Grid-tied residential charging system' and 'Grid-tied public charging system'. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE501– Power Generation Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. The maximum demand on a power station is 200 MW. If the annual load factor is 50%, calculate the annual energy generated.
2. What are the three parts of total cost of electrical energy generated?
3. Why thermal power plants are not suitable for supplying fluctuating loads?
4. Mention the major thermal power plants in India with their installed capacities.
5. List the factors influencing the selection of site for a hydro-electric power plant.
6. Differentiate impulse and reaction turbines.
7. Distinguish between atomic number and mass number of an atom.
8. What is the necessity of providing shielding for nuclear power plants?
9. What are the types of air filters used in a diesel engine?
10. State the merits of using liquid metal as working fluid in MHD power generation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What are the points to be considered while making the selection of number and sizes of the generating units in a power plant? (6)

ii) A generating station has the following daily cycle: (10)

Time (Hours)	0 – 6	6 – 10	10 – 14	14 – 20	20 – 24
Load (MW)	20	25	40	50	20

Draw the load curve and load duration curve.

Find (i) Number of units generated per day and

(ii) Load factor

(OR)

b) i) What do you understand by Tariff? Discuss the objectives and the desirable characteristics of tariff. (6)

ii) What do you understand by Tariff? Discuss the objectives and the desirable characteristics of tariff. Define and state the significance of the following terms as applied to power plant engineering: i) Demand factor ii) Diversity factor iii) Plant Capacity factor iv) Utilization factor and v) Reserve capacity. (10)

12. a) i) Draw the general layout of thermal power plant and explain its operation. (12)

ii) State the disadvantages of pulverized fuel firing. (4)

(OR)

b) i) With neat schematic diagram, explain the construction and working of Babcock and Wilcox horizontal water tube boiler. (12)

ii) What are the boiler auxiliaries? (4)

13. a) i) Discuss the operation of hydro-electric power plant suitable for high head with a neat sketch. (10)

ii) With a neat sketch, explain briefly the working of Pelton wheel turbine used in hydroelectric power plants. (6)

(OR)

b) i) Discuss the merits and demerits of hydro-electric power plants. (10)

ii) Give the comparison between Kaplan turbine and Francis turbine. (6)

14. a) i) State the properties of control rods and reactor coolant. (10)

ii) Explain briefly the working of fast breeder reactors. (6)

(OR)

b) i) With neat schematic arrangement, describe the working of Pressurized Water Reactor (PWR). (10)

ii) Discuss briefly the impact of radioactivity and its hazards. (6)

15. a) i) Explain the functions of any four major components of a diesel engine. (8)

ii) Explain the principle of MHD power generation. (8)

(OR)

b) i) What are the requirements of best lubricating oil? (8)

ii) Describe the working of a combined MHD-steam power plant with a helium gas cooled nuclear reactor. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE401 – Signals and Systems

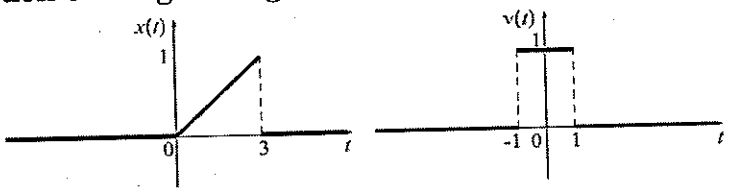
Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. How are the signals are classified?
2. Distinguish between periodic and non-periodic signals.
3. Define convolution integral.
4. Perform convolution of the given signal and obtain y(t) using graphical method.



5. State duality property of Fourier transforms.
6. State the time shifting property of Laplace transforms.
7. Differentiate continuous and discrete time systems.
8. List the properties of Region of convergence.
9. What is Aliasing?
10. State sampling theorem.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Sketch the following signals. (8)

i) $2u(t+2)-2u(t-3)$ ii) $u(n+4)-u(n-2)$

ii) Examine the given system is linear $i(t)=\frac{v(t)}{R}$ (8)

(OR)

b) i) Develop a system with an example that satisfies the condition of additive but not homogeneity. (8)

ii) Apply time invariant property and check whether the following systems are time invariant or not (8)

a) $y[n]-2ny[n-2]+3n^2y[n-2]=x[n]+x[n-2]$

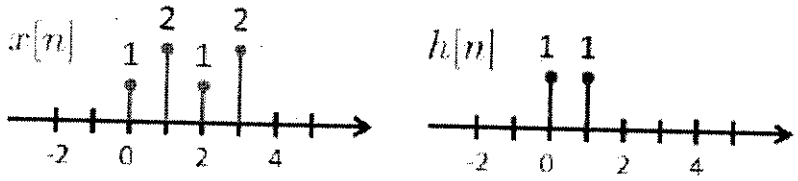
b) $y[n]=x\left[\frac{n}{4}\right]$

12. a) i) Solve the convolution for the given signals $x_1(t)=e^{-at}u(t)$ and $x_2(t)=e^{-bt}u(t)$. (8)

ii) Prove convolution is linear in continuous time system. (8)

(OR)

b) i) Obtain the output response by convolving the given two signals (8)



ii) Check whether the LTI system is causal for the impulse response $h[n]=0$, for all $n<0$ (8)

13. a) i) Determine the inverse Fourier transform of the following functions, using partial fraction expansion technique. (8)

i) $x(j\Omega)=\frac{4(j\Omega)+6}{(j\Omega)^2+6(j\Omega)+8}$

ii) $x(j\Omega)=\frac{3(j\Omega)+1}{(j\Omega+3)^2}$

ii) State the mathematical expression for Fourier transform and its inverse. (8)

(OR)

b) i) Determine the Laplace transform and identify the ROC for the signals in s-plane. (8)

i) $x(t)=e^{at}u(t)$

ii) $x(t)=e^{-t}u(t)+e^{-2t}u(t)$

ii) Compute the inverse Laplace transform of (8)

i) $X(s)=\frac{s+2}{(s+2)(s^2+4s+20)}$ ii) $X(s)=\frac{s+3}{(s+1)(s-2)}$

14. a) i) Find the Z transform of the following input and determine ROC $x[n] = \{2, 1, -1, 2, 3\}$. (8)

ii) Determine the inverse Z-transform of $X(Z) = \frac{Z}{(Z-1)(Z-2)(Z-3)}$, (8)

Using partial fraction method for

i) ROC, $|Z| > 3$ ii) ROC, $3 > |Z| > 2$

(OR)

b) i) Compute the inverse z-transform of $X(z) = \frac{1+2z+3z^2}{z^2+3z+2}$ (8)

ii) Find the Z transform of the following input and determine ROC (8)
$x[n] = \{8, 3, -2, 0, 4, 6\}$

15. a) i) Draw the direct form I realization structure of a 3rd order system. (8)

ii) Realize the transfer function $H(z) = \frac{2z(z+2)}{(z-0.1)(z+0.5)(z+0.4)}$ (8)

using direct form-I structure.

(OR)

b) i) List out the advantage of direct form-II realization when compared to direct form I realization. (8)

ii) Mathematically express the Nth order transfer function as the ratio of two polynomials in S-domain. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EEH306 – Intelligent Control of Electric Vehicles

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Name the different mathematical model for BLDC motor analysis.
2. What are the different types of rotor structure used in the BLDC motors?
3. Why the PID control principle is widely used in industrial drive control?
4. What are the advantages of a digital control system compared to a continuous control system?
5. Write about fuzzy intersection operation.
6. What are the advantages of fuzzy logic control?
7. Compare Spartan 3, Spartan 6 and Spartan 7 FPGA processor.
8. Give the syntax for data types in VHDL.
9. What are the parameters to be considered in designing gate driver circuit?
10. Mention the different circuit protection schemes involved in motor controller design.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss about the design procedure of BLDC motor with a neat flow chart. (16)

(OR)

b) Explain in detail about the different drive modes of BLDC operation with a neat circuit diagram. (16)

12. a) Explain the operation of the anti windup controller in BLDC motor operation. (16)

(OR)

b) Explain the vector control of BLDC motor with neat diagram. (16)

13. a) Explain typical Fuzzy control system with neat block diagram. (16)

(OR)

b) Explain any two types of the defuzzification method. (16)

14. a) Explain the architecture of FPGA with neat block diagram. (16)

(OR)

b) Write VHDL program for PWM generation and Speed detection. (16)

15. a) Illustate the operation of rotor position identification process using hall effect sensor. (16)

(OR)

b) Describe the open loop control of fuzzy logic BLDC motor control using FPGA with neat sketch. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE303 – DC Machines and Transformers

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is an electromechanical energy conversion system?
2. What is the hysteresis loss? How it can be minimized?
3. Name the different parts of a DC Machine.
4. What is the need of commutator in DC Generator?
5. What are the applications of DC Motor?
6. What is back emf? Give its significance.
7. Why the transformer rating is in KVA?
8. What are the advantages of three phase transformers?
9. What is the condition for maximum efficiency in DC machines?
10. Define All day efficiency.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Briefly explain about doubly exited magnetic field system. (8)

ii) Derive the equation for Lorentz force law. (8)

(OR)

b) i) Explain with neat diagram statically induced EMF and dynamically induced EMF with one application of each. (8)

ii) Explain the following Magnetic field properties (8)

(i) Magnetic Field

(ii) Magnetic Flux

(iii) Magnetic Flux Density

(iv) Magnetic Intensity or Force

(v) Absolute and Relative Permeability

12. a) i) Sketch and explain the open-circuit and load characteristics of the shunt and series dc generator. (10)

ii) A 4-pole generator has a wave-wound armature with 722 conductors, and it delivers 100 A on full load. If the brush lead is 8°. Calculate the armature demagnetizing and cross magnetizing ampere turns per pole. (6)

(OR)

b) i) Derive the expression for generated e.m.f in a DC generator. Discuss the factors affecting the generated e.m.f.? (10)

ii) A short-shunt dc compound generator supplies 150 A at 100 V. The resistance of armature, series field and shunt field windings are 0.04, 0.03 and 60 Ω respectively. Find the e.m.f generated. Also find the e.m.f generated, if same machine is connected as a long shunt machine. (6)

13. a) i) Describe the principle of operation of DC motor. (8)

ii) A 4-pole, 250 V DC series motor has a wave-connected armature with 1254 conductors. The flux per pole is 22 mWb when the motor is taking 50 A. Iron and friction losses amount to 1.0 kW. Armature resistance is 0.2 ohm and series field resistance is 1 ohm. Calculate: i) the speed ii) the shaft torque and iii) the efficiency at this load. (8)

(OR)

b) i) What is the necessity of a starter for DC Motor? With a neat diagram explain the working of three-point starter. (8)

ii) Derive the torque equation of DC Motor. (8)

14. a) i) Explain in detail how eddy current and hysteresis losses of a transformer can be minimized. (8)

ii) From the fundamentals obtain the approximate equivalent circuit of a single phase transformer. (8)

(OR)

b) i) With phasor diagram, Explain the working of a single-phase transformer under lagging p.f. load and leading p.f. load. (8)

ii) A three phase step down transformer is connected to 6.6 kV supply mains and takes 80 A. Calculate its secondary line voltage and line current for the following connections if the ratio of turns per phase is 16. (i) Y-Y (ii) Y-Δ (iii) Δ-Δ. (8)

15. a) With neat diagram, explain the procedure for conducting open circuit short circuit test and sumpner's tests on transformer to predetermine the efficiency of the transformer without directly loading the transformer. (16)

(OR)

b) Explain with diagram how Hopkinson's test and Swinburne's test is performed on DC machines. What are the advantages and disadvantages of this test? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES

22PEC21 – Modeling and Analysis of Electrical Machines

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the types DC machines based on Field Excitations.
2. What is the purpose of a Commutator in DC machines?
3. State the basic requirements in dynamic modeling of an induction machine.
4. Distinguish between Clarke and Park transformations.
5. State the significance of Slip power recovery scheme.
6. Draw the equivalent circuit of a three phase induction machine.
7. What is space vector modulation?
8. Compare DVC and indirect DVC schemes.
9. Differentiate between Surface PMSM and Interior PMSM.
10. Compare the features of PMSM and BLDC.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Develop with equivalent circuit, the electromechanical modelling of a DC motor. (10)

ii) How does the DC motor exhibit independent control of speed and torque? (6)

(OR)

b) i) Develop the expression for electromagnetic torque of a DC motor. (10)

ii) Write short notes on armature mmf and interpoles. (6)

12. a) i) Develop the steady state performance equation of a three phase induction motor. (8)

ii) Discuss with necessary equations and phasor diagram, the real time model of a two phase induction machine. (8)

(OR)

b) Demonstrate the different types of reference frames model of three phase induction machine. (16)

13. a) i) Explain with neat diagram, the principle of operation of slip power recovery scheme. (6)

ii) Demonstrate with neat diagram, the principle of operation of Static Scherbius drive. (10)

(OR)

b) i) Explain with neat block diagram, the concept and implementation of a constant Volts/Hz control. (10)

ii) Write short notes on generation of PWM voltage. (6)

14. a) Elaborate with neat diagram, the operation of DVC in stator reference frames with space vector modulation. (16)

(OR)

b) Demonstrate with block diagram, the implementation of indirect vector control scheme with necessary equations. (16)

15. a) i) With constructional features, explain the operating principle a Surface Permanent magnet synchronous machine. (8)

ii) Illustrate with neat diagram, the operation of a Interior Permanent magnet synchronous machine. (8)

(OR)

b) With constructional features, explain the operating principle and dynamic modeling of a BLDC motor. Analyze it performance over PMSM. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22EE203 – Basics of Electrical Engineering for Metallurgy

Time : 3 Hours

Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State kirchhoff's current and voltage law.
2. State Norton's Theorem.
3. Define form factor.
4. An alternating current of frequency 50 Hz has a maximum value of 120 A. write down the equation for its instantaneous value. Find the time taken to reach 96 A for the first time.
5. Differentiate ideal and practical transformer.
6. What are the advantages of Auto transformer?
7. State the Fleming's Right Hand rule for motor operation.
8. Why single phase induction motor is inherently self starting?
9. What is meant by primary batteries and secondary batteries?
10. What is the use of ELCB?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Compute the current through 23 Ω resistor of the figure.1 blow using superposition theorem. (16)

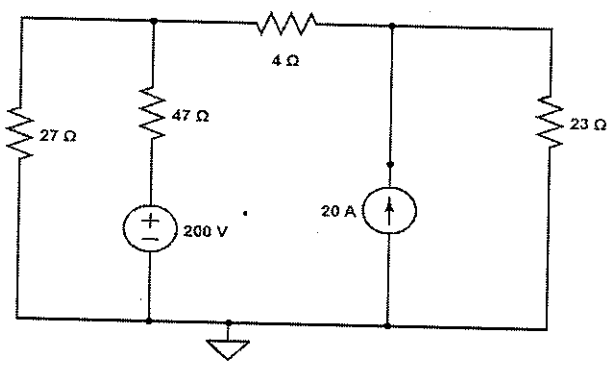


Figure.1.

(OR)

b) Analyze the time domain response of a first order series RL circuit (16)

and first order series RC circuit with derivations.

12. a) i) Analyze the series RLC circuit operation for sinusoidal voltage source and obtain the equation of real power and reactive power. (10)

ii) A series circuit has R = 10 Ω, L = 50 mH and C = 100 μF and is supplied with 200 V, 50 Hz, find (6)

a) impedance

b) current

c) power

d) power factor

e) voltage drop across each element.

(OR)

b) i) Discuss about voltage and current relations in Star and delta connections with neat vector diagrams for the three phase balanced circuit. (10)

ii) Derive the equation for resonance frequency for a series RLC circuit. (6)

13. a) i) Explain the construction and working principle of single phase transformer with neat diagram. (10)

ii) Derive the EMF equation for a single phase transformer with suitable notations. (6)

(OR)

b) i) Explain the operation of a transformer on load for different types of loads along with its vector diagram. (10)

ii) Discuss about the various types of transformer losses. (6)

14. a) Explain the construction and working principle of DC motor with neat diagram and describe about its speed control methods. (16)

(OR)

b) Explain the construction and working principle of three phase induction machine with neat diagram and describe about its speed control methods. (16)

15. a) Explain the significance of earthing in Electrical system and discuss about the various types of earthing systems used. (16)

(OR)

b) Explain the operation of On line and Off line UPS system with neat block diagram. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EE201 – Principles of Electrical Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State ohm's law and its limitations.
2. State Superposition Theorem.
3. Draw the power triangle for series RC circuit. Also Derive the expression for power factor from impedance triangle.
4. Define R.M.S value for alternating current.
5. Differentiate ideal and practical transformer.
6. What are the advantages of Auto transformer?
7. State the Fleming's Right Hand rule for motor operation.
8. Why single phase induction motor is not inherently self starting?
9. What are the differences between primary batteries and secondary batteries?
10. What is the use of ELCB?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Compute the current through 23 Ω resistor of the figure.1 blow using superposition theorem. (16)

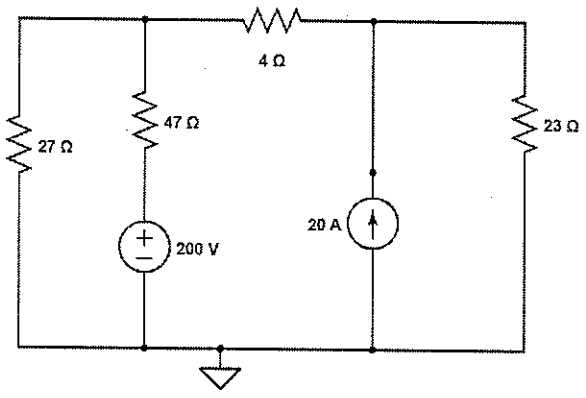


Figure.1.

(OR)

b) Analyze the time domain response of a first order series RL circuit and first order series RC circuit with derivations. (16)

12. a) i) Examine the functioning of a series RLC circuit under sinusoidal voltage input and derive expressions for the real power and reactive power. (10)

ii) A series circuit has R = 10 Ω, L = 50 mH and C = 100 μF and is supplied with 200 V, 50 Hz, find (6)

a) impedance

b) current

c) power

d) power factor

e) voltage drop across each element.

(OR)

b) i) Discuss about voltage and current relations in Star and delta connections with neat vector diagrams for the three phase balanced circuit. (10)

ii) Derive the equation for resonance frequency for a series RLC circuit. (6)

13. a) i) Explain the construction and working principle of single phase transformer with neat diagram. (10)

ii) Derive the EMF equation for a single phase transformer with suitable notations. (6)

(OR)

b) i) Explain the operation of a transformer with load for different types of loads along with its vector diagram. (10)

ii) Discuss about the various types of transformer losses. (6)

14. a) Explain the construction and working principle of DC motor with neat diagram and describe about its speed control methods. (16)

(OR)

b) Explain the construction and working principle of three phase induction machine with neat diagram and describe about its speed control methods. (16)

15. a) Discuss the importance of earthing in electrical systems and explore the different types of earthing systems employed. (16)

(OR)

b) Explain the operation of On line and Off line UPS system with neat block diagram. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE503 - Total Quality Management

Time : 3 Hours

Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Why is quality required in products and services?
2. Classify the barriers to TQM implementation.
3. Define Kaizen.
4. Justify the role of 5S in quality management.
5. List any four traditional tools of quality.
6. What is the need of control chart?
7. What are the six steps in the benchmarking process?
8. Develop the Taguchi loss function curve.
9. What are the benefits of ISO registration?
10. Identify the significance of quality auditing?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What are the dimensions of service quality? Give examples of any two services you have availed recently and analyze them based on their quality dimensions. (16)

(OR)

b) What are Deming's deadly diseases? How do they relate to his 14 points for management? (16)

12. a) Briefly discuss about the following i) Customer satisfaction and ii) Customer perception of quality. (16)

(OR)

b) Write short notes on the following: i) Supplier partnership, ii) Partnering, iii) Supplier selection, and Supplier rating. (16)

13. a) Explain in detail the six sigma concepts of process capability. Also bring out the methodologies adopted in six sigma practices. (16)

(OR)

b) How would you show your understanding about the following: i) Measure of central tendency and dispersion, ii) Population and sample, iii) Normal curve and iii) Process capability. (16)

14. a) Identify the integration of quality function deployment (QFD) with other activities. Also explain the prerequisites for QFD. (16)

(OR)

b) What is the objective of failure mode and effective analysis (FMEA). Describe about the various components and stages in FMEA. (16)

15. a) Analyze the elements, implementation, and documentation of ISO 9000 series of standard. (16)

(OR)

b) Elaborate the concept, requirements, and benefits of ISO 14000. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE201 – Electromagnetic Theory

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State divergence theorem.
2. What is the divergence of curl of a vector?
3. Give the relationship between potential gradient and electric field.
4. Write the use of Poisson's and Laplace equation.
5. What is field due to toroid and solenoid?
6. What is the inductance per unit length of a long solenoid of N turns and having a length L meters? Assume that its carries a current of I amps.
7. Determine the force per unit length between two long parallel wires separated by 4 cm in air and carrying currents of 20 A in the same direction.
8. State Faraday's law of electromagnetic induction.
9. Compute the reflection and transmission coefficients of an electric field wave travelling in air and incident normally on a boundary between air and a dielectric having permittivity of 5.
10. State pointing theorem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) State and prove Divergence theorem. (8)

ii) For a vector field A, show explicitly that $\Delta.\Delta \times A=0$: that is the divergence of the curl of any vector field is zero. (8)

(OR)

b) i) What is the different co-ordinate systems used to represent field vectors? Discuss about them in brief. (8)

ii) Show that the vector H = (y2 - z2 + 3yz - 2x) a_x + (3xz + 2xy) a_y + (3xy - 2xz + 2z) a_z is both irrotational and solenoidal. (8)

12. a) i) Compare and explain conduction current and displacement current. (8)

ii) A circular of radius 'a' meter is charged uniformly with a charge density ρs c/m^2. Find the electric field at a point 'h' meter from the disc along its axis. (8)

(OR)

b) i) A circular disc of 8 cm radius is charged uniformly with a total charge of 10^{-6} C. Find the electric intensity at a point 20 cm away from the disc along the axis. (8)

ii) Derive Poisson's and Laplace equations. (8)

13. a) i) Obtain an expression for the magnetic flux density and field intensity due to finite long current carrying conductor. (8)

ii) Give a brief note on the magnetic materials. (8)

(OR)

b) i) Derive and expression for self-inductance of co-axial cable of inner radius a and outer radius b. (8)

ii) A circular loop located on x2 + y2 = 9, z = 0 carries a direct current of 10 A along aθ. Determine H at (0,0, 4) and (0,0,-4) (8)

14. a) i) State and explain Faraday's law. (8)

ii) Compare the field theory and circuit theory. (8)

(OR)

b) i) Derive the Maxwell's equation for free space in integral and point forms using Faraday's law and explain. (8)

ii) Derive and explain the Maxwell's equations in point form and integral form using Ampere's circuital law. (8)

15. a) i) Obtain the electromagnetic wave equation for free space in terms of electric field. (8)

ii) Derive an expression for pointing vector. (8)

(OR)

b) i) Derive the expressions for input impedance and standing wave ratio of transmission line. (8)

ii) Find the skin depth at a frequency of 1.5 MHz in aluminium σ = 36.2 ms/m and μr = 1. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE303 – Digital Logic Circuits

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State the associative property of Boolean algebra.
2. List the important characteristics of CMOS family.
3. What is the difference between ripple adder and carry look a head adder?
4. Draw the circuit of Half subtractor.
5. Give one application each for Multiplexer and Decoder.
6. Show the truth table of 2:1 MUX.
7. Give the excitation table for T Flip Flop.
8. List the types of shift registers.
9. Define race conditions in asynchronous sequential circuit?
10. Mention the problems occur in asynchronous circuits.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Minimize the function F (A,B,C,D) = Σ (0,1,2,5,7,8,10,12,14) using tabulation method. Verify it using K map. (16)

(OR)

b) Explain NOR and OR gate construction using ECL. Also point out the characteristics of ECL family. (16)

12. a) i) Interpret a full adder circuit using logic gates. (12)

ii) Show that full added cange implemented using two half adders. (4)

(OR)

b) i) Design a 2-bit magnitude comparator using gates. (10)

ii) Show the following operation using BCD and addition (205+569). (6)

13. a) i) Explain briefly about parity codes. Design a paring generator circuit. (8)

ii) Encode the binary word 1011 into seven-bit even parity Hamming code. (8)

(OR)

b) i) What is Encoder? Design an octal to binary Encoder. (8)

ii) Briefly explain the differences between PAL and PLA, with necessary circuit. (8)

14. a) i) Convert the SR-Flip Flop to JK-Flip Flop. (8)

ii) With a neat diagram, explain the operation of a 3-bit ring counter. (8)

(OR)

b) Design a synchronous MOD-5 up counter. Implement it using JK Flip-Flop. (16)

15. a) i) Summarize the advantages and disadvantages of asynchronous sequential circuits. (10)

ii) Explain the purpose of primitive flow table. (6)

(OR)

b) i) Illustrate the concept of critical race. Why should it be avoided? (10)

ii) What is hazard? Explain hazards in digital circuits. (6)

S & H

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING AND METALLURGICAL ENGINEERING

18PH101 – Physics - Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define average velocity and instantaneous velocity of a particle in rectilinear motion.
2. The motion of a particle is defined by the relation $x = t^3 - 6t^2 - 36t - 40$ where x and t are expressed in mm and seconds respectively. Calculate the time at which the velocity is zero.
3. Write the limiting value of static and kinetic friction based on empirical rules.
4. Distinguish between inertial frame of reference and non-inertial frame of reference.
5. Examine the role of external forces in altering the linear momentum of a particle.
6. Identify the relationship between the potential energy function and the force field in different physical systems using the gradient.
7. Define radius of gyration.
8. State the parallel axis theorem of moment of inertia.
9. Define simple harmonic motion.
10. Analyze the conditions under which resonance occurs in forced oscillations.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the equations of motion for a particle in uniform rectilinear motion and for a particle in uniformly accelerated rectilinear motion. (16)

(OR)

b) Analyze the position, velocity, and acceleration of a particle at different points during curvilinear motion. (16)

12. a) State Newton's three laws of motion and derive the equation of motion for a particle moving in polar coordinates. (16)

(OR)

b) Consider the pulley itself is accelerating upward with an acceleration a_p. Find the tension in the string and the acceleration of the masses as seen by an outside observer. (16)

13. a) Apply Kepler's First, Second, and Third Laws to describe the motion of a planet around the Sun and explain how each law contributes to our understanding of planetary motion. (16)

(OR)

b) Derive the expression for the trajectory of a particle under the influence of a central force and apply this to the analysis of space mechanisms. (16)

14. a) Derive the expression for the moment of inertia of a uniform solid cylinder and a hollow cylinder about their respective axes of symmetry. (16)

(OR)

b) Identify Coriolis acceleration and analyze the plane motion of a particle in relation to a rotating frame. (16)

15. a) Explain the concept of simple harmonic motion using the example of a simple pendulum. Derive the time period for small oscillations. (16)

(OR)

b) Derive the equation of motion for a damped harmonic oscillator and analyze its behavior under different damping conditions. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2009 Regulations)

COMPUTER SCIENCE AND ENGINEERING

09MA301 – Mathematics - III

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Form a partial differential equation by eliminating the arbitrary constants 'a' and 'b' from $z = ax^2 + by^2$.
2. Solve $(D^2 - 7DD' + 6D'^2)z = 0$.
3. Write down the Dirichlet condition for Fourier series.
4. Find the R.M.S values of $f(x) = x^2$ in $-1 < x < 1$.
5. Classify the PDE $u_{xx} + u_{xy} + u_{yy} = 0$.
6. Write down the three possible solutions of Laplace equation in two dimensions.
7. State Fourier integral Theorem.
8. If $F(s) = F[f(x)]$, then find $F[xf(x)]$.
9. Find $Z\left[\frac{1}{n!}\right]$.
10. State initial value theorem on Z-transform.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the general solution of $(3z - 4y)p + (4x - 2z)q = 2y - 3x$. (8)

ii) Solve $(D^2 + 3DD' - 4D'^2)z = \cos(x + 2y) + e^{2x+y}$. (8)

(OR)

b) i) Find the complete integral of $p + q = x + y$. (8)

ii) Solve $z = px + qy + p^2q^2$. (8)

12. a) i) Find the Fourier series of $f(x) = x^2 + x$ in the interval $(-\pi, \pi)$. (8)

ii) Find the half range sine series of $f(x) = 4x - x^2$ in the interval $0 < x < 4$. (8)

(OR)

b) i) Find the Fourier series expansion of (8)

$$f(x) = \begin{cases} x & \text{for } 0 \le x \le \pi \\ 2\pi - x & \text{for } \pi \le x \le 2\pi \end{cases}$$

ii) Compute the first two harmonics of the Fourier series of $f(x)$ from the table given. (8)

x	0	$\pi/3$	$2\pi/3$	π	$4\pi/3$	$5\pi/3$	2π
$f(x)$	1	1.4	1.9	1.7	1.5	1.2	1

13. a) A string is stretched and fastened to two points that are distinct string l apart. Motion is started by displacing the string into the form $y = k(lx - x^2)$ from which it is released at time $t = 0$. Find the displacement of any point on the string at a distance of x from one end at time t. (16)

(OR)

b) A bar 10 cm long with insulated sides has its ends A and B maintained at temperature $50°C$ and $100°C$ respectively until steady state conditions prevail. The temperature at A is suddenly raised to $90°C$ and at the same time lowered to $60°C$ at B. Find the temperature distributed in the bar at time t. (16)

14. a) Find the Fourier Transform of the function (16)

$$f(x) = \begin{cases} 1 - |x|, & if\ |x| \le 1 \\ 0, & if\ |x| > 1 \end{cases}$$

. Hence deduce that

(i) $\int_0^\infty \left(\frac{\sin t}{t}\right)^2 = \frac{\pi}{2}$ (ii) $\int_0^\infty \left(\frac{\sin t}{t}\right)^4 = \frac{\pi}{3}$.

(OR)

b) Find the Fourier cosine transform of $e^{-a^2x^2}$ and hence find the Fourier cosine transform of $e^{-x^2/2}$. (16)

15. a) i) Find $Z\left[\frac{1}{(n+1)(n+2)}\right]$. (8)

ii) Using convolution theorem evaluate $Z^{-1}\left[\frac{8z^2}{(2z-1)(4z+1)}\right]$. (8)

(OR)

b) i) Find (1) $Z[2^n \cos n\theta]$ (2) $Z^{-1}\left[\frac{1}{z-5}\right]$. (8)

ii) Using Z transform, solve $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ given that $y_0 = y_1 = 0$. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CY201 – Environmental Science and Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Examine the importances of water resources.
2. Mention any two types of mining methods followed in India.
3. Explain biotic component of ecosystem.
4. Compare different types of ecological succession.
5. What is meant BOD and COD?
6. Examine the source of particulate gas pollutant.
7. Define ozone layer depletion.
8. How does green house effect causes global warming?
9. Explain urban problems related to energy.
10. List various methods to reduce AIDS.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Recall the importances of food resources in context to the modern civilization.	(8)
		ii)	Summarize the various steps on hydrological cycle.	(8)
			(OR)	
	b)	i)	Interpret effects of extracting mineral on the environment.	(8)
		ii)	Discuss how pesticides and fertilizers affect the environment and remedial action that can be taken to reduce the effects.	(8)
12.	a)	i)	Critically examine biotic and abiotic component in desert ecosystem.	(8)
		ii)	Explain in details food web and food chain.	(8)
			(OR)	
	b)	i)	Elaborate on endangered and endemic species present in the hot spot of biodiversity in India.	(8)
		ii)	Critically examine in-situ and ex-situ methods of preserving biodiversity.	(8)

13. a) i) Illustrate the sources and effect of SO_x, NO_x, and H_2S air pollutant. (8)

ii) Distinguish between the treatment of industrial and domestic waste water. (8)

(OR)

b) Compare BOD and COD. Explain the experimental method of determination of BOD. (16)

14. a) i) Recall the term acid rain and its causes, effects on the environment. (8)

ii) Interpret how photochemical smog is formed and remedial measure to reduce it? (8)

(OR)

b) i) Describe the destructive method involved in solid waste management. (8)

ii) Write a short notes on disaster management of earth quake and flood. (8)

15. a) i) Identify the importance of rain water harvesting system. (8)

ii) Outline the reason for population explosion and how the population can be controlled? (8)

(OR)

b) i) Evaluate family welfare and family planning program in India. (8)

ii) Analyze the important components in national population policy (NPP) 2000. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

CIVIL/MECHANICAL ENGINEERING

22PTMA301 – Numerical Methods

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the Newton-Raphson formula to find $\sqrt[3]{N}$, Where N is Positive integer.
2. Solve the following system by Gauss- Jordan method: $x + y = 3, 7x - 3y = 4$.
3. Find the second-degree polynomial through the points $(0,0), (1,1), (2,20)$ using Lagrange's formula.
4. State Newton's backward formula for interpolation.
5. Write the formula for $\frac{dy}{dx}$ *and* $\frac{d^2y}{dx^2}$ at $x = x_0$.
6. Find the area bounded by the curve $y = x^3$ and the X- axis from $x = 0$ *to* $x = 2$ with $h = 0.5$ using Trapezoidal rule.
7. Determine the value of y at $x = 0.1$ by Euler's method $y' = -y^2$ and $y(0) = 1$.
8. State the disadvantage of Taylor series method.
9. Write down the Crank-Nicolson formula to solve $u_t = u_{xx}$.
10. Write the standard five-point formula to solve Laplace equation $u_{xx} + u_{yy} = 0$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the positive root of $3x = \sqrt{1 + \sin x}$ corrected to three decimal places by iterative method. (8)

ii) Find the real positive root of $3x - cos\, x - 1 = 0$ by Newton- Raphson method correct to six decimal places. (8)

(OR)

b) i) Solve the system of equations by Gauss- Seidel method (correct to 3 decimal places): $8x - 3y + 2z = 20, 4x + 11y - z = 33, 6x + 3y + 12z = 35$. (8)

ii) Solve the equations by Gaussian Elimination method: $10x + y + z = 12, 2x + 10y + z = 13, 2x + 2y + 10z = 14$. (8)

12. a) i) Using Newton's divided difference formula find the missing value from the table: (8)

x:	1	2	4	5	6
y:	14	15	5	–	9

ii) From the given data below, find the number of students whose weight lies between 60 and 70: (8)

Weight in lbs:	0 – 40	40 – 60	60 – 80	80 – 100	100 – 120
y:	250	120	100	70	50

(OR)

b) i) Using Lagrange interpolation formula find $f(4)$ given that (8)
$f(0) = 2, f(1) = 3, f(2) = 12, f(15) = 3587$

ii) Using Newton's forward interpolation formula, find $f(2)$ for the following data. (8)

x:	0	5	10	15
y:	14	379	1444	3584

13. a) i) The following data gives the velocity of a particle for 20 seconds at interval of 5 seconds. Find the initial acceleration using the entire data (8)

Time	0	5	10	15	20
Velocity	0	3	14	69	228

ii) Calculate the value of the integral $\int_{2.5}^{4} ln\,(x)\,dx$ using trapezoidal rule with 5 subintervals (8)

(OR)

b) i) Compute the value of $\int_1^2 \frac{dx}{x}$ using Simpson's rule and Trapezoidal rule by taking $h = 0.25$. (8)

ii) Apply Gaussian three-point formula to evaluate $\int_{-1}^{1} \frac{dx}{1+x^2}$. (8)

14. a) i) Using Taylor series method find $y(0.2)\ for \frac{dy}{dx} = y^2 + x^2$ with $y(0) = 1$. (8)

ii) Using modified Euler's method, compute $y(0.1)$ with $h = 0.1$ from $y' = y - \frac{2x}{y}, y(0) = 1$. (8)

(OR)

b) i) Using R.K. method of fourth order find $y(0.1)$ for the initial value problem $\frac{dy}{dx} = x + y^2$, $y(0) = 1$. (8)

ii) Using Milne's method find $y(2)$ if $y(x)$is the solution of $\frac{dy}{dx} = \frac{1}{2}(x + y)$ given $(0) = 2, y(0.5) = 2.636, y(1) = 3.595$ *and* $y(1.5) = 4.968$. (8)

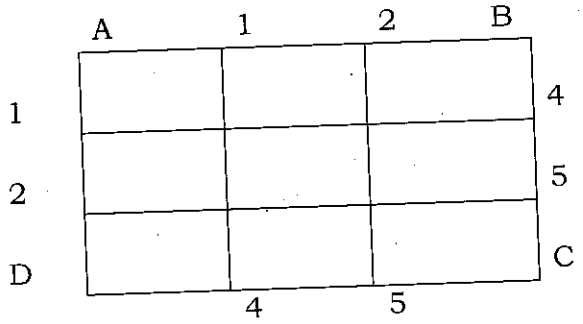
15. a) i) Using Bender- Schmidt's method solve $\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial u}{\partial t} = 0$ given $u(0,t) = 0, u(4,t) = 0, u(x,0) = x(4-x)$. Assume $h = 1$. Find the values of u up to $t = 5$. (8)

ii) Approximate the solution to the wave equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}, 0 < x < 1, t > 0$ with $u(0,t) = u(1,t) = 0, t > 0$ and $u(x,0) = \sin 2\pi x, 0 \le x \le 1$ and $\frac{\partial u}{\partial t}(x,0) = 0, 0 \le x \le 1$ taking $\Delta x = 0.25$ *and* $\Delta t = 0.25$ for 3-time steps. (8)

(OR)

b) i) Using Crank-Nicholson's scheme, solve $u_{xx} = 16u_t, \ 0 < x < 1, t > 0$ given $u(x,0) = 0, u(0,t) = 0, u(1,t) = 100t$. Compute u for one step in t direction taking $h = 0.25$. (8)

ii) Solve $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown in the figure below. (8)



Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING/MECHANICAL ENGINEERING

23PTCY101 – Environmental Science and Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What do you mean by deforestation?
2. Mention the impacts of soil erosion.
3. Recall ecological succession.
4. Examine the term biodiversity hot-spots.
5. Define biological oxygen demand.
6. Give any two methods of noise pollution control.
7. List out the adverse effect of global warming?
8. State the term eutrophication.
9. Inspect the term environmental ethics.
10. Write the expansion for HIV and AIDS.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Construct and discuss briefly about hydrological cycle. (8)

ii) Interpret the adverse environment impacts of modern agriculture. (8)

(OR)

b) i) Explain the environmental damage caused by mining activities? (8)

ii) Illustrate various types of land degradation with causes and solution. (8)

12. a) i) Elaborate the biotic and abiotic components of the ecosystem. (8)

ii) Briefly explain the energy flow through ecosystem. (8)

(OR)

b) i) Write short note on the factor that give threats to biodiversity. (8)

ii) Narrate In-Situ and Ex-situ conservation of bio-diversity. (8)

13. a) i) What is particulate matter? How it is controlled? (8)

ii) Describe the control measures of air pollution. (8)

(OR)

b) i) Analyze the control measures of water pollution. (8)

ii) Outline the effects of noise pollution. (8)

14. a) Examine about greenhouse effect and global warming. (16)

(OR)

b) Evaluate the steps involved in solid waste processing and solid waste management. (16)

15. a) i) Paraphase sustainable development and explain its concepts. (8)

ii) Recall rain water harvesting. Explain its needs and significance. (8)

(OR)

b) i) Discuss in detail about wasteland reclamation. (8)

ii) Infer the causes of population explosion. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2023 Regulations)

COMMON TO ALL BRANCHES

23PTMA201 – Mathematics-II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the dirichlet's conditions for the existence of the Fourier expansion of $f(x)$, in the interval $(0,2\pi)$.
2. Write a_o, a_n in the expansion of $x + x^3$ as a Fourier series in $(-\Lambda, \Pi)$.
3. Find the nature of the partial differential equation $4U_{xx} + 4U_{xy} + U_{yy} + 2U_x - U_y = 0$.
4. State One dimensional Wave equation.
5. Find $L[e^{-at}cosbt]$
6. Give the property of First shifting theorem.
7. Write Fourier Transform pair.
8. Find the Fourier sine transform of e^{-ax} ,a>0
9. Define Unit step function.
10. Find $Z\left[sin^2\left(\frac{n\pi}{4}\right)\right]$

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) If $f(x) = \frac{1}{2}(\pi - x)$, find the Fourier series of period 2π in the interval $(0,2\pi)$. Hence deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots = \frac{\pi}{4}$ (16)

(OR)

b) i) Find the Half Range Sine series for $f(x) = x(\pi - x)$ in $(0,\pi)$. Deduce that $\frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \cdots = \frac{\pi^3}{32}$ (8)

ii) Find the Fourier series x^2 in $(-\pi,\pi)$ Use Parsevals identity to prove $\frac{\pi^4}{90} = 1 + \frac{1}{2^4} + \frac{1}{3^4} + \cdots$ (8)

12. a) A string is stretched and fastened to two points $x = 0$ and $x = l$ apart. Motion is started by displacing the string into the form $y = k(lx - x^2)$ from which it is released at time $t = 0$. Find the displacement of any point on the string at a distance of x from one end at time t. (16)

(OR)

b) A rod 30 cm long has its ends A and B kept at 20° and 80° respectively until steady state conditions prevail. The temperature at each end is then suddenly reduced to 0° C and kept so. Find the resulting temperature function u (x, t) taking x = 0 at A. (16)

13. a) i) Find the Laplace transform of Triangular Wave function (8)

$f(t) = \begin{cases} t & ,0 < t < a \\ 2a - t & ,a < t < 2a \end{cases}$ with $f(t + 2a) = f(t)$

ii) Find $L^{-1}\left(\frac{s}{(s+2)^2+1}\right)$ (8)

(OR)

b) i) Verify the initial and final value theorem for the function $f(t) = 1 + e^{-t}(\sin t + \cos t)$ (8)

ii) Using Convolution theorem find $L^{-1}\left(\frac{1}{(s^2(s+3)}\right)$ (8)

14. a) Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2 \; if \; |x| < 1 \\ 0 \qquad if |x| \geq 1 \end{cases}$ (16)

Hence, prove that $\int_0^\infty \frac{sins\, s - scos\, s}{s^3} \, cos\left(\frac{s}{2}\right) ds = \frac{3\pi}{16}$

(OR)

b) Find the Fourier transform of $f(x) = \begin{cases} 1 - |x| \; if \; |x| < 1 \\ 0 \qquad if |x| > 1 \end{cases}$ Hence deduce that $\int_0^\infty \left(\frac{sint}{t}\right)^2 dt = \frac{\pi}{2}$, $\int_0^\infty \left(\frac{sint}{t}\right)^4 dt = \frac{\pi}{3}$ (16)

15. a) i) Find $Z^{-1}\left[\frac{10z}{(z-1)(z-2)}\right]$ (8)

ii) Use convolution theorem find inverse Z- transform of $\frac{8z^2}{(2z-1)(4z-1)}$ (8)

(OR)

b) Solve $y_{n+2} + 4y_{n+1} + 3y_n = 3^n$, given that $y_0 = 0, y_1 = 1$ (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PH202 – Physics - Waves, Optics and Quantum Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. The soldiers do not march over the bridge as it leads to the breaking of bridge due to resonance effect. Justify this.
2. Distinguish between progressive and stationary waves.
3. Interpret the given diagram. Shown in figure.1.

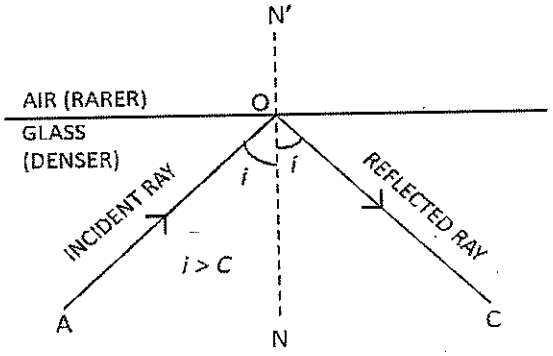


Figure.1

4. Differentiate simple and compound microscope.
5. Give the principle of superposition in wave optics.
6. Define polarization of light.
7. List out the properties of laser beam.
8. Give the roles of helium and nitrogen in CO_2 laser.
9. Recall the de Broglie equation for the wavelength of an electron accelerated by a potential difference of V volt.
10. Calculate the lowest energy of an electron in a box of 0.1 nm wide.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Define simple harmonic motion. Derive the equation of motion for damped vibration of motion and List any two characteristics of wave motion. (16)

(OR)

b) Derive the wave equation for progressive and stationary waves. (16)

12. a) State Fermat's principle and explain the laws of reflection and refraction. (16)

(OR)

b) Outline the method of imaging by a spherical refracting surface and by a coaxial optical system. (16)

13. a) Describe Michelson's interferometer experimental set up and explain how it can be used to find the wavelength of monochromatic light with neat sketch. (16)

(OR)

b) Describe the experimental setup for determining the wavelength of light and dispersive power using diffraction grating. (16)

14. a) Derive Einstein's A and B coefficients and obtain the relation between stimulated and spontaneous emission rate. (16)

(OR)

b) Explain the construction and working of a homojunction and heterojunction semiconductor laser with energy level diagram. (16)

15. a) Demonstrate in brief about Davisson and Germer experiment and hence prove that waves is associated with matter (16)

(OR)

b) Derive Schrödinger time dependent and time independent wave equation. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22PH201 – Physics - Electromagnetism

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define electric flux density. Give its unit.
2. The electric field exists only if there is an electric potential difference. Give the mathematical relation between electric field and electric potential.
3. How do you classify the materials based on conductivity?
4. Interpret the mechanism in the given figure.1.

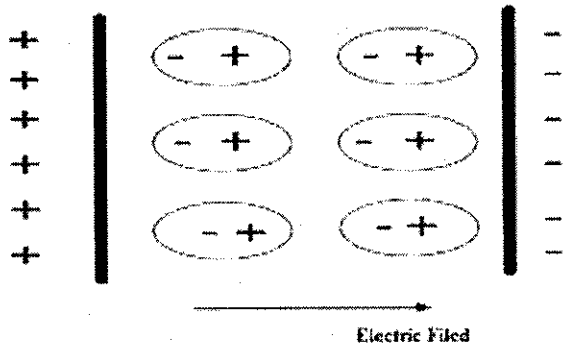


Figure.1

5. State Biot-Savart's law.
6. Recall magnetic Lorentz force.
7. Differentiate transformer emf and motional emf.
8. How will you distinguish displacement current from conduction current?
9. Write the Maxwell's equations.
10. Define radiation pressure.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) State Gauss law in electrostatics. Apply this to obtain an expression for the electric field intensity due to uniformly charged sphere using Gauss law. (16)

(OR)

b) Define electrostatic potential energy and deduce an expression for electrostatic potential energy of a system of point charges. (16)

12. a) Obtain an expression for electric potential and electric field due to an electric dipole. (16)

(OR)

b) Deduce an expression for the capacitance of parallel plate capacitor, co-axial capacitor and spherical capacitor. (16)

13. a) i) State ampere's circuital law. Apply this law to find the magnetic field generated due to infinite line current and infinite sheet current. (12)

ii) Calculate the magnetic field at a point 45 mm from a long straight wire carrying a current of 3 A. (4)

(OR)

b) i) Explain the magnetic boundary conditions for dielectric-dielectric, conductor – dielectric and conductor – free space. (12)

ii) Write short notes on the force on a current carrying conductor in a magnetic field. (4)

14. a) Differentiate self inductance and mutual inductance. Determine the mutual inductance of two tightly wound solenoids. (16)

(OR)

b) Derive modified ampere's law. Explain the Maxwell's equation in vacuum and non-conducting media. (16)

15. a) Derive the electromagnetic wave equation for plane waves in vacuum and prove that they are transverse in nature. (16)

(OR)

b) Obtain an expression for Poynting vector. Explain how the energy of electromagnetic waves depends on its amplitude. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III & IV Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING/METALLURGICAL ENGINEERING

18CY301 – Biology for Engineers

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define isoelectric point.
2. Classify the amino acids according to the position of amino group.
3. Identify factors which affect the enzyme catalyst reaction.
4. Compare protein and enzyme.
5. What is meant by quaternary structure of protein?
6. Examine xanthoproteic reaction.
7. Rephrase the term endergonic and exergonic reaction.
8. Distinguish exothermic and endothermic reaction.
9. Explain the components in DNA.
10. List the nitrogenous bases present in RNA.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Recall the reactions of glucose. (8)

ii) Summarize reaction of amino acids. (8)

(OR)

b) Interpret the functions, structure and deficiency disease of fat soluble vitamins. (16)

12. a) i) Critically analyze the different properties of enzyme. (8)

ii) Explain koshland induced fit mechanism of enzyme reaction. (8)

(OR)

b) Elaborate the derivation of Michaelis-menten equation of enzyme kinetics and its special cases. (16)

13. a) i) Discuss mechanism of protein synthesis. (8)

ii) Distinguish between the primary, secondary and tertiary structure of protein. (8)

(OR)

b) Describe different reaction of protein with suitable equation. (16)

14. a) i) Recall the external and internal factor which affects the photosynthesis? (8)

ii) Interpret the structure of ATP with suitable diagram. (8)

(OR)

b) Construct the preparatory and pay off phase of glycolysis. (16)

15. a) i) Identify the steps involved in DNA replication. (8)

ii) Outline the characteristics of genetic code. (8)

(OR)

b) i) Compare DNA and RNA. (8)

ii) Define various types of RNA and explain its function. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22CY401 – Non Metallic Materials

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define degree of polymerization.
2. Compare Addition and condensation polymerization.
3. Identify the biological property of polymers.
4. Compare the various polymers used in construction of building.
5. Examine the piezoelectric and dielectric property of ceramics.
6. Discuss the Pilkington process of manufacturing glass.
7. Elaborate on organic matric composites.
8. Distinguish the different constituents present in composites.
9. Explain the dispersion strengthened composites.
10. List the uses of layered laminar composites.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Recall the mechanism of free radical addition polymerization.	(8)
		ii)	Summarize the factor affecting the glass transition temperature.	(8)
			(OR)	
	b)		Interpret the different types of polymer additive used in industries.	(16)
12.	a)	i)	Critically examine the viscoelasticity of the polymer.	(8)
		ii)	Explain mechanical and thermal property of the polymers.	(8)
			(OR)	
	b)		Elaborate the various types of application of polymers.	(16)
13.	a)	i)	Compare glass blowing process and pressing method of designing the glass.	(8)
		ii)	Distinguish between traditional and advanced ceramics with suitable example.	(8)
			(OR)	

b) i) Compare the properties of metals, ceramics and polymers. (8)

ii) Discuss the preparation, properties and uses of carborundum and SiAlONs. (8)

14. a) i) Recall function of fibre reinforces composite (FRP). (8)

ii) Interpret the rule of mixture for iso-strain condition. (8)

(OR)

b) i) Construct the steps in manufacturing of FRP. (8)

ii) Distinguish between Particle reinforced composites, FRP and structural composites. (8)

15. a) i) Identify the application of particle reinforced composites. (8)

ii) Outline various steps involved in stir casting process. (8)

(OR)

b) i) Evaluate the advantage and application of Honeycomb sandwiched composite. (8)

ii) Examine the manufacturing techniques adopted for laminar composite. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2022 Regulations)

COMMON TO ALL BRANCHES

22PTMA101 – Mathematics - I

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the particular integral of $(D^2 - 4D + 4)y = \sin 2x$.
2. Convert the following differential equation into ODE with constant coefficients.
   $(x+2)^2\frac{d^2y}{dx^2} - (x+2)\frac{dy}{dx} + y = 3x + 4$.
3. Eliminate the arbitrary constants a and b from $z = ax + by - ab$.
4. Solve $(D^2 - 7DD' + 12D'^2)z = 0$
5. Find the value of 'a' so that the vector $\vec{F} = (x+3y)\vec{\imath} + (y-2z)\vec{\jmath} + (x+az)\vec{k}$ is solenoidal.
6. State Stoke's theorem.
7. Show that $|z|^2$ is not analytic at any point.
8. Find the invariant points of the transformation $w = \frac{z-1}{z+1}$.
9. Evaluate $\int_C \frac{\sin z}{z+5} dz$ where C is the circle $|z-1| = 1$.
10. Find the residue of $f(z) = \frac{z+1}{(z-1)(z-2)}$ at $z = 2$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve $(D^2 + 3D + 2)y = \sin 3x$. (8)

    ii) Solve $(D^2 + 1)y = cosec\, x$ by using method of variation of parameters. (8)

(OR)

    b) i) Solve $(D^2 - 5D + 6)y = x^2 + 3$ (8)

    ii) Solve $(x^2D^2 + xD - 9)y = 10 + \frac{5}{x^2}$. (8)

12. a) i) Form the partial differential equation by eliminating the arbitrary functions f and g from $z = f(2x+y) + g(3x-y)$. (8)

    ii) Solve $(D^2 - 7DD' + 6D'^2)z = xy$. (8)

(OR)

b) i) Solve $x(y-z)p + y(z-x)q = z(x-y)$. (8)

ii) Solve $(D^2 - DD' - 20D'^2)z = e^{5x+y} + \sin(4x+y)$. (8)

13. a) i) Find the directional derivative of $\phi = 3x^2 + 2y - 3z$ at (1,1,1) in the direction of $2\vec{\imath} + 2\vec{\jmath} - \vec{k}$. (8)

ii) Show that $\vec{F} = (y^2 + 2xz^2)\vec{\imath} + (2xy - z)\vec{\jmath} + (2x^2z - y + 2z)\vec{k}$ is irrotational and hence find its scalar potential. (8)

(OR)

b) Verify Gauss divergence theorem for $\vec{F} = 4xz\,\vec{\imath} - y^2\,\vec{\jmath} + yz\,\vec{k}$ over the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$. (16)

14. a) i) If $f(z) = u + iv$ is an analytic function, then prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)(\log|f(z)|) = 0$. (8)

ii) Find the bilinear transformation which maps the points $z = \infty, i, 0$ into the points $w = i, 0, \infty$. (8)

(OR)

b) i) Determine the analytic function $f(z) = u + iv$, given $u = \frac{\sin 2x}{\cosh 2y - \cos 2x}$. (8)

ii) Find the image in the w-plane of the infinite strip $\frac{1}{4} \le y \le \frac{1}{2}$ under the transformation $w = \frac{1}{z}$. (8)

15. a) i) Find the value of $\int_C \frac{e^{3z}}{(z-1)(z-3)}\,dz$, where C is the circle $|z| = 5$, using Cauchy's Integral Formula. (8)

ii) Expand $\frac{1}{z^2-3z+2}$ when $1 < |z| < 2$ by Laurent series. (8)

(OR)

b) i) Using the method of contour integration evaluate $\int_0^{2\pi} \frac{d\theta}{5 + 4\sin\theta}$. (8)

ii) Find the value of $\int_C \frac{z-2}{z^2-z}dz$ where C is $|z| = 2$ using residue theorem. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2018 Regulations)

COMMON TO ALL BRANCHES

18CY101 – CHEMISTRY

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare the Bond order of H_2, He_2, Li_2 and Be_2.
2. Examine the importance of crystal field theory.
3. Why does Oxygen has less first ionization enthalpy than Nitrogen?
4. Interpret HSAB principle of acids and bases.
5. Point out the criteria for an organic molecule to show optical isomerism.
6. Compare E1, E2 and E1CB reaction.
7. Spell Third and Zeroth law of thermodynamics.
8. Inspect standard cell potential relation with equilibrium constant.
9. Define Beer-Lambert's law.
10. State the term auxochrome.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Organize the molecular orbital diagram of N_2 and O_2. (8)

ii) Determine how huckel rule is used to determine the aromaticity of Benzene, annulene[14]. (8)

(OR)

b) i) Calculate the CFSE for high spin complex and low spin complex of d^6, d^7, d^8, d^9 electronic configuration. (8)

ii) Explain the postulates of crystal field theory. (8)

12. a) i) Find the Effective nuclear charge of K, Sc, O^{2-} and Mg^{2+}. (8)

ii) Distinguish between electron affinity and electro negativity. Why electron affinity of Chlorine is higher than Fluorine. (8)

(OR)

b) i) Recall the Bronsted-Lowry concept of acids and bases. Identify the conjugate acid of H_2O and HSO_4. (8)

ii) Outline the steps involved in calculating pH of acetic acid and sodium acetate buffer using Henderson - Hasselbatch equation. (8)

13. a) i) Summarize the conformational isomers of Cyclohexane with energy diagram. (8)

ii) Discuss the mechanism of Markovnikov rule and peroxide effect. (8)

(OR)

b) i) Show the mechanism of reaction of benzene with HNO_3 / H_2SO_4. (8)

ii) Report the difference between SN_1 and SN_2 reaction. (8)

14. a) i) Define Partial molar property, Enthalpy, Entropy and Free energy. (8)

ii) Derive Gibbs Duhem equation and explain the variation of chemical potential with pressure. (8)

(OR)

b) i) How is cell potential determined by Poggendroff method. (8)

ii) Write the steps involved in Nernst equation taking example of Daniel cell. (8)

15. a) i) Describe the instrumentation of UV visible spectosocpy. (8)

ii) Examine the modes of vibration of H_2O, CO_2 and NH_3. (8)

(OR)

b) i) Illustrate the working of AAS with neat diagram. (8)

ii) List the steps involved in determination of sodium in water using Flame photometer. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B. E. Degree Examinations – Nov/Dec 2024

III & IV Semester (Full Time)

(2018 Regulations)

CIVIL/EEE/METALLURGICAL ENGINEERING

18MA302 – Statistics and Numerical Methods

(Statistical Tables to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What does a positive skewness value indicate about the shape of a distribution?
2. What is the principle of least squares?
3. Define level of significance.
4. Find the value of χ^2 for the 2×2 contingency table

83	57
45	68

5. When will we use Newton's forward interpolation formula and when to use Newton's backward interpolation?
6. Define the term Numerical Integration.
7. Find y(1.1) by Taylor's series, given $\frac{dy}{dx} = x + y, y(1) = 0$
8. Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ when y = 1 for x = 0. Find y (0.1) by Euler's method.
9. Write down the explicit formula to solve the one-dimensional heat equation.
10. State the finite difference scheme for solving the Poisson's equation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Calculate the mean and standard deviation for the following data: (8)

Age in years	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members	3	61	132	153	140	51	2

ii) By the method of least squares, find the best fitting straight line to the data given below: (8)

x	5	10	15	20	25
y	15	19	23	26	30

(OR)

b) i) Calculate the first four moment of the following distribution about the mean: (8)

x	0	1	2	3	4	5	6	7	8
f	1	8	28	56	70	56	28	8	1

ii) Using the principle of least squares fit an equation of the form $y = ae^{bx}$ $(a > 0)$ to the data (8)

x	1	2	3	4
y	1.65	2.70	4.50	7.35

12. a) i) A machinist is expected to make engine parts with axle diameter of 1.75 cm. a random sample of 10 parts shows a mean diameter of 1.85 cm, with an SD of 0.1 cm. On the basis of this sample, would you say that the work of the machinist is inferior? (8)

ii) Two independent samples of 8 and 7 items respectively had the following values of the variable: (8)

Sample1 : 9 11 13 11 15 9 12 14

Sample 2: 10 12 10 14 9 8 10

Do the two estimates of population variance differ significantly at5 % LOS?

(OR)

b) i) Before an increase in excise duty on tea, 800 people out of a sample of 1000 were consumers of tea. After the increasing in duty, 800 people were consumers of tea in a sample of 1200 persons. Find whether there is a significant decrease in the consumption of tea after the increase in duty. (8)

ii) Theory predicts that the proportion of beans in 4 groups A, B, C, D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the 4 groups were 882, 313, 287 and 118. Does the experiment support the theory? (8)

13. a) i) Using Newton-Raphson method, find the iterative formula for the square root of N and hence find the value of $\sqrt{15}$. (8)

ii) Use Newton's divided difference formula, to find the value of $y(4)$: (8)

x	-1	0	3	6	7
y	3	-6	39	822	1611

(OR)

b) i) Using Newton's Forward interpolation formula, find $f(1.5)$ from the following data: (8)

x	0	1	2	3	4
$f(x)$	858.3	869.6	880.9	892.3	903.6

ii) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's 1/3 rule and 3/8 rule by dividing the range into six equal parts. (8)

14. a) i) Find $y(0.1)$ using Runge-Kutta method of order four, given (8)

$$\frac{dy}{dx} = y - x, y(0) = 1.$$

ii) Using Milne's method, find $y(0.8)$, given (8)

$\frac{dy}{dx} = 1 + y^2. y(0) = 1, y(0.2) = 0.2027$, $y(0.4) = 0.4228$ *and* $y(0.6) = 0.6841$.

(OR)

b) i) Solve $y' = y^2 + x, y(0) = 1$ using Taylor series method to find $y(0.1)$& $y(0.2)$ correct to four decimal places. (8)

ii) Given (8)

$y' = y - x^2, y(0) = 1, y(0.2) = 1.2186, y(0.4) = 1.4682$ &

$y(0.6) = 1.7379$, find $y(0.8)$ by Adam's – Bashforth method.

15. a) i) Solve the Poisson equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0, y = 0, x = 3, y = 3$ *and* $u = 0$ on the boundary. Assume mesh length $h = 1$ unit. (8)

ii) Solve by Bender-Schmidt formula, $u_{xx} = 2u_t$ when $u(0,t) = 0, u(4,t) = 0$ and with initial condition $u(x,0) = x(4-x)$ upto t=5 sec, taking $h = 1$. (8)

(OR)

b) i) Solve the boundary value problem, $y'' - y = 0$ with $y(0) = 0$ and $y(2) = 4$ by taking $h = 0.5$. (8)

ii) Solve by Crank-Nicholson's scheme: $16u_t = u_{xx}, 0 < x < 1, t > 0$ with $u(x,0) = 0$. $u(0,t) = 0, u(1,t) = 100t$. Compute u for one-step, taking $h = \frac{1}{4}$. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18MA303 – Linear Algebra and Numerical Methods

Time : 3 Hours | Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. Define vector space.
2. For which value of k will the vector $u = (1, -2, k)$ in R^3 be a linear combination of the vectors $v = (3,0,-2)$ and $w = (2,-1,5)$?
3. Find the divided difference of $f(x) = x^3 + x + 2$ for the arguments $1, 3, 6, 11$.
4. When will we use Newton's forward interpolation formula?
5. Write down the first two derivatives of Newton's forward difference formula at the point $x = x_0$.
6. Calculate $\int_1^4 f(x)dx$ from the table by trapezoidal rule.

x	1	2	3	4
$f(x)$	1	8	27	64

7. Using Euler's method, compute $y(0.1)$ given $\frac{dy}{dx} = 1 - y^2$, $y(0) = 2$.
8. State Milne's predictor and corrector formulae to solve first order ordinary differential equations.
9. Write down the finite difference scheme for solving $y'' + x + y = 0; y(0) = y(1) = 0$ with $h = 0.5$
10. Write down the diagonal and standard five-point formula in Laplace equation $U_{xx} + U_{yy} = 0$.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Show that any intersection of subspaces of a vector space V is a subspace of V. (8)

ii) Let $V = R^3$ and $S = \{(1,0,0), (2,2,0), (5,7,2)\}$. Show that S is a minimal generating set. (8)

(OR)

b) i) Show that the span of any subset S of a vector space V is a subspace of V. (8)

ii) State and prove dimension theorem for linear transformation. (8)

12. a) i) Find the value of $f(7.5)$ from the following table Using Newton's backward formula. (8)

x	1	2	3	4	5	6	7	8
y	1	8	27	64	125	216	343	512

ii) Fit a straight line to the following data by using least square method. (8)

x	1	2	3	4	5
y	5	4	3	2	1

(OR)

b) i) Find the value of $f(1)$ using Lagrange's method. (8)

x	-1	0	2	3
y	-8	3	1	12

ii) Fit a second-degree parabola to the following data by using least square method. (8)

x	1	3	4	6	8
y	1	2	4	4	5

13. a) i) Obtain first and second derivative of y at $x = 2.2$ from the data. (8)

x	1.4	1.6	1.8	2.0	2.2
y	4.0552	4.9530	6.0496	7.3891	0.7473

ii) By dividing the range into 6 equal parts, find the value of $\int_0^{\pi} \sin x \, dx$ using Simpson's $1/3^{rd}$ rule. (8)

(OR)

b) i) By applying Gaussian three-point formula, find $\int_3^7 \frac{dx}{1+x^2}$. (8)

ii) Obtain $f'(5)$ from the data. (8)

x	0	1	4	5
y	8	11	78	123

14. a) i) Using Taylor series method, find y at $x = 0.1$ given $\frac{dy}{dx} = x^2y - 1$, $y(0) = 1$. (8)

ii) Apply fourth order Runge-Kutta method, to find an approximate value of y when $x = 0.2$ given that $y' = x + y, y(0) = 1$ with $h = 0.2$. (8)

(OR)

b) i) Find $y(2)$ by Milne's method $\frac{dy}{dx} = \frac{x+y}{x^2-y^2}$, given $y(0) = 2, y(0.5) = 2.636$, $y(1.0) = 3.595$ and $y(1.5) = 4.968$. (8)

ii) Find the values of y at $x = 0.1$ given that $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$ by modified Euler's method. (8)

15. a) i) Solve : $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, given $u(0,t) = 0, u(4,t) = 0, u(x,0) = x(4-x)$, taking $h = 1$ (for 4 times steps). (8)

ii) Solve $U_{xx} + U_{yy} = 0$ in $0 \le x \le 4, 0 \le y \le 4$ given that $u(0,y) = 0$, $u(4,y) = 8 + 2y, u(x,0) = x^2/2, u(x,4) = x^2$ taking $h = k = 1$, correct of 1 decimal. (8)

(OR)

b) i) Solve by Crank-Nicolson's method $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ For $0 < x < 1, t > 0$, $u(0,t) = 0, u(1,t) = 0, u(x,0) = 100(x - x^2)$. Compute u for one time step with $h = \frac{1}{4}$. (8)

ii) Solve $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$ subject to the following conditions $u(0,t) = 0$, $u(1,t) = 0, t > 0$ and $u_t(x,0) = 0$, $u(x,0) = \sin^3 \pi x$ for all in $0 \le x \le 1$. Taking $h = \frac{1}{4}$. Compute u for 4 time steps. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12MA101 – Mathematics - I

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. State Cayley-Hamilton theorem and also write it uses.
2. If $2, -1, -3$ are the Eigen value of the matrix A, then find the Eigen value of $A^2 - 2I$.
3. If α, β, γ are the roots of $x^3 + 3x^2 + 2x + 1 = 0$, find the value of $\Sigma\alpha$ and $\alpha\beta\gamma$.
4. Form an equation whose roots are three times those of the equation $x^3 - x^2 + x + 1 = 0$.
5. Find the equation of the envelope for the family of straight line $y = mx + am^2$.
6. Define radius of curvature of a curve.
7. Find $\frac{dy}{dx}$ if $x^3 + y^3 = 3axy$.
8. If $x = uv,\ y = \frac{u}{v}$, find $\frac{\partial(x,y)}{\partial(u,v)}$.
9. Find the area bounded by the lines $x = 0, y = 1$ and $y = x$.
10. Evaluate $\int_1^3 \int_2^4 \int_1^2 xyz\, dz\, dy\, dx$.

(5 x 16 = 80 Marks)

Part B

Answer ALL Questions

11. a) i) Find the Eigen values and Eigen vectors for the matrix $\begin{pmatrix} 11 & -4 & -7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{pmatrix}$. (8)

ii) Using Cayley-Hamilton theorem, find A^{-1} for the matrix (8)

$$A = \begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}.$$

(OR)

b) Reduce the quadratic form into the canonical by using orthogonal transform $3x^2 - 3y^2 - 5z^2 - 2xy - 6yz - 6xz$ and hence find rank, index, signature, nature. (16)

12. a) i) Solve $x^4 - 5x^3 + 4x^2 + 8x - 8 = 0$, given that one of the roots is $1 - \sqrt{5}$. (8)

ii) Discuss the nature of roots of the equation $x^9 + 5x^8 - x^3 + 7x + 2 = 0$. (8)

(OR)

b) i) Find the equation whose roots are less by 2, than the roots of the equation $x^5 - 3x^4 - 2x^3 + 15x^2 + 20x + 15 = 0$. (8)

ii) Solve the equation: $x^4 - 10x^3 + 26x^2 - 10x + 1 = 0$. (8)

13. a) i) Find the radius of curvature at $(a, 0)$ on the curve $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$. (8)

ii) Find the evolute of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. (8)

(OR)

b) i) Find the circle of curvature of the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at a point (a, a). (8)

ii) Find the equation of the envelope for the family of the lines $\frac{x}{a} + \frac{y}{b} = 1$ with the condition on the parameters $a + b = c$ for a constant c. (8)

14. a) i) If $u = \tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$. (8)

ii) Find the Maximum and Minimum values of $f(x, y) = x^3 + y^3 - 3x - 12y + 20$. (8)

(OR)

b) i) Expand $f(x, y) = e^x \cos y$ *at* $\left(0, \frac{\pi}{2}\right)$ upto 3^{rd} term using Taylor's series. (8)

ii) A rectangular box open at the top is to have a volume of 32cc. Find the dimensions of the box requiring, the least material for the construction. (8)

15. a) i) By changing the order of integration, evaluate $\int_0^1 \int_y^1 \frac{x}{x^2+y^2}\, dx\, dy$. (8)

ii) Find by double integral, the area enclosed by the curves $y^2 = 4ax$ and $x^2 = 4ay$. (8)

(OR)

b) i) Find the volume of sphere bounded by $x^2 + y^2 + z^2 = a^2$. (8)

ii) By changing in to polar Co – ordinates, evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\, dxdy$. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING /MECHANICAL ENGINEERING

16PTMA301 – Numerical Methods

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State the order of convergence and the criterion for the convergence in Newton-Raphson method.
2. Give two direct methods to solve a system of linear equations.
3. When to use Newton's forward interpolation and when to use Newton's backward interpolation?
4. Construct the divided difference table for the following data:

x	:	0	1	2	5
$f(x)$	:	2	3	12	147

5. Evaluate $\int_{-3}^{3} x^2\,dx$ using trapezoidal rule taking $h = 1$.
6. Under what condition, Simpson's $1/3^{rd}$ rule can be applied and state the formula.
7. Give any three methods to Solving first order ODE in single step method.
8. Find $y(0.2)$ for the equation $y' = y + e^x$, given that $y(0) = 1$ by using Euler's method.
9. Write down the standard five-point formula to find the numerical solution of Laplace equation.
10. Write down the simplified form of Bender-Schmidt's recurrence equation.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Using iteration method, find a positive root correct to 4 decimal places for the equation $e^x - 3x = 0$. (8)

ii) Solve the following system of equations by Gauss elimination method. (8)

$-3x_1 + 2x_2 - 3x_3 = -6$; $x_1 - x_2 + x_3 = 1$; $2x_1 - 5x_2 + 4x_3 = 5$.

(OR)

b) i) Solve by Gauss-Seidel iterative method. (8)

$x + y + 54z = 110$; $27x + 6y - z = 85$; $6x + 15y + 2z = 72$.

ii) Solve $x + 3y + 3z = 16 ; x + 4y + 3z = 18. x + 3y + 4z = 19$ by using Gauss-Jordan method. (8)

12. a) i) Using Lagrange's interpolation formula, find the value corresponding to $x = 10$ from the following table: (8)

x	5	6	9	11
y	12	13	14	16

ii) Find $y(2)$ by using Newton's divided difference formula from the following table. (8)

x	0	1	3	4
y	1	4	40	85

(OR)

b) i) From the following data, find y value at $x = 45$ by Newton's forward interpolation formula. (8)

x	40	50	60	70	80
y	184	204	226	250	276

ii) From the following data, find the cubic polynomial by using Newton's backward difference formula and hence find y value at $x = 4$. (8)

x	0	1	2	3
y	1	2	1	10

13. a) i) From the following table, obtain $y'(16)$ by Newton difference method. (8)

x	15	17	19	21	23	25
y	3.873	4.123	4.359	4.583	4.796	5

ii) Evaluate $\int_0^6 \frac{1}{1+x^2}\, dx$ correct to three decimal places dividing the range of integration into 6 equal parts by using trapezoidal rule and Simpson's $1/3$ rule. (8)

(OR)

b) i) Evaluate $\int_1^2 \frac{1}{1+x^3}\, dx$ by Gaussian three-point quadrature formula. (8)

ii) The table given below reveals the velocity v of a body during the time 't'. Find its Acceleration at $t = 1.1$ (8)

t	1.0	1.1	1.2	1.3	1.4
v	43.1	47.7	52.1	56.4	60.8

14. a) i) Find the value of $y(0.2)$ and from $\frac{dy}{dx} = 1 - 2xy$ by Taylor's series method. (8)

ii) Using Modified Euler's method, find $y(0.1)$ and $y(0.2)$ from $\frac{dy}{dx} = -\frac{y^2}{1+x}$ by choosing $h = 0.1$ (8)

(OR)

b) i) Using Runge-Kutta method, find the value of y when $x = 0.1$ given that $\frac{dy}{dx} = -2x - y\,;\ y(0) = -1.$ (8)

ii) Given $\frac{dy}{dx} = x - y^2$; $y(0) = 0, y(0.2) = 0.02,\ y(0.4) = 0.0795$ and $y(0.6) = 0.1762$. Compute $y(0.8)$ using Milne's Method. (8)

15. a) i) Solve $u_t = 4u_{xx}$, given that $u(x,0) = \frac{x}{2}(8-x),\ u(0,t) = 0,$ $u(6,t) = 6$ by Bender-Schmidt's formula Compute u up to 5 steps. (8)

ii) Solve $16\,u_t = u_{xx}$, given that $u(x,0) = 0,\ u(0,t) = 0, u(1,t) = 100\,t$ by Crank-Nicholson formula. Compute u for 1 time step. (8)

(OR)

b) By Liebmann's iteration method, solve the elliptic equation $u_{xx} + u_{yy} = 0$ over the square region of side 4, satisfying the boundary conditions (16)

(i). $u(0,y) = 0, 0 \le y \le 4,$

(ii). $u(4,y) = 12 + y, 0 \le y \le 4,$

(iii). $u(x,0) = 3x, 0 \le x \le 4,$

$(iv).\ u(x,4) = x^2, 0 \le x \le 4.$

By dividing the square into 16 square meshes of side 1 and always correcting the computed values to two places of decimals.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22MA204 – Fourier Series and Transforms

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. If $f(x) = \begin{cases} 2x-3 & if\ -2 < x < 0 \\ 2x+3 & if\ 0 < x < 2 \end{cases}$ could be expressed as Fourier Series in the interval $(-2,2)$, then find the value of the Euler's constant a_4.
2. Find the root mean square value of the function $f(x) = x$ in $(0,2)$.
3. Classify the partial differential equation $x^2u_{xx} = (y^2-1)u_{yy} + xu_x + 3$, x is non-zero & $|y| < 1$.
4. Write down the various possible solutions of one-dimensional heat equation.
5. Find Laplace transform of the function "$t\cos 3t$".
6. Find inverse Laplace transform of "$\cot^{-1} s$".
7. State Parseval's identity for Fourier Transform.
8. If $F[f(x)] = \varphi(s)$, then find $F[xf(x)]$.
9. Find Z transform of a^n.
10. Form the difference equation by eliminating arbitrary constants from $y_n = a3^n - 2$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Obtain the Fourier series of $f(x) = x\sin x$ in $(0,2\pi)$. (8)

ii) Determine the Fourier series of $f(x) = x$ in the interval $-\pi < x < \pi$. (8)

(OR)

b) i) Find a Fourier series to represent $f(x) = 2x - x^2$ with period 3 in the range (0,3). (8)

ii) Find the half range cosine series of $f(x) = (\pi - x)^2$ in the interval $(0,\pi)$. Hence find the value of the series $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \cdots$. (8)

12. a) A bar 10 cm long with insulated sides has its ends A & B maintained at the temperature 30°C & 80°C respectively until steady state conditions prevail. The temperature at A is suddenly raised to 40° C and at the same time temperature at B is lowered to 60° C. Find the temperature distribution in the bar, $u(x,t)$. (16)

(OR)

b) An infinitely long rectangular plate with insulated surface is 10 cm Wide. The two long edges and one short edge are kept at zero temperature, while the other short edge x = 0 is kept at temperature given by $u(0, y) = \begin{cases} 20y & in\ 0 < y < 5 \\ 20(10-y) & in\ 5 < y < 10 \end{cases}$. Find the steady state temperature distribution in the plate. (16)

13. a) i) Identify the Laplace transform of the function $\frac{\cos at - \cos bt}{t}$. (8)

ii) Find the inverse Laplace transform of the function $\frac{s}{(s^2+1)^2}$ using convolution theorem. (8)

(OR)

b) i) Find the Laplace transform of the function $f(t) = \begin{cases} 1 & in\ 0 \le t \le a \\ -1 & in\ a \le t \le 2a \end{cases}$, where $f(t) = f(t + 2a)$ for all 't'. (8)

ii) Find the inverse Laplace transform of $\frac{s}{(s^2+1)(s^2+4)(s^2+9)}$ (8)

14. a) Find the Fourier transform of $f(x)$, defined as, $f(x) = \begin{cases} 1 & \text{if } |x| < a \\ 0 & \text{if } |x| > a > 0 \end{cases}$. Hence find the values of the followings: i) $\int_0^\infty \left(\frac{\sin t}{t}\right) dt$ & ii) $\int_0^\infty \left(\frac{\sin t}{t}\right)^2 dt$. (16)

(OR)

b) Show that the function $e^{-\frac{x^2}{2}}$ is self-reciprocal with respect to Fourier transform. (16)

Using convolution theorem technique, evaluate $\int_0^\infty \frac{x^2 dx}{(x^2+25)(x^2+9)}$

15. a) i) If $Z[\{f(n)\}] = F(z) = \frac{2z^2+5z+14}{(z-1)^4}$, find the values of $f(2)$& $f(3)$. (8)

ii) Find inverse Z transform of the function $\frac{z^2}{(z-a)(z-b)}$ using convolution theorem. (8)

(OR)

b) i) Find inverse Z-transform of $\frac{z^2}{(z-1)^2(z+1)}$. (8)

ii) Solve the difference equation $y_{n+2} - 4y_{n+1} + 4u_n = 2^n$ with $y_0 = 0$, and $y_1 = 1$ using Z – transform. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22MA203 – Linear Algebra, Partial Differential Equations and Vector Calculus

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Examine whether or not $W = \{(x, y) \in R^2 : x + y = 0\}$ is a subspace of R^2.
2. Let $T: R^2 \to R^2$ be defined by $T(a_1, a_2) = (2a_1 + a_2, a_1)$. Is T linear?
3. Let $V = R^2$ and $S = (1, 0), (0, 1)$. Check whether S is orthonormal basis or not.
4. Prove that $\|\alpha + \beta\| \leq \|\alpha\| + \|\beta\|$ for any two vectors α, β belong to the standard inner product space.
5. Solve: $pq = 1$.
6. Classify $u_{xx} - y^4 u_{yy} = 2y^3 u_y$.
7. Find $L[e^{-5t} cos 3t]$.
8. Find $L^{-1}\left[\frac{s^3 - 3s^2 + 7}{s^4}\right]$.
9. Show that $\vec{F} = (x + 2y)\vec{i} + (y + 3z)\vec{j} + (x - 2z)\vec{k}$ is solenoidal.
10. State Stokes theorem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Let V be the set of all 2×2 matrices with real entries. Show that V is a vector space over R with respect to usual matrix addition done entry wise and usual scalar multiplication done entry wise. Verify all the conditions of a vector space. (8)

ii) Let V be a vector space and let $S_1 \subseteq S_2 \subseteq V$. If S_2 is linearly independent, then prove that S_1 also linearly independent. (8)

(OR)

b) i) Let V be a vector space with dimension n. Prove that any linearly independent subset of V that contains exactly n vectors is a basis for V. (8)

ii) Let $T: R^3 \to R^3$ be defined by $T(x, y, z) = (2x - 3y + 4z, 5x - y + 2z, 4x + 7y)$. Find the matrix relative to the usual basis of R^3. (8)

12. a) State and prove the Gram Schmidt orthogonalization process. (16)

(OR)

b) i) Find the orthogonal basis containing the vector (1, 3, 4) for R^3 With the standard inner product. (8)

ii) Using Least square approximation determine the best linear fit for the data points (1, 2), (2, 3), (3, 5). (8)

13. a) i) Find the general solution of $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$. (8)

ii) Solve: $p(1 + q) = qz$. (8)

(OR)

b) i) Solve $z = px + qy + p^2 - q^2$. (8)

ii) Solve : $[D^2 - 4DD' + 4D'^2]z = e^{2x+y}$. (8)

14. a) i) Find the Laplace transform of $f(t) = \begin{cases} k & 0 \le t \le a \\ -k & a \le t \le 2a \end{cases}$ and $f(t + 2a) = f(t)$. (8)

ii) Find the Laplace transform for $\frac{e^{-at} - e^{-bt}}{t}$. (8)

(OR)

b) i) Find $L^{-1}\left[\frac{s-2}{s(s+2)(s-1)}\right]$ (8)

ii) Solve $\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = 2$, given $y = 0$ and $\frac{dy}{dt} = 5$ for $t = 0$. (8)

15. a) Verify Gauss divergence theorem for $\vec{F} = x^2\vec{i} + y^2\vec{j} + z^2\vec{k}$ taken over the cube $x = 0, x = 3, y = 0, y = 3, z = 0$ and $z = 3$. (16)

(OR)

b) Verify Green's theorem in a plane for $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$, where C is the boundary of the region bounded by the parabolas $y^2 = x$ and $x^2 = y$. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22MA202 – Linear Algebra and Linear Programming Problem

Time : 3 Hours | Maximum Marks : 100

Part A | (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define vector space.
2. Define sub space.
3. State dimension theorem.
4. Define linear transformation.
5. Let a=$\begin{bmatrix} -5 \\ 2 \end{bmatrix}$ and b =$\begin{bmatrix} -7 \\ 3 \end{bmatrix}$ find $\frac{a.b}{a.a}$
6. Find the length of u if u=$\begin{bmatrix} 1/3 \\ -2/3 \\ 2/3 \end{bmatrix}$
7. Define slack variable.
8. What is duality?
9. Find IBFS for the following transportation problem by using North West corner rule

		Destination			
		A	B	C	Supply
Source	1	2	7	4	5
	2	3	3	1	8
	3	5	4	7	7
	4	1	6	2	14
Demand		7	9	18	

10. Find IBFS for the following transportation problem by least cost method.

		To			Supply
	1	2	1	4	30
From	3	3	2	1	50
	4	2	5	9	20
Demand	20	40	30	10	

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) For what value of h will y be in the subspace of R^3 spanned by v_1, v_2, v_3 if $v_1 = \begin{bmatrix} 1 \\ -1 \\ -2 \end{bmatrix}, v_2 = \begin{bmatrix} 5 \\ -4 \\ -7 \end{bmatrix}, v_3 = \begin{bmatrix} -3 \\ 1 \\ 0 \end{bmatrix}$ and $y = \begin{bmatrix} -4 \\ 3 \\ h \end{bmatrix}$ (8)

ii) Consider the vectors S_1 = { (1,0,0), (2,2,0), (5,7,2)} is a minimal generating set of R^3. (8)

(OR)

b) i) Prove that the intersection of two subpace is a sub space (8)

ii) Let V_1 = (1,2,1), V_2 = (2,9,0) and V_3 = (3,3,4. Show that the set S = {V_1, V_2, V_3} is a basis of R^3. (8)

12. a) i) Find the linear transformation $T:V_3 \rightarrow V_3$ determined by the matrix $\begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$ with respect to the standard basis. (8)

ii) Find the eigen value and eigen vectors of $A=\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ (8)

(OR)

b) Diagonalise the matrix $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ (16)

13. a) i) Let x=(2,1+i,i) and y=(2-i,2,1+2i) be vectors in C. Compute ||x||, ||Y|| and ||X+y|| (8)

ii) State and prove triangle inequality. (8)

(OR)

b) Use Gram-schmidt process, find an orthonormal basic for (1, 0, 1), (0, 1, 1), (1, 3, 3). (16)

14. a) Solve the LPP by using Big-M method (16)

$Minimize\ Z = 4x_1 + 3x_2$ Subject to

$2x_1 + x_2 \geq 10$

$-3x_1 + 2x_2 \leq 6$

$x_1 + x_2 \geq 6$

$and\ x_1, x_2 \geq 0$

(OR)

b) Solve the LPP by using simplex method (16)

Maximize $Z = 3x_1 + 2x_2 + 5x_3$ Subject to

$x_1 + 4x_2 \le 420$

$3x_1 + 2x_3 \le 460$

$x_1 + 2x_2 + x_3 \le 430$

$x_1, x_2, x_3 \ge 0$

15. a) Solve the transportation problem(by using Vogel's methods (16)

	1	2	3	4	supply
I	21	16	25	13	11
II	17	18	14	23	13
III	32	27	18	41	19
Demand	6	10	12	15	

(OR)

b) i) A company has four machines to do the three jobs. Each job can be assigned to one and only one machine. The cost of each job on the each machine is given below in the table. (8)

		Machines			
		M_1	M_2	M_3	M_4
Jobs	A	18	24	28	32
	B	8	13	17	19
	C	10	15	19	22

What are job assignments which will minimize the cost?

ii) Solve the following traveling salesman problem (8)

		To			
		A	B	C	D
From	A	-	46	16	40
	B	41	-	50	40
	C	82	32	-	60
	D	40	40	36	-

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

CIVIL/MECHANICAL/METALLURGICAL ENGINEERING

22MA201 – Partial Differential Equation, Vector Calculus and Complex Variables

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Obtain partial differential equation by eliminating arbitrary constant 'a' and 'b' from $z = (x-a)^2 + (y-b)^2$.
2. Find the complete integral of $p + q = pq$.
3. Solve $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 0$.
4. Find particular integral of $(D^2 + 2DD' + D'^2)z = e^{y-x}$.
5. For what values of 'a', 'b' and 'c' such that $\vec{F} = (x + 2y + az)\vec{\imath} + (bx - 3y - z)\vec{\jmath} + (4x + cy + 2z)\vec{k}$ is irrotational.
6. State Stoke's theorem.
7. Verify whether the function $f(z) = z^2$ is analytic or not.
8. Find the map of the circle $|z| = 3$ under the transformation $w = 2z$.
9. Evaluate $\int_C \frac{z^2+3z-4}{z+5}\,dz$ Where C is the circle $|z| = 2$.
10. Calculate the residue of $f(z) = \frac{1-e^{2z}}{z^4}$ at the pole zero.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve $z = px + qy + p^2 - q^2$. (8)

    ii) Find the general solution of $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$. (8)

(OR)

    b) i) Find the complete integral of $p^2y(1 + x^2) = qx^2$. (8)

    ii) Form the partial differential equation by eliminating arbitrary function ϕ from $\phi(x^2 + y^2 + z^2, xyz) = 0$. (8)

12. a) i) Solve $(D^2 + DD' - 6D'^2)z = x^2y$. (8)

    ii) Solve $(D^2 - D'^2 - 3D + 3D')z = e^{3x+y} + 4$. (8)

(OR)

b) i) Solve $(D^2 + D'^2)z = 2\sin^2(x+y)$. (8)

ii) Solve the following PDE by using variable separable method. (8)
$\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y}$, given $u(0,y) = 8e^{-3y}$.

13. a) i) Using Green's theorem in the XY plane, evaluate (8)
$\int_C (XY + Y^2)\,dx + x^2\,dy$ where C is the closed curve of the region bounded by $Y = x$ and $Y = x^2$.

ii) Prove that $\vec{F} = (y^2 - 2xyz^3)\vec{i} + (3 + 2xy - x^2z^3)\vec{j} + (6z^3 - 3x^2yz^2)\vec{k}$ is irrotational vector and find the scalar potential such that $\vec{F} = \nabla\phi$. (8)

(OR)

b) Verify Gauss divergence theorem for $\vec{F} = x^3\vec{i} + y^3\vec{j} + z^3\vec{k}$ where S is the surface of the cuboid bounded by the planes $x = 0, x = a, y = 0, y = a, z = 0, z = a$. (16)

14. a) i) If $f(z)$ is a regular function of z, then show that (8)
$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\log|f(z)|^2 = 0$.

ii) Find the analytic function $w = u + iv$ whose real part is $e^x(x\cos y - y\sin y)$. (8)

(OR)

b) i) Find the image of the infinite strip $\frac{1}{4} \le y \le \frac{1}{2}$ under the transformation $w = \frac{1}{z}$. (8)

ii) Find the bilinear transformation that maps the points $z = 0, 1, \infty$ onto the points $w = i, 1, -i$ respectively. (8)

15. a) i) Expand the function $f(z) = \frac{z^2-1}{(z+2)(z+3)}$ as a Laurent series in $2 < |z| < 3$. (8)

ii) Using Cauchy's integral formula, find the value of $\int_C \frac{z^2}{(z-1)^2(z+2)}\,dz$, where C is $|z| = 3$. (8)

(OR)

b) Find the value of the integral $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta}$ by using contour integration. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

COMMON TO ALL BRANCHES

23PTMA101 – Mathematics - I

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Solve $(D^4 - 1)y = 0$
2. Convert the following differential equation into ODE with constant coefficients, $(2x-1)^2\frac{d^2y}{dx^2} - (2x-1)\frac{dy}{dx} + 3y = 3\sin(\log(2x-1))$.
3. Eliminate the arbitrary constants "a" and "b" from $z = ax^3 + by^3$.
4. Solve $(D^2 - 5DD' + 6D'^2)z = 0$
5. Find a unit normal vector to the surface $x^2 + y^2 - z = 5$.
6. State Green's theorem.
7. Show that $f(z) = \bar{z}$ is nowhere differentiable.
8. Find the fixed points of the transformation $w = \frac{z}{z^2+3}$.
9. State Cauchy's fundamental theorem.
10. Evaluate $\int_C \frac{e^{-3z}}{2z+3}dz$ where C is the circle $|z| = 1$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve $(D^3 + 2D^2 + D)y = e^{2x} + \sin x$. (8)

ii) Solve $(D^2 + 4)y = 4\tan 2x$ by using method of variation of parameters. (8)

(OR)

b) i) Solve $(D^2 - 4D + 4)y = x^3e^{2x}$. (8)

ii) Solve $(x^2D^2 + 3xD - 5)y = \cos(\log x)$. (8)

12. a) i) Form the partial differential equation by eliminating the arbitrary functions "f" and "g" from $z = f(y) + g(x + y + z)$. (8)

ii) Solve $(D^2 + 4DD' - 5D'^2)z = e^{2x-y} + \cos(x - 2y)$ (8)

(OR)

b) i) Find the general solution of $x(z^2 - y^2)p + y(x^2 - z^2)q = z(y^2 - x^2)$. (8)

ii) Solve$(D^2 - DD' - 2D'^2)z = 2x + 3y$. (8)

13. a) i) Find the directional derivative of $\phi = xy + yz + zx$ at (1,2,0) in the direction of $\vec{i} + 2\vec{j} + 2\vec{k}$. (8)

ii) Show that $\vec{F} = (6xy + z^3)\vec{i} + (3x^2 - z)\vec{j} + (3xz^2 - y)\vec{k}$ is irrotational and hence find its scalar potential. (8)

(OR)

b) Verify Gauss divergence theorem for $\vec{F} = (x^2 - yz)\vec{i} + (y^2 - zx)\,\vec{j} + (z^2 - xy)\,\vec{k}$ over the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$. (16)

14. a) i) If $f(z) = u + iv$ is an analytic function, then prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4\,|f'(z)|^2$. (8)

ii) Find the image of $|z - 2i| = 2$, under the transformation $w = \frac{1}{z}$. (8)

(OR)

b) i) Find an analytic function $f(z) = u + iv$, whose imaginary part is $3x^2y - y^3$. (8)

ii) Find the bilinear transformation which maps the points $z = -2,0,2$ into the points $w = 0, i, -1$. (8)

15. a) i) Find the value of $\int_C \frac{3z^2+z}{z^2-1}\,dz$, where C is the circle $|z - 1| = 1$, using Cauchy's Integral Formula. (8)

ii) Find the value of $\int_C \frac{e^z}{(z+1)^2}dz$ where C is $|z - 1| = 3$ using Cauchy's residue theorem. (8)

(OR)

b) i) Expand $\frac{z^2-1}{(z+2)(z+3)}$ when $2 < |z| < 3$ by Laurent's series. (8)

ii) Using the method of contour integration evaluate $\int_0^{2\pi} \frac{d\theta}{2 + \cos\theta}$. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22MA304 – Fourier Series, Complex Variables and Transforms

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Dirichlet's conditions for a function f(x) to be expanded as Fourier series.
2. In the Fourier series expansion of $f(x) = \begin{cases} 1+\frac{2x}{\pi}, & -\pi < x < 0 \\ 1-\frac{2x}{\pi} & 0 < x < \pi \end{cases}$ in $(-\pi, \pi)$, find the value of b_n, the coefficient of $\sin nx$.
3. State Fourier integral theorem.
4. Prove that if $F(s)$ is the Fourier transform of $f(x)$, then $F[xf(x)] = -i\frac{d}{ds}F\{f(x)\}$
5. Prove an analytic function with constant imaginary part is constant.
6. Find 'a' so that u (x,y) = $ax^2 - y^2 + xy$ is harmonic.
7. Evaluate $\oint_C \frac{e^{2z}dz}{(z+1)}$, C : |z| = 2
8. Find the residue at the pole of $f(z) = \frac{2z+3}{(z+2)^2}$.
9. Find Z transform of $\frac{1}{n}$.
10. Form the difference equation by eliminating arbitrary constants from $y_n = A(3)^n$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the half range sine series of $f(x) = x\sin x$ in $(0, \pi)$. (8)

ii) Compute the first two harmonics of the Fourier series of f(x) from the table given: (8)

x	0	π/3	2π/3	π	4 π/3	5 π/3	2 π
f(x)	1	1.4	1.9	1.7	1.5	1.2	1

(OR)

b) i) Find the Fourier Series expansion of $f(x) = x(2\pi - x)$ in the interval $(0, 2\pi)$. (8)

ii) Find the Fourier series for $f(x) = |\cos x|$ in the interval $(-\pi, \pi)$. (8)

12. a) Find the Fourier transform of the function $(x) = \begin{cases} 1-x^2, & |x|<1 \\ 0, & |x|>1 \end{cases}$. (16)

Hence evaluate (i) $\int_0^\infty \frac{sint-tcost}{t^3}dt$ (ii) $\int_0^\infty \frac{sint-tcost}{t^3}\cos\frac{t}{2}dt$ and (iii) $\int_0^\infty \left(\frac{sint-tcost}{t^3}\right)^2 dt = \frac{\pi}{15}$.

(OR)

b) Find Fourier cosine transform of $f(x) = e^{-a^2x^2}$. Also, using convolution theorem technique, evaluate $\int_0^\infty \frac{x^2dx}{(x^2+25)(x^2+9)}$. (16)

13. a) i) Determine the analytic function f(z) = u + iv such that $u - v = e^x(\cos y - \sin y)$ (8)

ii) Find the image of the strip $1 < x < 2$ under the transformation $w = \frac{1}{z}$. (8)

(OR)

b) i) If $f(z) = u + iv$ is a regular function of z in a domain D, then $\nabla^2|f(z)|^2 = 4|f'(z)|^2$. (8)

ii) Find the bilinear transformation that maps the points $-1,0,1$ in the z-plane onto the points $-1, -i, 1$ in w-plane respectively. (8)

14. a) i) Find the Laurent's series of $f(z) = \frac{7z-2}{z(z+1)(z-2)}$ valid in the region $1 < |z+1| < 3$. (8)

ii) Evaluate $\int_C \frac{12z-7}{(z^2-1)(2z+3)}dz$, where C is the circle $|z - i| = \sqrt{3}$. (8)

(OR)

b) i) Evaluate using Cauchy's integral formula, $\int_C \frac{dz}{(z+1)^2(z-2)}$, $C: |z| = \frac{3}{2}$. (8)

ii) Evaluate $\int_0^\pi \frac{1+2\cos\theta}{5+4\cos\theta}d\theta$, using contour integration. (8)

15. a) i) Find the Z-transform of the function $f(n) = \frac{1}{(n+1)(n+2)}$. (8)

ii) Find inverse Z transform of the function $\frac{12z^2}{(3z-1)(4z-1)}$ using convolution theorem. (8)

(OR)

b) i) Find inverse Z-transform of $\frac{z^2}{(z+2)(z-1)^2}$ by partial fraction method. (8)

ii) Solve the difference equation $y_{n+2} + 3y_{n+1} + 2y_n = (-3)^n$ with $y_0 = 0$, and $y_1 = 1$ using Z – transform. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22MA305 – Fourier Series, Boundary Value Problems and Transforms

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Does $f(x) = \tan x$ posses a Fourier series expansion?
2. Determine the value of a_n in the Fourier series expansion of $f(x) = x^3$ in $(-\pi, \pi)$.
3. Classify the partial differential equation $y^2 u_{xx} - 2xy\, u_{xy} + x^2 u_{yy} + 2u_x - 3u_y = 0$.
4. The ends A and B of a rod of length $10\ cm$ long have their temperature kept $20°C$ and $70°C$. Find the steady state temperature distribution on the rod.
5. State the sufficient conditions for the existence of Laplace transform.
6. Evaluate $L^{-1}\left[\frac{s}{(s+6)^3}\right]$.
7. Find the Fourier cosine transform: $F_C[e^{-4x}]$.
8. State the convolution theorem on Fourier transform.
9. Form the difference equation by eliminating the arbitrary constant A from $y_n = A3^n$
10. Find the $Z-$ transform of $(n+1)(n+2)$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Find the Fourier series of the function (16)

$$f(x) = \begin{cases} x, & 0 \le x \le \pi \\ 2\pi - x, & \pi \le x \le 2\pi \end{cases}.$$

Also deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$.

(OR)

b) i) Find the half-range sine series for $f(x) = x(\pi - x)$ in the interval $(0, \pi)$. (8)

ii) Find the half-range cosine series for $f(x) = x$ in $0 \le x \le \pi$. (8)

12. a) A tightly stretched string with fixed ends $x = 0$ and $x = l$ is initially in a position given by $y(x, 0) = y_0 \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from rest from his position, find the displacement y at any distance x from one end and at any time t. (16)

(OR)

b) An infinitely long rectangular plate with insulated surface is 10 cm wide. The two long edges and one short edge are kept at zero temperature, while the other short edge $y = 0$ is kept at temperature given by (16)

$$u = \begin{cases} 20x, & 0 \le x \le 5 \\ 20(10 - x), & 5 \le x \le 10 \end{cases}$$

Find the steady state temperature at any point in the plate.

13. a) i) Evaluate $L[t^2 e^{-3t} \sin 2t]$. (8)

ii) Using Convolution theorem, Evaluate $L^{-1}\left[\frac{1}{s(s^2+1)}\right]$. (8)

(OR)

b) i) Verify final value theorem for the function $f(t) = 1 + e^{-t}(\sin t + \cos t)$. (8)

ii) Find the Laplace transform of the square - wave function of period a defined as $f(t) = \begin{cases} 1, & when \quad 0 < t < \frac{a}{2} \\ -1, & when \quad \frac{a}{2} < t < a \end{cases}$. (8)

14. a) i) Find the Fourier sine transform of (8)

$$f(x) = \begin{cases} x, & 0 < x < 1 \\ 2 - x, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$$

ii) Find the Fourier transform of $f(x) = e^{-x^2/2}$. (8)

(OR)

b) Find the Fourier transform of $f(x) = \begin{cases} a^2 - x^2, & |x| < a \\ 0, & |x| > a \end{cases}$. (16)

Hence evaluate $\int_0^\infty \left(\frac{\sin t - t\cos t}{t^3}\right)^2 dt$.

15. a) State and prove the convolution theorem for Z-transforms. (16)

Using convolution theorem find $Z^{-1}\left(\frac{8z^2}{(2z-1)(4z-1)}\right)$

(OR)

b) i) Solve: $y(n+2) - 4y(n+1) + 4y(n) = 0$, $y(0) = 1$ *and* $y(1) = 0$ by z-transform. (8)

ii) If $Z[f(n)] = F(z)$, then prove that $Z[n\, f(n)] = -z\frac{d}{dz}[F(z)]$. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MA306 – Linear Algebra and Transforms

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find whether the vector (2, 4, 6, 7, 8) is in the subspace of R^5 spanned by (1, 2, 0, 3, 0), (0, 0, 1, 4, 0) and (0, 0, 0, 0, 1).
2. Show that the transformation $T: R^3 \rightarrow R^2$ defined by $T(x, y, z) = (z, x + y)$ is linear.
3. Define inner product space and give its axioms.
4. If V is the vector space of mxn matrices over R, find the norm of $A = \begin{pmatrix} 1 & 2 \\ 3 & -4 \end{pmatrix}$ with respect to the inner product $(A, B) = Tr(B^+A)$.
5. Find the Laplace transform of $[t\, e^t]$.
6. Find inverse Laplace transform of $\frac{3s}{(s-3)^2}$
7. State Fourier integral theorem.
8. Prove that $F_c[f(x) \cos ax] = \frac{1}{2}[F_c(s + a) + F_c(s - a)]$.
9. If $z[f(t)] = F(z)$ then, prove that $z[f(t + T)] = zF(z) - zf(0)$.
10. Find the Z-transform of $\frac{1}{n!}$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the linear transformation $T: R^4 \rightarrow R^3$ whose null space N_T is generated by (1, 2, 3, 4) and (0, 1, 1, 1). (8)

ii) Illustrate the vectors $\{(1,2,3), (0,1,2), (0,0,1)\}$ generate R^3. (8)

(OR)

b) i) Find the dimension and a basis for the solution space W of the system of homogeneous equation: (8)

$x_1 + 2x_2 + 2x_3 - x_4 + 3x_5 = 0$, $x_1 + 2x_2 + 3x_3 + x_4 + x_5 = 0$ and

$3x_1 + 6x_2 + 8x_3 + x_4 + 5x_5 = 0$.

ii) Let V and W be vector spaces and $T: V \rightarrow W$ be linear transformation. If V is finite dimensional, then prove that (8)
nullity(T) + rank(T) = dimension (V).

12. a) i) If V is the vector space C^2 with standard inner product and if T is an adjoint operation on C^2 defined by $T(e_1) = (1, -2)$, $T(e_2) = (i, -1)$, find T^*, assuming that $v = (x_1, x_2)$. (8)

ii) Find the vectors which form an orthogonal basis with vectors (1,-2,2,-3) and (2,-3,2,4) in R^4. (8)

(OR)

b) i) Let R^3 have the Euclidean inner product. Use Gram-Schmidt process to transform the basis $\{u_1, u_2, u_3\}$ into an orthonormal basis, where $u_1 = (1,1,1), u_2 = (0,1,1)$ & $u_3 = (0,0,1)$. (8)

ii) If V is a vector space of m x n matrices over R, prove that $(A, B) = Tr(B^T A)$ is an inner product space. (8)

13. a) i) Identify the Laplace transform of the function $\frac{e^{at} - \cos bt}{t}$. (8)

ii) Solve the ordinary differential equation using Laplace transform $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 8y = e^{2t}, given\ y(0) = 2$ & $y'(0) = -2$. (8)

(OR)

b) i) Find the Laplace transform of the function $f(t) = \begin{cases} t & in\ 0 \le t \le a \\ 2a - t & in\ a \le t \le 2a \end{cases}$ where $f(t) = f(t + 2a)$ for all 't'. (8)

ii) Using Convolution theorem, find inverse Laplace transform of the function $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$. (8)

14. a) Find the Fourier transform of $f(x)$, defined as, $f(x) = \begin{cases} 1 - x^2 & \text{if } |x| < 1 \\ 0 & otherwise \end{cases}$ Hence find the values of the followings: (16)

(i) $\int_0^\infty \frac{\sin t - t\cos t}{t^3} dt$ (ii) $\int_0^\infty \frac{\sin t - t\cos t}{t^3} \cos\left(\frac{t}{2}\right) dt$ &

(iii) $\int_0^\infty \left(\frac{\sin t - t\cos t}{t^3}\right)^2 dt$

(OR)

b) Show that the function $e^{-\frac{x^2}{2}}$ is self-reciprocal with respect to Fourier transform and also evaluate using convolution theorem technique, $\int_0^\infty \frac{x^2 dx}{(x^2+25)(x^2+9)}$. (16)

15. a) i) Find inverse Z-transform of $\frac{z^2}{(z^2+1)(z^2+4)}$ by partial fraction method. (8)

ii) Solve the difference equation $u_{n+2} + 4u_{n+1} + 3u_n = 2^n$ with $u_0 = 0$, and $u_1 = 1$ using Z – transform. (8)

(OR)

b) i) Find the Z-transform of the function $f(n) = \frac{2n+3}{(n+1)(n+2)}$. (8)

ii) Find inverse Z transform of the function $\frac{8z^2}{(2z-1)(4z-1)}$ using convolution theorem. (8)

13. a) Write the requirements of an instrument amplifier and discuss how to design an instrumentation amplifier using three operational amplifiers and also mention the advantages of an Instrumentation Amplifier. (16)

(OR)

b) Compare the different types of ADC techniques and explain the operation of successive approximation type A/D converter with suitable diagram. (16)

14. a) Discuss the functional block diagram of voltage controlled oscillator (566) with neat diagram and derive the output frequency of VCO and also mention the applications of VCO. (16)

(OR)

b) Discuss the concept and operation of astable and monostable multivibrator using IC 555 with neat diagram and design a waveform generator using suitable multivibrator of IC 555 timer. (16)

15. a) i) Explain the concept and working of function generator IC 8038. (8)

ii) Explain in detail about the operation of LM380 power amplifier IC with neat diagram. (8)

(OR)

b) i) Compare the features and performance of Linear and Switching Regulators. (8)

ii) Describe the operation of LM 317 Voltage regulator with necessary diagram. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE302 – Linear Integrated Circuits

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the steps involved in the preparation of Silicon wafers.
2. Write the advantages of integrated circuits over discrete components.
3. Define: CMRR.
4. Write the importance of frequency compensation in practical op-amps.
5. Design a peak detector circuit using op-amp.
6. Why Sample and Hold Circuit is required for data converters?
7. Mention the applications of an IC 555 Timer.
8. Why VCO is called as voltage to frequency converter?
9. How does current boosting is achieved in a IC 723?
10. List the features of opto-coupler ICs.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the steps used in preparation of silicon wafer with neat diagram. (8)

ii) Describe the photolithography process with neat diagram. (8)

(OR)

b) i) Explain the process of oxidation in IC fabrication. (8)

ii) Explain how epitaxial layer is grown during IC fabrication. (8)

12. a) i) Discuss the characteristics of an ideal op-amp. (8)

ii) Describe the operation of a differential amplifier with neat diagram. (8)

(OR)

b) i) Discuss the functions of all the basic building blocks of an operational amplifier. (8)

ii) Explain the operation of an integrator with neat diagram. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22MA302 – Statistics and Numerical Methods

(Statistical tables may be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the mode for the following

Class interval:	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency:	5	8	7	12	28	20	10	10

2. Define about skewness.
3. Define null hypothesis.
4. List any two uses of t-distribution.
5. Write the condition for convergence in Newton-Raphson method.
6. Write the Newton's formula to find y′ *when* $x = x_0$.
7. Given $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$ Find y(0.2) by Euler's method.
8. Write the Milne's predictor corrector formula.
9. Classify the P.D.E $xf_{xx} + yf_{yy} = 0, x > 0, y > 0.$
10. Write the formula to solve the Poisson equation.
    $u_{xx} + u_{yy} = f(x, y)$

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Using the method of least squares find the best fitting straight line y=ax+b to the data below (8)

X:	5	10	15	20	25
Y:	16	19	23	26	30

ii) Calculate the first 3 moments about the mean for the following data. (8)

X:	0	1	2	3	4	5	6	7	8
Y:	1	8	28	56	70	56	28	8	1

(OR)

b) i) Fit a straight line y=ax+b by method of least squares to the following data (8)

X:	0	1	2	3	4
Y:	1	1.8	3.3	4.5	6.3

ii) For a distribution, the mean is 10, variance is 16 and $\gamma_1 = 1$. Obtain the first 3 moments about the origin. (8)

12. a) i) In a city A, 20% of a random sample of 900 school boys had a slight physical defect. In another city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? (8)

ii) Two independent samples of sizes 8 and 7 contained the following values, (8)

Sample 1: 19 17 15 21 16 18 16 14

Sample 2: 15 14 15 19 15 18 16 --

Is the difference between the samples means significant?

(OR)

b) i) Two random samples gave the following data (8)

	Size	mean	variance
Sample1:	8	9.6	1.2
Sample2:	11	16.6	2.5

Could both the samples be from populations with the same variance?

ii) (8)

Machine :	A	B	C	D
Production time :	1 hour	1 hour	2 hours	3 hours
No.of defectives :	12	30	63	98

Do the figures indicate a significant difference in the performance of machines?

13. a) i) Solve the following system of equations by Gauss elimination method (8)

$$x + 2y + z = 3; 2x + 3y + 3z = 10; 3x - y + 2z = 13$$

ii) Find the value of y at x=6 from the following data, using Newton's interpolation formula (8)

x:	1	2	7	8
y:	1	5	5	4

(OR)

b) i) Find the value of y at x = 21 from the following data by using Newton's method. (8)

x:	20	23	26	29
y:	0.3420	0.3907	0.4384	0.4848

ii) Evaluate $I = \int_0^6 \frac{1}{1+x^2}\,dx$ using Simpson's 1/3 rule by dividing the range of integration into six equal parts. (8)

14. a) i) Solve $\frac{dy}{dx} = x + y, given\ y(1) = 0$ and find y(1.1) by Taylor's series method. (8)

ii) Using Adam's method find y (0.4) given (8)
$\frac{dy}{dx} = \frac{xy}{2}$, $y(0) = 1.$ $y(0.1) = 1.01, y(0.2) = 1.022, y(0.3) = 1.023$

(OR)

b) i) Using modified Euler's method, find y (0.1) given $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$ (8)

ii) Given $\frac{dy}{dx} = x + y, given\ y(0) = 1.$ Determine y (0.1) by R.K. method of order four. (8)

15. a) Solve $u_{xx} = u_{tt}\ given$ (16)
$u(x,0) = 0, u_t(x,0) = 0,\ u(0,t) = 0\ and\ u(1,t) = 100\ sin\pi t,$
Find the values of 'u' for four time steps with h=0.25.

(OR)

b) Solve $u_{xx} + u_{yy} = 0$ over the square mesh of side 4 units satisfying the following boundary conditions. (16)
$(i)\ u(0,y) = 0\ for\ 0 \le y \le 4, (ii) u(4,y) = 12 + y\ for\ 0 \le y \le 4,$
$(iii)\ u(x,0) = 3x\ for\ 0 \le x \le 4, (iv) u(x,4) = x^2\ for\ 0 \le x \le 4,$

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22MA303 – Probability and Numerical Methods

(Use of Statistical tables are Permitted)

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. The mean and standard deviation of the binomial distribution are 5 and 2. Find the distribution.
2. The number of monthly breakdowns of a computer is a random variable having a Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month without any breakdown.
3. First four moments about mean of a distribution are 0, 2.5, 0.7 and 18.75. Find coefficient of skewness and kurtosis.
4. What is the Least Squares Method in statistics, and how is it used?
5. Define Type – I error and Type – II errors.
6. List the Characteristics of F-distribution.
7. What is the criterion for convergence of Newton-Raphson method?
8. Using Gauss elimination method, solve $5x+4y=15, 3x+7y=12$.
9. What is inverse interpolation?
10. What do you mean by trapezoidal rule?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A radar unit is used to measure speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 km/hr and a standard deviation of 10 km/hr. What is the probability that a car picked at random is travelling at more than 100 km/hr? (8)

ii) State and Prove Chebyshev's Inequality. (8)

(OR)

b) i) The joint probability density function of two random variables X & Y is given by $f(x,y)=\left\{x\left(\frac{1+3y^2}{4}\right)\right.$, $0<x<2$, $0<y<1$. (8)

Find the marginal densities and conditional density function $f\left(\frac{x}{y}\right)$

ii) From the following data (8)

a) Find the two regression lines.

b) The co efficient of correlation between the marks in economics and statistics.

Marksin Economics:	25	28	35	32	31	36	29	38	34	32
Marksin Statistics:	43	46	49	41	36	32	31	30	33	39

12. a) i) Find the moment generating function X having the PDF (8)

$$f(x)=\begin{cases} x & ,0<x<1 \\ 2-x & ,1<x<2 \\ 0 & ,otherwise \end{cases}$$

ii) Explain the terms skewness and kurtosis in statistics. (8)

(OR)

b) i) By the method of least squares find the straight line to the data given below (8)

x	5	10	15	20	25
y	16	19	23	26	30

ii) By the method of least squares find a parabola to the data given below (8)

x :	1	2	3	4	5
y :	5	12	26	60	97

13. a) i) The mean lifetime of a sample of 100 light tubes produced by a company is found to be 1580 hours with standard deviation of 90 hours. Test the hypothesis that the mean lifetime of the tubes produced by the company is 1600 hours. (8)

ii) The height of six randomly chosen sailors are (in inches): 63, 65, 68, 69, 71 and 72. Those of 10 randomly chosen soldiers are 61, 62, 65, 66, 69, 69, 70, 71, 72 and 73. Discuss, the height that these data thrown on the suggestion that sailors are on the average taller than soldiers. (8)

(OR)

b) i) Two independent samples of sizes 9 and 7 from a normal population had the following values of the variables. (8)

Sample I : 18 13 12 15 12 14 16 14 15

Sample II : 16 19 13 16 18 13 15

ii) Test of fidelity and selectivity of 190 radio receivers produced the results shown in the following table. (8)

Fidelity

Selectivity	Low	Average	High	Total
Low	6	12	32	50
Average	33	61	18	112
High	13	15	0	28
Total	52	88	50	190

Use the 0.01 level of significance to test whether there is a relationship between fidelity and selectivity.

14. a) i) Compute two iterations for the function $f(x) = x^3 - 5x + 1 = 0$ using the secant method, in which the real roots of the equation f(x) lies in the interval (0, 1). (8)

ii) Determine the root of the given equation $x^2-3 = 0$ for $x \in [1, 2]$ by bisection method. (8)

(OR)

b) i) Solve the system of equations (8)
$x_1 + x_2 + x_3 = 1$, $3x_1 + x_2 - 3x_3 = 5$ and $x_1 - 2x_2 - 5x_3 = 10$ by LU decomposition method.

ii) Solve the following system of equations by Gauss-Siedal method of Iteration. (8)

$$27x + 6y - z = 85,\ x + y + 54z = 110,\ 6x + 15y + 2z = 72.$$

15. a) i) Find the value *f(3)* by using Lagrange's formula from (8)

x :	0	1	2	5
$f(x)$:	2	3	12	147

ii) The population of a town is as follows: (8)

x year	1941	1951	1961	1971	1981	1991
y Population in thousands	20	24	29	36	46	51

Estimate the population during the period 1946.

(OR)

b) i) Approximate the area under the curve y = f(x) between x =0 and x=8 using Trapezoidal Rule with n = 4 subintervals. A function f(x) is given in the table of value (8)

x	0	2	4	6	8
f (x)	3	7	11	9	3

ii) Evaluate $\int_0^{2\pi} \sin x dx$ by dividing the range in to ten equal parts,using Simpson's one-third rule, (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22MA301 – Transforms and Numerical Methods

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the Fourier transform pair.
2. Find the Fourier cosine transform of e^{-x}.
3. Find the Laplace transform of $t\cos 4t$.
4. Find the inverse Laplace transform of $\frac{s-2}{s^2-4s+5}$
5. Using Newton-Raphson method to find an iterative formula for $\sqrt{N}, N > 0$
6. State Lagrange's interpolation formula.
7. State the order of errors in Trapezoidal rule and Simpson's rule.
8. Using Euler's method to find $y(0.25)$ if $\frac{dy}{dx} = 2xy,\ y(0) = 1$ with $h = 0.25$.
9. State the explicit scheme formula for the solution of one dimensional wave equation.
10. What is the purpose of Liebmann's iteration process?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Determine the Fourier transform of $f(x)$if $f(x) = \begin{cases} 1-x^2 \text{if} |x| \le 1 \\ 0 \quad \text{if } |x| > 1 \end{cases}$. (10)

Hence prove that $\int_0^\infty \frac{\sin s - s\cos s}{s^3}\cos\left(\frac{s}{2}\right) ds = \frac{3\pi}{16}$.

ii) Use Parseval's identity to evaluate $\int_0^\infty \frac{dx}{(x^2+4)^2}$. (6)

(OR)

b) i) Prove that $f(x) = e^{-\frac{x^2}{2}}$ is self reciprocal under Fourier transform. (10)

ii) Determine the Fourier sine transform of $f(x) = \begin{cases} x & \text{if } 0 < x < 1 \\ 2-x & \text{if } 1 \le x < 2 \\ 0 & \text{if } x \ge 2. \end{cases}$ (6)

12. a) i) Verify the initial and final value theorem for the function (8)
$$f(t) = 1 + e^{-t}(\sin t + \cos t).$$

ii) Find the Laplace transform of the "square wave" function $f(t)$ is defined by $f(t) = \begin{cases} k \text{ if } 0 \le t \le a \\ -k \text{ if } a < t \le 2a \end{cases}$ and $f(t+2a) = f(t)$ for all t. (8)

(OR)

b) i) Use convolution theorem, find $L^{-1}\left[\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right]$. (8)

ii) Solve $y'' - 3y' + 2y = e^{-t}$ given $y(0) = 1,\ y'(0) = 0$ using Laplace transform. (8)

13. a) i) Solve the following system of linear equation by Gauss elimination method: $2x + 3y - z = 5;\ 4x + 4y - 3z = 3\ ;\ 2x - 3y + 2z = 2$ (8)

ii) Solve the following system of equation by Gauss Seidel method: (8)
$10x - 5y - 2z = 3;\ 4x - 10y + 3z = -3;\ x + 6y + 10z = -3.$

(OR)

b) i) The following data are taken from the steam table. (8)

Temperature	140	150	160	170	180
Pressure	3.685	4.854	6.302	8.076	10.225

Find the pressure at temperature $t = 142^o$ and $t = 175^o$.

ii) Using Newton's divided difference formula to estimate the value of $f(3)$ from the following data (8)

x	1	2	4	6
$f(x)$	−26	12	256	844

14. a) i) Determine $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 51$ from the following data. (8)

x	50	60	70	80	90
y	19.96	36.65	58.81	77.21	94.61

ii) Divide the range in to 6 equal parts, to find $\int_0^6 \frac{dx}{1+x}\,dx$ using Trapezoidal and Simpson's rule. Compare with the actual integration. (8)

(OR)

b) i) Use Fourth order Runge-Kutta method to find $y(0.2)$, $y(0.4)$ if $\frac{dy}{dx} = x^3 + y, y(0) = 2$ (assume $h = 0.2$). (8)

ii) Given that $\frac{dy}{dx} = x^2(1+y); y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548$ and $y(1.3) = 1.979$, determine the value of $y(1.4)$ by using Adams-Bashforth method. (8)

15. a) Solve by Crank Nicholoson method: $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$, subject to given $u(0,t) = 0, u(x,0) = 0$ and $u(1,t) = t$, for two time steps, assume $h = \frac{1}{4}$. (16)

(OR)

b) Solve the Laplace equation $u_{xx} + u_{yy} = 0$ with $u(x,0) = 3x, u(4,y) = 12 + y, u(0,y) = 0, u(x,4) = x^2$ for $0 \leq x, y \leq 4$. Find the values of $u(i,j), i = 1,2,3$ and $j = 1,2,3$ correct upto two decimal places. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E.Degree Examinations –Nov/Dec 2024

II Semester (Part Time)

(2016 Regulations)

COMMON TO ALL BRANCHES

16PTMA201 – Mathematics - II

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. State Dirichlet's conditions for a function f(x) to be expanded as Fourier series.
2. If the Fourier series of the function $f(x) = x + x^2$ in the interval $(-\pi, \pi)$ is $\frac{\pi^2}{3} + \sum_{n=0}^{\infty}(-1)^n\left[\frac{4}{n^2}\cos nx - \frac{2}{n}\sin nx\right]$, then find the value of the series $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \cdots$
3. Write down the various solutions of two dimensional heat equation.
4. Classify the partial differential equation $(1-x^2)u_{xx} - 2xyu_{xy} + (1-y^2)u_{yy} + xu_x + 3x^3u_y - 2u = 0, x > 0 \,\&\, y > 0.$
5. Find the Laplace transform of $\frac{t}{e^t}$.
6. Find inverse Laplace transform of "$\cot^{-1} s$ ".
7. State Fourier integral theorem.
8. If $F[f(x)] = \varphi(s)$, then find $F[xf(x)]$.
9. Find the Z-transform of $\frac{1}{n!}$.
10. Form the difference equation by eliminating arbitrary constants from $y_n = a2^n + 5$.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Determine the Fourier series of the function $f(x) = |\cos x|$ in the interval $-\pi < x < \pi$. (8)

ii) Find half range sine series of $f(x) = x^2 in(0, \pi)$. (8)

(OR)

b) i) Find the half range cosine series of $f(x) = (\pi - x)^2$ in the interval $(0, \pi)$. Hence find the value of the series $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \cdots$. (8)

ii) Compute the first harmonic of the function f(x) from the given table: (8)

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
f(x)	1	1.4	1.9	1.7	1.5	1.2	1

12. a) A string is stretched and fastened to two points x = 0 and x = l apart. Motion is started by displacing the string into the form $y = k(lx - x^2)$ from which it is released at time $t = 0$. Find the displacement of any point on the string at a distance of x from one end at time t. (16)

(OR)

b) A bar l cm long with insulated sides has its ends A & B maintained at the temperature 30°C & 80°C respectively until steady state conditions prevail. The temperature at A is suddenly raised to 40°C and at the same time temperature at A is lowered to 60°C. Find the temperature distribution in the bar, $u(x, t)$. (16)

13. a) i) Find the Laplace transform of the function $f(t) = \begin{cases} tin\ 0 \le t \le a \\ 2a - tina \le t \le 2a' \end{cases}$ where $f(t) = f(t + 2a)$ for all 't'. (8)

ii) Solve the ordinary differential equation using Laplace transform $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 8y = e^{2t}, given y(0) = 2 \& y'(0) = -2$. (8)

(OR)

b) i) Identify the Laplace transform of the function $\frac{e^{at} - \cos bt}{t}$. (8)

ii) Using Convolution theorem, find inverse Laplace transform of the function $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$. (8)

14. a) Find the Fourier transform of $f(x)$, defined as, $f(x) = \begin{cases} 1 - x^2 & \text{if } |x| < 1 \\ 0 & otherwise \end{cases}$ Hence find the values of the followings: (16)

i) $\int_0^\infty \frac{\sin t - t\cos t}{t^3} dt$ ii) $\int_0^\infty \frac{\sin t - t\cos t}{t^3} \cos\left(\frac{t}{2}\right) dt$ &

iii) $\int_0^\infty \left(\frac{\sin t - t\cos t}{t^3}\right)^2 dt$

(OR)

b) Show that the function $e^{-\frac{x^2}{2}}$ is self-reciprocal with respect to Fourier transform. Also using convolution theorem technique, evaluate $\int_0^\infty \frac{x^2 dx}{(x^2+25)(x^2+9)}$ (16)

15. a) i) Find inverse Z-transform of $\frac{z^2}{(z^2+1)(z^2+4)}$ by partial fraction method. (8)

ii) Solve the difference equation $u_{n+2} + 4u_{n+1} + 3u_n = 2^n$ with $u_0 = 0$, and $u_1 = 1$ using Z – transform. (8)

(OR)

b) i) Find the Z-transform of the function $f(n) = \frac{2n+3}{(n+1)(n+2)}$. (8)

ii) Find inverse Z transform of the function $\frac{8z^2}{(2z-1)(4z-1)}$ using convolution theorem. (8)

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B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

CIVIL ENGINEERING/MECHANICAL ENGINEERING

23PTMA301 – Numerical Methods

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Solve $5x - 3y = 8$; $3x + y = 2$ by Gauss-Jordan method.
2. Find the interval in which a real root of the equation $x^3 + x^2 - 1 = 0$ lies.
3. Define Newton's forward interpolation formula.
4. If $f(x) = \frac{1}{x^2}$, find the divided difference $f(a, b)$ and $f(a, b, c)$.
5. Using Trapezoidal rule to evaluate $\int_0^1 x^3 dx$ by dividing into 2 equal parts.
6. Write Simpson's 3/8 formula for numerical integration.
7. Why do we need numerical methods to solve differential equations?
8. State the modified Euler's formula.
9. Name the two methods that you can solve one dimensional heat equation.
10. State one dimensional wave equation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find a positive root of $x^3 - 6x + 4 = 0$ by Newton Raphson method correct to four decimal places. (8)

ii) Solve the equations by Gauss elimination Method: (8)
$x + y + z = 9$; $2x - 3y + 4z = 13$; $3x + 4y + 5z = 40$.

(OR)

b) i) Find the inverse of the following matrix by Gauss-Jordan method. (8)

$$\begin{bmatrix} 2 & 1 & 2 \\ 2 & 2 & 1 \\ 1 & 2 & 2 \end{bmatrix}$$

ii) Solve the equations by Gauss-Seidel Method: (8)
$x + y + 54z = 110$; $27x + 6y - z = 85$; $6x + 15y + 2z = 72$.

12. a) i) Using Lagrange's interpolation formula to find a polynomial $f(x)$ for the following data and also find $f(1)$. (8)

x	-1	0	2	3
$f(x)$	-8	3	1	12

ii) From the following table, find $f(5)$. (8)

x	0	1	3	6
$f(x)$	1	4	88	1309

(OR)

b) i) Determine the value of $f(22)$ given that (8)

x	20	25	30	35	40	45
$f(x)$	354	332	291	260	231	204

ii) The following table gives the value of the density of saturated water for various temperature of saturated stream (8)

Temperature °C	100	150	200	250	300
Density kg/m^3	958	917	865	799	712

Find the density of water when the temperature is 275°C.

13. a) i) Find the first two derivatives of $f(x)$ at $x = 1.5$ by using Newton's forward interpolation formula from the following data. (8)

x	1.5	2	2.5	3	3.5	4
$f(x)$	3.375	7	13.625	24	38.875	59

ii) The evaluate $\int_{-1}^{1} \frac{dx}{1+x^2}$ using trapezoidal rule by dividing into 8 subintervals. (8)

(OR)

b) i) By dividing the range into 10 equal parts evaluate $\int_0^{\pi} sinx\, dx$by using Simpson's one-third rule. (8)

ii) Evaluate the $\int_2^3 \frac{dt}{1+t}$ using Gaussian two-point formula and three-point formula. (8)

14. a) Compute $y(0.2)$ given $\frac{dy}{dx} = y - x$, $y(0) = 2$, by fourth order Runge-Kutta method, assuming that $h = 0.1$. (16)

(OR)

b) Given $\frac{dy}{dx} = x(x^2 + y^2)e^{-x}$, $y(0) = 1$, find y at $x = 0.1, 0.2, 0.3$ by Taylor's series method and compute $y(0.4)$ by Milne's method. (16)

15. a) Solve the Poisson Equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 8x^2y^2$ for the square mesh given $u = 0$ on the 4 boundaries dividing the square into 16 sub-squares of length one unit. (16)

(OR)

b) Solve by Crank-Nicholson method the equation $u_{xx} = u_t$ subject to $u(x, 0) = 0, u(0, t) = 0$ and $u(1, t) = t$, for two time steps. (16)

Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12MA301 – Mathematics - III

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Form the partial differential equation from $z = (x + a)(y + b)$ by eliminating the arbitrary constant.
2. Find the complete solution of $z = px + qy + p^2 + q^2$.
3. State Dirichlet's condition for a given function f(x) to be expanded in Fourier series.
4. In the Fourier series expansion of $f(x) = x^2 - 3$ in $(-\pi, \pi)$, what is the value of b_2.
5. Write down the all possible solutions of the one-dimensional heat flow equation.
6. An insulated rod has of length 30 cm has its end at A and B maintained at 10°C and 100°C respectively. Find the steady state solution of the rod.
7. If F [f(x)] =F(s), then prove that $F\{e^{iax} f(x)\} = F(s + a)$
8. Find the Fourier sine transform of the function e^{-2x}.
9. Find the Z-transform of $(-1)^n$.
10. State the final value theorem on Z-transform.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Form the partial differential equation by eliminating from $z = xy + f(x^2 + y^2 + z^2)$ (8)

ii) Solve: $z = p^2 + q^2$. (8)

(OR)

b) i) Solve: $x(y - z)p + y(z - x)q = z(x - y)$. (8)

ii) Solve: $p + q = pq$ (8)

12. a) i) Find the Fourier series for $f(x) = x^2 \ in \ -\pi < x < \pi$ (8)

ii) Find the Half-Range cosine series for $f(x) = x(\pi - x)$ in $(0, \pi)$ (8)

(OR)

b) Find the cosine series for $f(x) = x$ in $(0, \pi)$ and then using Parseval's theorem, Show that $\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \ldots \infty$ (16)

13. a) A rod 30 cm long has its ends A and B kept at 20°C and 80°C respectively, until steady state condition prevails. The temperature at each end is then suddenly reduced to 0°C and kept so. Find the resulting temperature function $u(x,t)$ taking $x = 0$ at A. (16)

(OR)

b) An infinitely long rectangular plate with insulated surface is 10 cm wide. The two long edges and one short edge are kept at zero temperature, while the other short edge $x = 0$ is kept at temperature given by $u = \begin{cases} 20y & 0 \le y \le 5 \\ 20(10-y) & 5 \le y \le 10 \end{cases}$ (16)

Find the steady state temperature distribution in the plate.

14. a) Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2 \; in \; |x| \le 1 \\ 0 \quad\quad |x| > 1 \end{cases}$. (16)

Hence prove that $\int_0^\infty \frac{\sin s - s\cos s}{s^3} . cos\left(\frac{s}{2}\right) ds = \frac{3\pi}{16}$.

(OR)

b) i) Find Fourier cosine transform of $e^{-\frac{x^2}{2}}$. (8)

ii) Evaluate: $\int_0^\infty \frac{dx}{(x^2+16)(x^2+25)}$ using Fourier transform. (8)

15. a) i) Find $Z\left[\frac{2n+3}{(n+1)(n+2)}\right], n > 0$ (8)

ii) Using convolution theorem, find the inverse Z-transform of $\frac{8z^2}{(2z-1)(4z-1)}$. (8)

(OR)

b) Using Z-transform solve difference equation $y(n+2) + 4y(n+1) + 2y(n) = 3^n$. Given that $y(0) = 0$ and $y(1) = 1$. (16)

Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12MA401 – Numerical Methods

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the Newton-Raphson formula to find $\sqrt[3]{N}$, Where N is Positive integer?
2. Solve the following system by Gauss- Jordan method: $x + y = 3, 7x - 3y = 4$.
3. Find the second-degree polynomial through the points $(0,0), (1,1), (2,20)$ using Lagrange's formula.
4. State Newton's backward formula for interpolation.
5. Write the Newton's forward formula for $\frac{dy}{dx}$ *and* $\frac{d^2y}{dx^2}$ at $x = x_0$.
6. Find the area bounded by the curve $y = x^3$ and the X- axis from $x = 0$ *to* $x = 2$ with $h = 0.5$ using Trapezoidal rule.
7. Determine the value of y at $x = 0.1$ by Euler's method $y' = -y^2$ and $y(0) = 1$.
8. State the disadvantage of Taylor's series method.
9. Write down the Crank-Nicolson formula to solve $u_t = u_{xx}$.
10. Write the standard five-point formula to solve Laplace equation $u_{xx} + u_{yy} = 0$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the positive root of $3x = \sqrt{1 + \sin x}$ corrected to three decimal places by iterative method. (8)

ii) Find the real positive root of $3x - \cos x - 1 = 0$ by Newton- Raphson method correct to six decimal places. (8)

(OR)

b) i) Solve the system of equations by Gauss- Seidel method (correct to 3 decimal places): $8x - 3y + 2z = 20, 4x + 11y - z = 33, 6x + 3y + 12z = 35$. (8)

ii) Solve the equations by Gaussian Elimination method: $10x + y + z = 12, 2x + 10y + z = 13, 2x + 2y + 10z = 14$. (8)

12. a) i) Using Newton's divided difference formula find the missing value from the table: (8)

x:	1	2	4	5	6
y:	14	15	5	–	9

ii) From the given data below, find the number of students whose weight lies between 60 and 70: (8)

Weight in lbs :	0 – 40	40 – 60	60 – 80	80 – 100	100 – 120
y :	250	120	100	70	50

(OR)

b) i) Using Lagrange interpolation formula find $f(4)$ given that (8)
$f(0) = 2, f(1) = 3, f(2) = 12, f(15) = 3587$

ii) Using Newton's forward interpolation formula, find $f(2)$ for the following data. (8)

x :	0	5	10	15
y :	14	379	1444	3584

13. a) i) The following data gives the velocity of a particle for 20 seconds at interval of 5 seconds. Find the initial acceleration using the entire data (8)

Time	0	5	10	15	20
Velocity	0	3	14	69	228

ii) Calculate the value of the integral $\int_{2.5}^{4} ln\,(x)\,dx$ using trapezoidal rule with 5 subintervals. (8)

(OR)

b) i) Compute the value of $\int_1^2 \frac{dx}{x}$ using Simpson's rule and Trapezoidal rule by taking $h = 0.25$. (8)

ii) Apply Gaussian three-point formula to evaluate $\int_{-1}^{1} \frac{dx}{1+x^2}$. (8)

14. a) i) Using Taylor's series method find $y(0.2)\ for \frac{dy}{dx} = y^2 + x^2$ with $y(0) = 1$. (8)

ii) Using modified Euler's method, compute $y(0.1)$ with $h = 0.1$ from $y' = y - \frac{2x}{y}, y(0) = 1$. (8)

(OR)

b) i) Using R.K. method of fourth order find $y(0.1)$ for the initial value problem $\frac{dy}{dx} = x + y^2$, $y(0) = 1$. (8)

ii) Using Milne's method find $y(2)$ if $y(x)$is the solution of $\frac{dy}{dx} = \frac{1}{2}(x + y)$ given $(0) = 2, y(0.5) = 2.636, y(1) = 3.595\ and\ y(1.5) = 4.968$. (8)

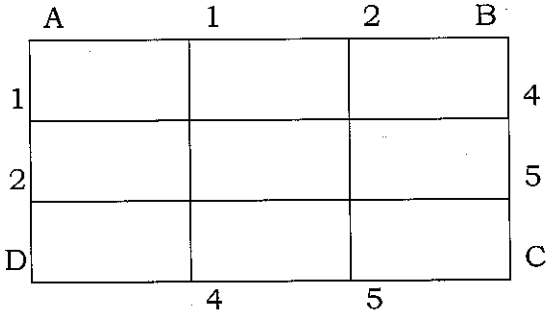
15. a) i) Using Bender- Schmidt's method solve $\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial u}{\partial t} = 0$ given $u(0,t) = 0, u(4,t) = 0, u(x,0) = x(4-x)$. Assume $h = 1$. Find the values of u up to $t = 5$. (8)

ii) Approximate the solution to the wave equation (8)
$\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}, 0 < x < 1, t > 0$ with $u(0,t) = u(1,t) = 0, t > 0$ and $u(x,0) = \sin 2\pi x, 0 \leq x \leq 1$ and $\frac{\partial u}{\partial t}(x,0) = 0, 0 \leq x \leq 1$ taking $\Delta x = 0.25$ *and* $\Delta t = 0.25$ for 3-time steps.

(OR)

b) i) Using Crank-Nicholson's scheme, solve $u_{xx} = 16u_t,\ 0 < x < 1, t > 0$ (8)
given $u(x,0) = 0, u(0,t) = 0, u(1,t) = 100t$. Compute u for one step in t direction taking $h = 0.25$.

ii) Solve $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values (8)
as shown in the figure below.



Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MA403 – Probability and Statistical Methods

(Tables of Normal, t test, F test & Chi square to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Bag I contains 2 red 1 black balls and bag II contains 3 red and 2 black balls. What is the probability that a ball drawn from one of the bags is red?
2. Verify whether the function $f(x) = \begin{cases} |x| & in\ -1 \le X \le 1 \\ 0 & ,\ elsewhere \end{cases}$ can be the probability density function of a continuous random variable.
3. If X follows exponential distribution with parameter 1 then find P[|x|<1].
4. State Chebyshev's inequality.
5. List the types of correlation.
6. The regression equations of X on Y and Y on X are respectively 5 x – y = 22 and 64 x – 45 y = 24, find the means of X and Y.
7. Find the Quartile coefficient of skewness in a series where Q_1 = 18, Q_3 = 25, mode = 21 and mean = 18.
8. Define Leptokurtic and Platykurtic.
9. A coin is tossed 400 times and it turns up head 216 times. If the coin is unbiased one then find the test statistic of single proportion.
10. Mention the conditions for applying in Chi-square test.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A box contains 2000 components of which 15% are defective. A second box contains 5000 components of which 25% are defective. Two other boxes contains 1000 components of which 10% are defective. A box is chosen at random and an item selected was found to be defective. Find the probability that this has come from the second box. (8)

ii) A random variable has the probability density function (8)
$f(x) = \begin{cases} 2e^{-2x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$ then find the moment generating function and first four moments about origin.

(OR)

b) i) A random variable X has the following probability distribution: (8)

x	- 2	- 1	0	1	2	3
P(x)	0.1	k	0.2	2k	0.3	3k

a) Find value of k b) Evaluate P(X<2) and P(- 2 < x < 2)
c) Evaluate the mean of X.

ii) A continuous random variable has a probability density function (8)
$f(x) = kx^2e^{-x}$, $x \geq 0$ then determine the value of k, mean and variance.

12. a) i) Obtain the moment generating function, mean and variance of the (8)
exponential distribution.

ii) After correcting the proofs of the first 50 pages of a book, it is found (8)
that on the average there are 3 errors per 5 pages. Use Poisson distribution and estimate the number of pages 0, 1, 2 errors in the whole book of 1000 pages.

(OR)

b) i) The weekly wages of 1000 workmen are normally distributed around (8)
a mean of Rs.70 with a S.D. of Rs.5. Estimate the number of workers whose weekly wages will be i) between Rs. 69 and Rs.72 ii) less than Rs.69 iii) more than Rs.72.

ii) The number of planes landing at an airport in a 30 minutes interval (8)
obeys the Poisson law with mean 25. Use Chebychev's inequality to find the least chance that the number of planes landing within a given 30 minutes interval will be between15 and 25.

13. a) The joint distribution of X and Y is given by (16)
$f(x,y) = \frac{x+y}{21}$, $x = 1,2,3$ *and* $y = 1,2$. Find the marginal distributions of X and Y , conditional distributions of Y for X = x, also evaluate P (X + Y $\leq$ 3).

(OR)

b) Two random variables X and Y having the joint density function (16)
$f(x,y) = \begin{cases} \frac{3}{2}(x^2+y^2), & 0 \leq x \leq 1, \ 0 \leq y \leq 1 \\ 0, & Otherwise \end{cases}$
then calculate the correlation coefficient r (X , Y).

14. a) i) Compute the Karl Pearson's coefficient of Skewness from the data given below: (8)

value	10	20	30	40	50	60	70
frequency	1	5	12	22	17	9	4

ii) Find the first four moments about a value 25 for the given data of weakly income of ten carpenters. (8)

Rs.	No. of carpenters
0 – 10	1
10 – 20	3
20 – 30	4
30 – 40	2

(OR)

b) Fit a second degree parabola to the following data, taking x as independent variable by method of least squares. (16)

x	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	11	10	0

15. a) i) In a simple sample of 600 men from a large city, 400 are found to be car owners. In one of 900 from another city, 450 are car owners. Do the data indicate that the cities are significantly different with respect to car owning among men? (8)

ii) A random sample of 10 boys had the following I.Q.'s 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. of 100? (8)

(OR)

b) i) The following table gives the number of units produced per day by two workers A and B for a number of days. (8)

A	42	32	40	43	40	37		
B	41	40	43	35	34	41	42	36

Should these results be accepted as evidence that B is more stable water?

ii) The theory predicts the population of beans in the four groups A, B, C & D should be 9:3:3:1. In an experiment among 1600 beans, the number in the four groups were 882, 313, 287 & 118. Does the experimental result support the theory? (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22MA402 – Probability and Stochastic Processes

(Statistical Table is permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. If a random variable X takes values $1, 2, 3, 4$ such that $2P(X = 1) = 3P(X = 2) = P(X = 3) = 5P(X = 4)$. Find the probability distribution of X.
2. The pdf of a continuous random variable X is given by $f(x) = \begin{cases} ke^{-x} & 0 \le x \le \infty \\ 0 & otherwise \end{cases}$. Find k.
3. Let X be binomial random variable with $E[X] = 5$ and $Var(X) = 4$. Determine the distribution.
4. Find the Moment generating function of $f(x) = \frac{1}{2a}, -a < x < a$.
5. The joint probability mass function of two random variables X and Y is given by $p(x, y) = \begin{cases} kxy, & x = 1,2,3; y = 1,2,3 \\ 0 & otherwise \end{cases}$. Determine the value of the constant k.
6. If X and Y are independent random variables with $Var(X) = 2$ and $Var(Y) = 3$, then find $Var\ (3X + 4Y)$.
7. State Liapounoff's form of central limit theorem.
8. State strong law of large numbers.
9. Define Wide sense stationary Process.
10. Define Power spectral density.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A consulting firm rents car from three agencies such that 50% from agency L, 30% from agency M and 20% from agency N. If 90% of the cars from L, 70% of cars from M and 60% of the cars from N are in good conditions (8)

i) What is the probability that the firm will get a car in good condition?

ii) If a car is in good condition, what is probability that it has come from agency N?

ii) A continuous random variable X has the distribution function (8)

$$F(x) = \begin{cases} 0 & x < 0 \\ x & 0 \le x < 1. \\ 1 & 1 \le x \end{cases}$$

Find *i*) the probability density function.

ii) $P(0.2 \le X \le 0.7)$.

(OR)

b) i) A discrete random variable has the following probability distribution. (8)

x	-2	-1	0	1	2	3
$p(x)$	0.1	k	0.2	$2k$	0.3	$3k$

i) Find the value of k.

ii) Find $P(X < 2)$

iii) $P(-2 < X < 2)$

iv) Find the distribution function of X.

v) Find the mean value of X.

ii) Let X be the number occur when a die is thrown. Find the moment generating function and hence find the Mean and Variance of X. (8)

x	1	2	3	4	5	6
$p(x)$	1/6	1/6	1/6	1/6	1/6	1/6

12. a) i) On the average, 20% of the products manufactured by ABC Company are found to be defective. If we select 6 of these products at random and X denotes the number of defective products find the probability that (8)

i) two products are defective

ii) at most one product is defective

iii) at least two products are defective.

ii) If 2% of electric bulbs manufactured by a certain company are defective find the probability that in a sample of 200 bulbs (8)

1. less than 2 bulbs are defective
2. more than 3 bulbs are defective.

$[e^{-4} = 0.0183]$

(OR)

b) i) The air pressure in a randomly selected tyre put on a certain model new car is normally distributed with mean value 31 psi and standard deviation 0.2 psi. (8)

a) What is the probability that the pressure for a randomly selected tyre

b) between 30.5 and 31.5 psi (b) between 30 and 32 psi

c) What is the probability that the pressure for a randomly selected tyre exceeds 30.5 psi?

ii) State and prove memory less property of exponential distribution. (8)

13. a) i) The joint probability distribution of X and Y is given by $p(x,y) = \frac{x+2y}{18}; x = 1,2;\ y = 1,2$. Find all the marginal distributions and $E(X)$. (8)

ii) Suppose the number of red lights Alex encounters each day to work is on average 4.8. Alex really will be late if he encounters 8 or more red lights. Let X be the number of lights he gets on a given day. Give a bound for $P(X \geq 8)$ using Chebyshev's inequality, if we also assume $Var(X) = 2.88$. (8)

(OR)

b) i) The Probability density function of random variables X and Y is given by $P(X = x, Y = y) = \begin{cases} \frac{x+y}{32} & ; x = 1,2, y = 1,2,3,4 \\ 0 & otherwise \end{cases}$. Compute the covariance of X and Y. (8)

ii) A biased coin, which lands heads with probability $1/10$ each time it is flipped, is flipped 200 times consecutively. Give an upper bound on the probability that it lands heads at least 120 times. (8)

14. a) i) The lifetime of a certain brand of an electric bulb may be considered as random variable with mean 1200 h and standard deviation 250 h. Using Central limit theorem, find the probability that the average life time of 60 bulbs exceed 1250 h. (8)

ii) If $X_1, X_2, \ldots, X_n$ are Poisson variates with parameter $\lambda = 2$, use central limit theorem to estimate $P(120 \leq S_n \leq 160)$ where $S_n = X_1 + X_2 + \cdots + X_n$ and $n = 75$. (8)

(OR)

b) i) Let $X_n \sim$ uniform $\left(0, \frac{1}{n}\right)$. Show that $X_n \xrightarrow{L^r} 0$, for any $r \geq 1$. (8)

ii) Consider a sequence $\{X_n, n = 1,2, \ldots\}$ such that (8)

X_n	0	n^2
$P(X_n)$	$1 - \frac{1}{n}$	$\frac{1}{n}$

Show that $i) X_n \xrightarrow{p} 0 (ii) X_n$ does not converge in the r^{th} mean for any $r \geq 1$.

15. a) Given the random process $X(t) = 10\cos(100t + \theta)$ where θ is uniformly distributed over $(-\pi, \pi)$. Prove that $\{X(t)\}$ is correlation ergodic. (16)

(OR)

b) Find the mean and variance of the stationary process whose ACF is given by (16)

i) $R_{XX}(\tau) = 16 + \frac{9}{1+6\tau^2}$

ii) $R_{XX}(\tau) = \frac{25\tau^2+36}{6.25\tau^2+4}$

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22MA401 – Discrete Mathematics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Show that the compound proposition $(\neg q \wedge (p \rightarrow q)) \rightarrow \neg q$ is a tautology.
2. Symbolize the statement "All men are mortal".
3. State Pigeon hole principle.
4. State principle of inclusion-exclusion for two sets.
5. List any two special types of graphs.
6. State "Hand Shaking Theorem".
7. Define an algebraic system.
8. Define Field.
9. State Distributive inequality property of the lattice $\{L, \leq\}$.
10. State absorption law in Boolean algebra B.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the principal disjunctive normal form of the statement $p \wedge \neg(q \wedge r)(p \rightarrow q)$. (8)

ii) Show that the conclusion $\forall x(P(x) \rightarrow \neg Q(x))$ follows from the premises $\exists x(P(x) \wedge Q(x)) \rightarrow \forall y(R(y) \rightarrow S(y)) \& \exists y(R(y) \wedge \neg S(y))$. (8)

(OR)

b) i) Show that $(t \wedge s)$ can be derived from the premises $p \rightarrow q,\ q \rightarrow \neg r, r,\ p \vee (t \wedge s)$. (8)

ii) Use the indirect method to prove that the conclusion $\exists z Q(z)$ follows from the premises $\forall x(P(x) \rightarrow Q(x)) \& \exists y P(y)$. (8)

12. a) i) How many solutions does the equation $x_1 + x_2 + x_3 - 11$ have, where x_1, x_2, x_3 are non-negative such that $x_1 \leq 3, x_2 \leq 4$ & $x_4 \leq 6$? Use the principal of inclusion-exclusion. (8)

ii) Prove that in any group of six people, at least three must be mutual friends or at least three must be mutual strangers. (8)

(OR)

b) i) Solve the recurrence relation (8)
$a_{n+2} - 6a_{n+1} + 9a_n = 3(2)^n + 7(3)^n, n \geq 0, a_0 = 1$ & $a_1 = 4$.

ii) Prove by mathematical induction that (8)
$1.2.3 + 2.3.4 + \cdots + n(n+1)(n+2) = \frac{1}{4}n(n+1)(n+2)(n+3)$

13. a) i) Prove that the number of vertices of odd degree in an undirected graph is even. (8)

ii) Determine whether the following pairs of graphs are isomorphic. Exhibit the isomorphism explicitly or prove that it does not exit. (8)

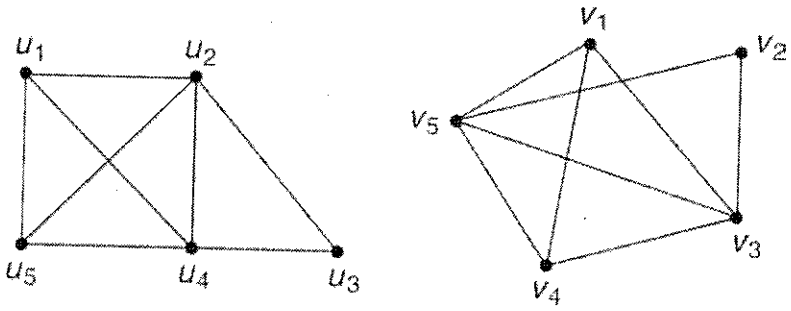


Figure.1.

(OR)

b) i) Prove that if a graph G (either connected or not) has exactly two vertices of odd degree, then there is a path joining these two vertices. (8)

ii) Prove that if a connected graph G is an Euler graph then every vertex of G is of even degree. (8)

14. a) i) Prove that the order of a subgroup of a finite group is a divisor of the order of the group. (8)

ii) Prove that a non-empty subset H of a group {G, *} is a subgroup if and only if $a, b \in H \Rightarrow a * b^{-1} \in H$. (8)

(OR)

b) i) If * is the binary operation on the set R of real numbers defined by $a * b = a + b + 2ab$, a) Find if {R, *} is a semigroup. Is it commutative? b) Find the identity element, if exists. c) Which elements have inverse and what are they? (8)

ii) If S = N x N, the set of ordered pairs of positive integers with the operation * defined by $(a, b) * (c, d) = (ad + bc, bd)$ and if $f: (S,*) \longrightarrow (Q,+)$ is defined by $f(a, b) = \frac{a}{b}$, show that f is a homomorphism. (8)

15. a) i) In a distributive lattice $\{L,\vee,\wedge\}$, if an element $a \in L$ has a complement, then it is unique. (8)

ii) Draw the Hasse diagram of the lattice $\{P(S), \subseteq\}$ in which the join and the meet are the operations ∪ and ∩ respectively, where $S = \{a, b, c\}$. Also identify a sublattice of this lattice with 4 elements. (8)

(OR)

b) i) Prove that if $\{L, \leq\}$ is a lattice, for any a, b, c $\in L$, $a \leq c \Leftrightarrow a \vee (b \wedge c) \leq (a \vee b) \wedge c$. (8)

ii) In a Boolean algebra, if $a + b = 1$ & $a.b = 0$, show that $b = a'$ (Here a' is the complement of a). (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & III Semester (Full Time)

(2022 Regulations)

ECE/EEE/METALLURGICAL ENGINEERING

22PH102 – Materials Science for Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define mobility.
2. State Wiedemann Franz law.
3. Differentiate between extrinsic and intrinsic semiconductor.
4. List few applications of Hall effect.
5. Define electrical susceptibility and give its unit.
6. What are polymeric dielectric materials?
7. Define Bohr magnetron.
8. Distinguish between type-I and type-II semiconductors.
9. What is shape memory alloy?
10. Write down few properties of carbon nanotubes.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Derive an expression for electrical conductivity and thermal conductivity of metals based on classical free electron theory.	(16)
		(OR)	
	b)	Explain density of states in metals and derive its carrier concentration.	(16)
12.	a)	Derive an expression for carrier concentration in N-type semiconductor.	(16)
		(OR)	
	b)	What is Hall effect? Derive an expression for Hall coefficient. Explain the experimental method to determine Hall coefficient?	(16)
13.	a)	Derive Langevin-Debye equation for polarization of materials.	(16)
		(OR)	
	b)	Derive an expression for internal field and hence deduce Clausius-Mosotti relation.	(16)

14. a) Explain domain theory of ferromagnetism. Apply the same to explain Hysteresis in ferromagnetic materials. (16)

(OR)

b) i) Write down BCS theory. (8)

ii) Describe the principle, construction and working of Magnetic levitation. (8)

15. a) Describe about the preparation methods of metallic glasses. Write down its properties and its applications. (16)

(OR)

b) i) Write a brief note about top down and bottom-up approach methods in the preparation of nanomaterials. (8)

ii) Explain the preparation of nanomaterial by Ball milling method. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D. Degree Examinations – Nov/Dec 2024

(2022 Regulations)

CHEMISTRY

22PHDCY01 – Research Methodology – S & H

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Tell about descriptive research?
2. Can you change research objectives during the research process?
3. What is data collection?
4. Define the reliability of data.
5. List the different types of reports?
6. Illustrate about spacing in a research paper.
7. What is meant by citation?
8. How do you calculate your citation index?
9. Find the level 2 plagiarism?
10. What is copy right infringement?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Distinguish the research methods and research methodology.	(8)
		ii)	Summarize the criteria of good research.	(8)
			(OR)	
	b)	i)	Distinguish between null hypothesis and alternative hypothesis.	(8)
		ii)	Identify the z-test and t-test.	(8)
12.	a)	i)	Explain the methods of primary data collection.	(8)
		ii)	List out the merits and demerits of collecting data through questionnaires.	(8)
			(OR)	
	b)	i)	Explain the secondary data collection.	(8)
		ii)	Construct the characteristics of the case study methods.	(8)

13.	a)	i)	List the various steps involved in writing the research report.	(8)
		ii)	Explain the mechanics of writing a research reports.	(8)
			(OR)	
	b)	i)	Categorize the general outline about technical report.	(8)
		ii)	Outline the punctuations and abbreviations which are used in the report writing.	(8)
14.	a)	i)	Choose the role of citations in research writing.	(8)
		ii)	Interpret the use endnotes and footnotes in a research paper.	(8)
			(OR)	
	b)	i)	Identify the procedure for preparing notes and works cited in MLA format.	(8)
		ii)	Examine the information required in parenthetical documentation.	(8)
15.	a)	i)	Explain the types of plagiarism in research.	(8)
		ii)	Identify the consequences of plagiarism.	(8)
			(OR)	
	b)	i)	Organize about the unintentional plagiarism.	(8)
		ii)	Examine the copy right infringement issues.	(8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

23PTCY301 – Environmental Science and Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is desertification? Give any two reasons for it
2. Differentiate between deforestation and forest degradation.
3. Mention any two threats to biodiversity.
4. What are the components in ecosystem?
5. What are the advantages and disadvantages of using an electrostatic precipitator during the removal of particulate in air?
6. Categorize the natural and man-made pollutants that cause air pollution.
7. What are the components of the 3 R concept?
8. Define: Photochemical smog.
9. What do you mean by sustainable development?
10. Expand the abbreviation: HIV and AIDS

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) How are land degradation and soil erosion depleting the land resources? Mention few steps to eradicate soil erosion. (8)

ii) In what ways does the use of chemical fertilizers and pesticides in modern agriculture affect human health and ecosystems? (8)

(OR)

b) i) Explain the consequences of overdrawing surface and groundwater? (8)

ii) Describe the effects of natural resource depletion and how individual actions can help mitigate this issue? (8)

12. a) i) What are the ecological pyramids? Explain why some of these pyramids upright while others are inverted in different ecosystems. (8)

ii) Elaborate in a systematic manner about the ecosystem and the respective energy flow. (8)

(OR)

b) i) What is ecological succession? Explain the different types and stages of ecological succession. (8)

ii) Biodiversity is a precious gift which needs to be conserved. Justify the statement by explaining any three important values of biodiversity and two in-situ methods of conservation of biodiversity. (8)

13. a) i) Explain the causes, effects, and the suitable preventive measures of water pollution. (8)

ii) What are the impacts of noise on human health and well-being? Explain the various control measures to reduce noise pollution in an urban environment? (8)

(OR)

b) i) How would you implement a domestic wastewater treatment plan for a small community? Discuss the steps involved. (8)

ii) Analyze the process for determining BOD and break down each step involved. (8)

14. a) i) What are the mechanisms by which the greenhouse effect leads to global warming, and how can they be dissected? (8)

ii) Describe the effects of earthquakes, and the methods used to manage their consequences? (8)

(OR)

b) i) Explain the sources of e-waste, its effects on the environment and health, and the methods used for disposal? (8)

ii) Categorize solid wastes, and elaborate any two destructive treatment methods would you apply to manage it effectively? (8)

15. a) i) Summarize briefly on waste land reclamation and environmental ethics. (8)

ii) What do you mean population explosion, discuss the policies to control population growth in India. (8)

(OR)

b) i) How can rainwater harvesting techniques be applied in residential buildings? (8)

ii) What are the strengths and weaknesses of current family welfare policies in addressing specific demographic needs? (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II & III Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING/ELECTRICAL AND ELECTRONICS ENGINEERING

18PH202 – Physics - Waves & Optics and Quantum Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. A spring of stiffness factor 98 Nm^{-1} is pulled through 20 cm. Find the restoring force and calculate the mass which would be attached to stretch the spring by the same amount.
2. Define forced Vibration.
3. State Fermats Principle.
4. Define Mirage effect
5. Give the principle of superposition of waves.
6. Recall interference of light
7. List out the properties of laser.
8. Recall population inversion.
9. State uncertainity principle
10. Write down the properties of matter waves.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the equation of motion of a simple harmonic motion. (16)

(OR)

b) i) Discuss the velocity of a transverse wave along a stretched string. (12)

ii) Distinguish between progressive wave and stationary wave. (4)

12. a) Explain the propagation of light from the effect of translation and refraction by matrix method. (16)

(OR)

b) i) Describe simple microscope and derive an expression for its magnifying power. (12)

ii) The focal lengths of objective and eye lenses of astronomical telescope are 200 cms and 5 cms, the final image is formed at least distance of distinct vision. Calculate the magnifying power of the telescope. (4)

13. a) i) Describe the construction of Michelson interferometer and explain the types of fringes formed. (12)

ii) Develop a note on Youngs double slit experiment. (4)

(OR)

b) i) Explain how to determine the wavelength of light by using diffraction grating? (12)

ii) Simplify polarisation by reflection. (4)

14. a) Explain the construction and working of Nd-YAG laser. Draw a suitable energy level diagram. (16)

(OR)

b) Explain the construction and working of CO_2 laser with its energy level diagram. (16)

15. a) Derive Schrodinger's time independent and time dependent wave equation. (16)

(OR)

b) Derive an expression for energy levels of a particle enclosed in one-dimensional potential box of width L and infinite height. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18MA301 – Probability and Statistics

(Use of statistical tables are permitted)

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. The cumulative distribution function (CDF) of a random variable X is $F(X) = 1 - (1 + x)e^{-x}, x > 0$. Find the probability density function of X.
2. The pdf of a continuous random variable X is given by $f(x) = \begin{cases} ke^{-2x} & 0 \le x \le \infty \\ 0 & otherwise \end{cases}$. Find k.
3. On average, every one out of 10 telephones are found busy. Six telephone numbers are selected at random. Find the probability that four of them will be busy.
4. If a Random variable X has the moment generating function $M_X(t) = \frac{2}{2-t}$, then determine the variance of X.
5. If $f(x, y) = kxe^{-y}; y > 0, 0 < x < 2$ is the joint pdf of two random variables X and Y, What is the value of k.
6. If X and Y are independent random variables with $Var(X) = 4$ and $Var(Y) = 5$, then find $Var(2X - 3Y)$.
7. The first four moments about mean of a frequency distribution are $0, 100, -7$ and 35000. Discuss the kurtosis of the distribution.
8. The first three central moments of a distribution are $0, 15, -31$. Find the moment coefficient of skewness.
9. Define Type- I and Type-II errors.
10. Write down the uses of Chi-square distribution.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) In a neighborhood, 90 % children were falling sick due flu and 10 % due to measles and no other disease. The probability of observing rashes for measles is 0.95 and for flu is 0.08. If a child develops rashes, find the child's probability of having flu. (8)

ii) A continuous random variable X has the distribution function (8)

$$F(x) = \begin{cases} 0 & x \leq 1 \\ k(x-1)^4 & 1 < x \leq 3. \\ 1 & x > 3 \end{cases}$$

Find

(*i*) k

(*ii*) pdf of X

(*iii*) $P(X < 2)$.

(OR)

b) i) A discrete random variable has the following probability distribution. (8)

x	-2	-1	0	1	2	3
$p(x)$	0.1	k	0.2	$2k$	0.3	$3k$

i) Find the value of k.

ii) Find $P(X < 2)$

iii) $P(-2 < X < 2)$

ii) Let X be the number occur when a die is thrown. Find the moment generating function and hence find the Mean and Variance of X. (8)

x	1	2	3	4	5	6
$p(x)$	1/6	1/6	1/6	1/6	1/6	1/6

12. a) i) There are four fused bulbs in a lot of 10 good bulbs. If three bulbs are drawn at random with replacement, find the probability of distribution of the number of fused bulbs drawn. (8)

ii) In the manufacture of glassware, bubbles can occur in the glass which reduces the status of the glassware to that of a 'second'. If, on average, one in every 1000 items produced has a bubble, calculate the probability that exactly six items in a batch of three thousand are seconds. (8)

(OR)

b) i) An electric firm manufactures light bulbs that have a length of life which is normal distributed with mean $\mu = 800$ hours and standard deviation $\sigma = 40$ hours. Find the probability that a bulb burns between 778 and 834 hours? (8)

ii) State and prove memory less property of exponential distribution. (8)

13. a) The joint probability distribution of X and Y is given by (16)

$p(x,y) = \frac{x+y}{21}; x = 1,2,3;\ y = 1,2$. Find all the marginal and conditional probability distributions.

(OR)

b) Two random variables X and Y have the joint density function (16)
$f(x,y) = \begin{cases} 2-x-y & 0<x<1, 0<y<1 \\ 0 & otherwise \end{cases}$ Show that $Cor(X,Y) = -\frac{1}{144}$.

14. a) i) The first three moments of a distribution about the value 2 of the variable are $1, 16$ and -40 respectively. Find the values of the first three moments about the origin. (8)

ii) Fit a straight line to the following data: (8)

x	1	2	3	4	6	8
y	2.4	3.1	3.5	4.2	5.0	6.0

(OR)

b) i) First four moments about mean of a distribution are $0, 2.5, 0.7$ and 18.75. Find coefficient of skewness and kurtosis. (8)

ii) Calculate Karl Pearson's coefficient of Skewness for the following data. (8)

X	25	15	23	40	27	25	23	25	20

15. a) i) A sample height of 6400 Englishmen has a mean of 67.85 inches and a S.D. of 2.56 inches, while a sample of heights of 1600 Australians has a mean of 68.55 inches and a S.D. of 2.52 inches. Do the data indicate that Australians are on the average taller than Englishmen? (8)

ii) A survey on cars had conducted in 2011 and determined that 60 % of car owners have only one car, 28 % have two cars, and 12 % have three or more. Supposing that you have decided to conduct your own survey and have collected the data below, determine whether your data supports the results of the study. Use a significance level of 0.05. Also, given that, out of 129 car owners, 73 had one car and 38 had two cars. (8)

(OR)

b) i) A normal population has a mean of 6.48 and standard deviation of 1.5. In a sample of 400 members mean is 6.75. Is the difference significant? (8)

ii) 1000 students at college level were graded according to their I.Q. and their economic conditions. What conclusion can you draw from the following data: (8)

Economic conditions	I.Q. Level	
	High	Low
Rich	460	140
Poor	240	160

Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING/METALLURGICAL ENGINEERING

18MA201 – Differential Equations and Complex Variables

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Determine the particular integral of $(D^3 + 8)\, y = e^{-2x}$.
2. Transform the equation $(x+2)^2 \frac{d^2y}{dx^2} - (x+2)\frac{dy}{dx} + y = x + 2$ into the linear differential equation with constant coefficient.
3. Form the P.D.E. from the equation $z = a(x+y) + b$ by eliminating the arbitrary constants a and b.
4. Solve : $\sqrt{p} + \sqrt{q} = 1$.
5. Solve : $\left[D^2 - 2\,D\,D' + 2\,D'^2 \right] z = 0$.
6. Write the Laplace equation in polar coordinate form.
7. State the sufficient conditions for analytic function.
8. Find the invariant points of the transformation $w = \frac{3z-4}{z-1}$.
9. Evaluate $\int_C \frac{3z}{z-3} dz$ where C is $|z|=1/2$.
10. State Cauchy's residue theorem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve : $(x^2D^2 + 4xD + 2)y = log\, x$. (8)

ii) Solve $(D^2 + 4)y = sec\, 2\, x$ by use method of variation of parameters. (8)

(OR)

b) Solve the simultaneous first order differential equations: (16)
$\frac{dx}{dt} + y = sin\, 2\, t$ and $\frac{dy}{dt} - x = cos\, 2\, t$.

12. a) i) Form the P.D.E. by eliminating arbitrary constants a and b from the equation $(x-a)^2 + (x-b)^2 + z^2 = 1$. (8)

ii) Solve : $p + q = p\, q$. (8)

(OR)

b) i) Solve : $z = px + qy + p^2 - q^2$. (8)

ii) Solve : $(3z - 4y)p + (4x - 2z)q = 2y - 3x$. (8)

13. a) Solve : $[D^3 - D^2 D']\, z = 4\sin(x + y) + e^{x+2y} + x$. (16)

(OR)

b) Find the solution of one dimensional wave equation by separation of variable method. (16)

14. a) i) Check the analyticity of $f(z) = \log z$. (8)

ii) Construct the analytic function $f(z) = u + iv$ given that $v = x^4 - 6x^2y^2 + y^4$. (8)

(OR)

b) i) Find the image of $x = 2$ under the transformation $w = 1/z$. (8)

ii) Determine the bilinear transformation that maps the points $z = 1, i, -1$ in z-plane into the points $w = 0, 1, \infty$ in w-plane respectively. (8)

15. a) i) Expand $f(z) = \frac{z-1}{(z+2)(z+3)}$ as Laurent's series valid in the region $2 < |z| < 3$. (8)

ii) Evaluate $\int_c \frac{z-2}{z(z-1)} dz$ where c is $|z| = 3$. (8)

(OR)

b) Evaluate $\int_0^{2\pi} \frac{d\theta}{5 - \sin\theta}$ by using contour integration. (16)

Register Number:

Government College of Engineering :: Salem

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B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18MA202 – Differential Equations and Linear Algebra

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Solve$(D^2 + 9)y = 0$.
2. Transform the equation $x^2y'' + xy' = x$ into linear differential equation with constant coefficients.
3. Form a partial differential equation by eliminating arbitrary constants "a" and "b" from $z = ax + by + a^3 + b^3$.
4. Find the complete integral of $pq = 4$.
5. Solve $(D^2 - 6DD' + 9D'^2)z = 0$.
6. Write Laplace equation in polar coordinates.
7. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 0 & 5 \end{bmatrix}$.
8. Write the condition for convergence in Newton-Raphson method.
9. Determine whether the vectors $v_1 = (1,2,-3), v_2 = (1,-3,2), v_3 = (2,-1,5)$are linearly independent or not.
10. State Rank-Nullity theorem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve: $(D^2 + 2D + 1)y = e^{-x}\cos 2x$. (8)

ii) Using the method of variation of parameters, solve $\frac{d^2y}{dx^2} + 4y = \tan 2x$. (8)

(OR)

b) i) Solve: $(x+2)^2\frac{d^2y}{dx^2} - (x+2)\frac{dy}{dx} + y = x + 2$. (8)

ii) Solve: $\frac{dx}{dt} = 3x + 4y, \frac{dy}{dt} = 2x + y,\ x(0) = 1$ and $y(0) = 2$. (8)

12. a) i) Form the partial differential equation by eliminating the arbitrary functions " f " and "g" from $z = f(x + cy) + g(x - cy)$. (8)

ii) Find the singular solution of $z = px + qy + p^2 - q^2$. (8)

(OR)

b) i) Find the complete solution of $z = p^2 + q^2$. (8)

ii) Find the general solution of $x(z^2 - y^2)p + y(x^2 - z^2)q = z(y^2 - x^2)$. (8)

13. a) i) Solve $(D^2 + 4DD' - 5D'^2)z = \sin(x - 2y) + e^{2x-y}$. (8)

ii) Solve $(D^3 - 7DD'^2 - 6D'^3)z = x^2y$. (8)

(OR)

b) i) Solve $(D^2 - 2DD' + D'^2 - 3D + 3D' + 2)z = e^{2x-y}$. (8)

ii) Find the various possible solutions of the one dimensional wave equation $\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2}$ by separation of variables method. (8)

14. a) i) Solve the following system of equations, if consistent: $x + y + z = 3$, $x + y - z = 1$; $3x + 3y - 5z = 1$. (8)

ii) Find the iterative formula for finding the value of $\frac{1}{N}$, where N is a non-zero real number, using Newton-Raphson method. Hence evaluate $\frac{1}{26}$ correct to 4 decimal places. (8)

(OR)

b) i) Solve the following equations by Gauss-Seidel method. (8)
$4x + 2y + z = 14$, $x + 5y - z = 10$, $x + y + 8z = 20$.

ii) Using Gauss-Jordan method, find the inverse of the matrix (8)
$A = \begin{bmatrix} 2 & 2 & 3 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{bmatrix}$.

15. a) i) Determine the basis and dimension of the solution space of the linear homogeneous system $x + y - z = 0, -2x - y + 2z = 0, -x + z = 0$. (8)

ii) Let $T: R^3 \to R^2$ by $T(a, b, c) = (a - b, 2c)$, find $N(T), R(T)$, nullity(T) rank(T). (8)

(OR)

b) Let $T: V_3(R) \to V_3(R)$ be a linear transformation defined by (16)

$$T(x, y, z) = (2x, 4x - y, 2x + 3y - z), \forall\, x, y, z \in R.$$

a) Prove that T is invertible b) find T^{-1} c) find T^2 d) findT^{-2}.

Register Number :

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B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18MA205 – Differential Equations and Transforms

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the Particular integral of $(D^2 + 1)y = \sin x$.
2. Solve: $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + y = 0$.
3. Form the partial differential equation from $z = (x + a)(y + b)$ by eliminating the arbitrary constant.
4. Find the complete solution of $z = px + qy + p^2 + q^2$.
5. Solve: $(D - D' - 1)(D - D' - 3)z = 0$.
6. Solve: $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin x$.
7. Find $L[t \sin 2t]$.
8. Find $L^{-1}\left[\frac{1}{s^2 + 25}\right]$.
9. State and prove the Linearity property of Fourier transform.
10. Find the Fourier transform of

$$f(x) = \begin{cases} 1 \text{ in } |x| \leq a \\ 0 \text{ in } |x| > a \end{cases}$$

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve: $(D^2 + 5D + 4)y = e^{-x} \sin 2x$. (8)

ii) Solve: $\frac{d^2y}{dx^2} + 4y = 4 \tan 2x$ using method of variation of parameter. (8)

(OR)

b) i) Solve: $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \sin(\log x)$. (8)

ii) Solve: $\frac{dx}{dt} - y = 0, \frac{dy}{dt} + x = 0$. (8)

12. a) i) Form the partial differential equation by eliminating the arbitrary functions f and g from $z = f(x + cy) + g(x - cy)$. (8)

ii) Solve: $p + q = pq$. (8)

(OR)

b) i) Solve: $x(y-z)p + y(z-x)q = z(x-y)$. (8)

ii) Solve: $p(1+q) = qz$. (8)

13. a) Using the method of separation of variables solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x,0) = 6e^{-3x}$. (16)

(OR)

b) Obtain the solution of one-dimensional wave equation. (16)

14. a) i) Find the Laplace transform of $f(t) = \begin{cases} t & 0 < t < 1 \\ 2-t & 1 < t < 2 \end{cases}$ with $f(t+2) = f(t)$. (8)

ii) Verify the initial and final value theorem on Laplace transform for the function $f(t) = 1 + e^{-t}(\sin t + \cos t)$. (8)

(OR)

b) i) Find $L^{-1}\left[\frac{s}{(s^2+9)^2}\right]$ using convolution theorem. (8)

ii) Solve $y'' + 4y' + 4y = e^{-t}$ given $y(0) = y'(0) = 0$, using Laplace transform. (8)

15. a) Find the Fourier transform of the function $f(x) = \begin{cases} 1-|x| & |x| < 1 \\ 0 & |x| > 1 \end{cases}$. Hence show that $\int_0^\infty \left[\frac{\sin t}{t}\right]^2 dt = \frac{\pi}{2}$. (16)

(OR)

b) i) Show that $e^{\frac{-x^2}{2}}$ is self-reciprocal with respect to Fourier Transform. (8)

ii) Evaluate: $\int_0^\infty \frac{dx}{(x^2+1)(x^2+4)}$ using Fourier transform. (8)

Register Number:

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B.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22MA102 – Matrices, Calculus and Differential Equations

Time : 3 Hours | Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. Define Skew-symmetric matrix with example.
2. Find the eigen values of A^2 given $A = \begin{bmatrix} 5 & 1 & 2 \\ 0 & 4 & 5 \\ 0 & 0 & 3 \end{bmatrix}$.
3. If $u = (x-y)(y-z)(z-x)$, show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.
4. Evaluate $\int_1^3 \int_1^2 \frac{1}{xy} dxdy$.
5. Solve $(D^4 + 8D^2 + 16)y = 0$.
6. Transform the differential equation $x^2 \frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = sin(logx)$ into differential equations with constant co-efficient.
7. Form the P.D.E. by eliminating arbitrary constants a and b from $Z = (x+a)^2 + (y+b)^2$.
8. Solve $(D^3 - 4D^2D' + 4DD'^2)z = 0$.
9. In what direction from the point (1, 1, -2) is the directional derivative of $\phi = x^2 - 2y^2 + 4z^2$ maximum?
10. Find the constants a, b, c so that $\vec{F} = (x + 2y + az)\vec{i} + (bx - 3y - z)\vec{j} + (4x + Cy + 2z)\vec{k}$ is irrotational.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Using Cayley- Hamilton theorem find A^{-1} and A^4 for the matrix (8)

$$A = \begin{pmatrix} 13 & -3 & 5 \\ 0 & 4 & 0 \\ -15 & 9 & -7 \end{pmatrix}.$$

ii) Find the Eigen values and Eigen vectors of the matrix (8)

$$A = \begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}.$$

(OR)

b) Reduce the quadratic form $x^2+y^2+z^2-2xy-2yz-2xz$ into a canonical form by using orthogonal transformation. (16)

12. a) i) Find the maximum and minimum of the function $x^3+y^3-12x-3y+20$. (8)

ii) Find the area bounded by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ using double integration. (8)

(OR)

b) i) Change the order of integration in $\int_0^a \int_y^a \frac{xdydx}{x^2+y^2}$ and hence evaluate it. (8)

ii) Evaluate $\int\int\int \frac{dzdydx}{\sqrt{1-x^2-y^2-z^2}}$ for all positive values of x, y, z for which the integral is real over the sphere $x^2 + y^2 + z^2 = 1$. (8)

13. a) i) Find the solution of x, if $Dx+y=\sin 2t, and -x+Dy=\cos 2t.$ (8)

ii) Transform the differential equation $(x^2D^2-xD+1)y=\left(\frac{\log x}{x}\right)^2$ into linear differential equation with constant coefficients and hence solve. (8)

(OR)

b) i) Solve $y''-2y'+y=e^x \log x$ using method of variation of parameter. (8)

ii) Solve $\frac{d^2y}{dx^2}+6\frac{dy}{dx}+9y=\sin x \cos 2x.$ (8)

14. a) i) Solve $x^2p+y^2q=z(x+y).$ (8)

ii) Solve $(r+s-6t)=y\cos x.$ (8)

(OR)

b) i) Solve $z=px+qy+p^2q^2.$ (8)

ii) Solve $(D^2-2DD')z=x^3y+e^{2x-y}.$ (8)

15. a) Verify Stoke's theorem for $\vec{F}=(x^2-y^2)\vec{i}+2xy\vec{j}$ in the rectangular region in the xy plane bounded by the lines $x=0, x=a, y=0, y=b.$ (16)

(OR)

b) Verify Gauss divergence theorem for $\vec{F}=(x^2-yz)\vec{i}+(y^2-zx)\vec{j}+(z^2-xy)\vec{k}$ taken over the rectangular parallopiped $0 \le x \le a, 0 \le y \le b, 0 \le z \le c$. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES EXCEPT EEE

22MA101 – Matrices, Calculus and Ordinary Differential Equations

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. If $A = \begin{bmatrix} 1 & 3 & 5 \\ 0 & 4 & 7 \\ 0 & 0 & -2 \end{bmatrix}$, then find the eigen values of A^{-1}

2. Find the sum and the product of the eigen values of the matrix $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$.

3. Find the value of $\lim_{x \to 0} x \cot x$.

4. Find the derivative of the function $y = (x^3 - 1)^{100}$.

5. Find $\frac{dy}{dx}$ if $3x^2 + xy - y^2 + 4x - 2y + 1 = 0$.

6. Define saddle points.

7. Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \int_0^{2\cos\theta} dr d\theta$.

8. Evaluate $\int_0^1 \int_0^2 \int_0^3 xyz dx dy dz$.

9. Solve $\frac{d^2y}{dx^2} = 16y$.

10. Reduce the equation $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = \log x$ into the linear equation with constant coefficients.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve the following system of equations, if consistent: (8)
$x + y + z = 3, x + y - z = 1, 3x + 3y - 5z = 1$.

ii) Verify Cayley-Hamilton theorem for the matrix (8)
$A = \begin{bmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and hence find A^4.

(OR)

b) Reduce the quadratic form ${x_1}^2 + 2{x_2}^2 + {x_3}^2 - 2x_1x_2 + 2x_2x_3$ to a canonical form by an orthogonal reduction and discuss its nature. (16)

12. a) i) Find the limit (i) $\lim_{t\to 0}\frac{\sqrt{t^2+9}-3}{t^2}$ (ii) $\lim_{x\to 0}\frac{|x|}{x}$. (8)

ii) If the function f defined by $f(x)=\begin{cases}\frac{2^{x+2}-16}{4^x-16}, & x\neq 2\\ k, & x=2\end{cases}$ is continuous at $x=2$, then find the value of k. (8)

(OR)

b) i) Find the derivative of the function $(sinx)^{cosy}=(siny)^{cosx}$. (8)

ii) Find the local maximum & minimum values of $f=x^4-4x^3$ using derivative test. (8)

13. a) i) Given the transformations $u=e^x\,cosy$ and $v=e^x\,siny$ and that f is a function of u and v, prove that $\frac{\partial^2 f}{\partial x^2}+\frac{\partial^2 f}{\partial y^2}=(u^2+v^2)\left(\frac{\partial^2 f}{\partial u^2}+\frac{\partial^2 f}{\partial v^2}\right)$. (8)

ii) If $u=\frac{yz}{x}$, $v=\frac{zx}{y}$ and $w=\frac{xy}{z}$, then find $\frac{\partial(u,v,w)}{\partial(xy,z)}$. (8)

(OR)

b) i) A rectangular box open at the top is to have volume of 32 cubic metre. Find the dimensions of the box requiring least materials for its construction. (8)

ii) Expand $f(x,y)=e^x cosy$ in powers of x and y upto second degree terms by using Taylor series. (8)

14. a) i) Change the order of integration in $\int_0^1\int_x^1\frac{xdydx}{x^2+y^2}$ and then evaluate it. (8)

ii) Evaluate $\int_0^1\int_0^{1-x}\int_0^{1-x-y}dxdydz$. (8)

(OR)

b) i) Express $\int_0^a\int_0^{\sqrt{a^2-x^2}}\sqrt{x^2+y^2}\,dydx$ in polar coordinates and then evaluate it. (8)

ii) Find the area enclosed by the lemniscate $r^2=a^2cos2\theta$, by double integration. (8)

15. a) i) Solve $\frac{d^2y}{dx^2}-4\frac{dy}{dx}+3y=\sin 3x$. (8)

ii) Solve $\frac{d^2y}{dx^2}+y=\operatorname{cosec} x$ by using the method of variation of parameters. (8)

(OR)

b) i) Solve $(2x+3)^2\frac{d^2y}{dx^2}-2(2x+3)\frac{dy}{dx}-12y=6x$. (8)

ii) Solve the simultaneous equations $\frac{dx}{dt}+y=sin2t$, $-x+\frac{dy}{dt}=cos2t$. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D. Degree Examinations – Nov/Dec 2024

(2022 Regulations)

CHEMISTRY

22PHDCY03 – Corrosion and Corrosion Control

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the effects of corrosion.
2. Pure metal normally corroded on its surface. Identify the reason.
3. What is galvanic corrosion?
4. Which chemicals causes for caustic embrittlement?
5. Relate the ΔG and Corrosion.
6. What is corrosion current?
7. Highly volatile corrosion products leads to more corrosion. Why?
8. How anodic area affects corrosion?
9. What is meant by corrosion inhibitor?
10. Define electroless plating.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Inspect the mechanism of oxidation corrosion.	(8)
		ii)	Illustrate the corrosion caused by the nature of the oxide layer.	(8)
			(OR)	
	b)	i)	Examine the hydrogen evolution occurs during corrosion.	(8)
		ii)	Identify the Corrosion by hydrogen.	(8)
12.	a)	i)	Mud or water on the metal surface causes corrosion. Justify.	(8)
		ii)	Recall the terms pipeline corrosion and crevice corrosion.	(8)
			(OR)	
	b)	i)	Erosion corrosion is a continuous process. Explain.	(8)
		ii)	Identify the intergranular corrosion and stress corrosion.	(8)
13.	a)	i)	Discover the applications of electrochemical series.	(8)
		ii)	How did you measure the emf of the unknown cell?	(8)
			(OR)	

	b)	i)	Analyze the Pourbiax diagram.	(8)
		ii)	Explain the any two corrosion monitoring techniques.	(8)
14.	a)	i)	Utilize the corrosion influenced by nature of the metal.	(8)
		ii)	Explain the corrosion caused by environment of the metal.	(8)
			(OR)	
	b)	i)	Apply the over voltage in corrosion.	(8)
		ii)	Inspect the polarisation of electrodes.	(8)
15.	a)	i)	Explain the term sacrificial anodic protection.	(8)
		ii)	Develop the corrosion control methods by modifying the environment and design the metal.	(8)
			(OR)	
	b)	i)	Construct the electroplating of gold with neat diagram.	(8)
		ii)	Analyze the nanoparticles and biopolymers act as corrosion inhibitors.	(8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2022 Regulations)

CIVIL/CSE/MECHANICAL/METALLURGICAL ENGINEERING

22PH101 – Engineering Physics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is acoustical Grating?
2. Define Absorption co-efficient.
3. Differentiate Spontaneous and Stimulated Emission.
4. Calculate the numerical aperture of an optical fiber whose core and cladding are made of materials of refractive index 1.6 and 1.5 respectively.
5. List out the different modes of transmission of heat.
6. Mention the properties of thermal insulating materials.
7. What is de-Broglie wavelength?
8. An electron is accelerated by a potential difference of 150 V. Calculate its wavelength.
9. Name the seven crystal systems.
10. Define atomic radius.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe in detail about the production of ultrasonic waves by magnetostriction method. (16)

(OR)

b) Explain the factors affecting the acoustics of buildings with their remedies. (16)

12. a) Describe the construction and working of CO_2 laser with energy level diagram. (16)

(OR)

b) Discuss the classification of optical fiber based on material and modes. (16)

13. a) Determine the thermal conductivity for good conductors by Searle's method. (16)

(OR)

b) Determine the thermal conductivity for bad conductors by Lee's disc method. (16)

14. a) Derive time independent and dependent Shrodinger's equation. (16)

(OR)

b) Derive an expression for energy of a particle in one dimensional box. (16)

15. a) Describe the Bridgman and Czochralski technique for growing crystals. (16)

(OR)

b) Explain briefly about the different types of crystal imperfections. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12MEE19 – Power Plant Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Give four examples for a high pressure boiler.
2. List out the types of draught.
3. What are the purposes of carrying out steam turbine performance tests?
4. Draw the variation of fixed and operation cost.
5. How solar power projects will improve Indian Economy?
6. List out the factors to be considered in selecting a prime mover for a hydro-electric power plant.
7. Name the important components in gas power plant.
8. What are the factors to be considered for selection of diesel engine?
9. Why nuclear power plants are important for India?
10. What is a chain reaction? How it is controlled?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Sketch and describe a fluidized bed combustion (FBC) system. State its merits and demerits. (16)

(OR)

b) Draw the layout of a steam power plant and explain its important feature. (16)

12. a) Briefly discuss about the automatic controls for feed water, steam and fuel supply. (16)

(OR)

b) Explain load curves and load duration curves? Discuss their utility in the economics of generation. (16)

13. a) With a neat sketch, explain in detail about the working principles of Hydel power plant. (16)

(OR)

b) Explain the working of a solar power plant and enumerate the advantages and disadvantages of concentrating collectors over flat collectors. (16)

14. a) With a neat sketch explain in detail about the component and layout of Diesel engine power plant. (16)

(OR)

b) i) Explain with a neat diagram of wind electric generating power plant. (8)

ii) Explain in detail about the various types of Wind energy system. (8)

15. a) Describe the working of a typical fast breeder nuclear reactor power plant, with neat diagram. (16)

(OR)

b) Demonstrate the difference between a pressurized water reactor nuclear power plant and boiling water reactor nuclear power plant. (16)

15. a) A cube with a 35 mm edge lies with a face on the ground and an edge on the picture plane. All the vertical faces are equally inclined to the picture plane. The station point is 80 mm in front of the PP and 60 mm above the ground. The edge of the cube in contact with the picture plane is situated 10 mm to the right of the station point. Draw the perspective projection of the cube. (16)

(OR)

b) A square pyramid of base 30 mm, axis height 45 mm rests with its base on GP. One of the base edges is parallel to PP and 20 mm behind it. Station point S is 60 mm above the ground plane, 70 mm in front of the picture plane and lies in the central plane which is 40 mm to the right of the axis of the pyramid. Draw the perspective projection of the square pyramid. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12MEE04 – Automobile Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define an automobile.
2. How automobile is classified on the basis of type of wheel drive?
3. List the advantages of petrol injection.
4. What is known as 'EURO NORMS'?
5. Write down the application of cone clutch.
6. What is the need of gear box in automobile?
7. Why is camber angle provided?
8. Mention the benefits of anti-lock brakeing system.
9. State the advantages of CNG.
10. Write the needs of alternate fuels in automobiles.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) How do you check the alignment of chassis frame? Explain clearly. (16)

(OR)

b) Explain about the various aerodynamic forces and its influenced moments acting on a fast-moving passenger car. (16)

12. a) Explain in detail the working of rotary distribution type fuel injection system. (16)

(OR)

b) Sketch and explain the construction and operation of a simple carburetor. (16)

13. a) Explain briefly, with neat sketches of the following: (16)

1) Torque tube drive

2) Hotchkiss drive

(OR)

b) With the help of a neat sketch, explain the construction and operation of a sliding mesh gearbox. (16)

14. a) Explain the Ackermann steering mechanism and Davis steering mechanism with a neat sketch. (16)

(OR)

b) Sketch and explain the working of telescopic hydraulic shock absorber. What effect does their action have on the working of springs? (16)

15. a) List out the components of a Hydrogen Fuel Cell electric vehicle and Give typical examples of vehicles based on Fuel Cell. (16)

(OR)

b) Explain the construction of LPG system in petrol engine and describe the salient features of using LPG as alternate fuel. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12MEE07 – Computer Integrated Manufacturing

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the major communications used in manufacturing industry?
2. Mention the roles of CIM play in plant operations.
3. Define group technology.
4. What are the steps involved in process planning?
5. How does bar code technology work in manufacturing?
6. List any two applications of FMS.
7. How does CIM align with company strategy?
8. What is a local area network?
9. What is open system interconnection?
10. What are data associations in a database?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the product-related activities such as design, production, and marketing benefit from the integration of computer integrated manufacturing (CIM). (16)

(OR)

b) i) Discuss the role of marketing engineering in the development of products within a CIM-based environment. (8)

ii) In what ways does CIM enhance plant operations in a manufacturing environment? (8)

12. a) Describe group technology which improves the integration of CAD and CAM systems and what impact does this have on production efficiency? (16)

(OR)

b) Discuss the role of computer-aided process planning and cellular manufacturing process planning systems in process planning. (16)

13. a) What is shop floor control its functions? Explain various phases of SFC. (16)

(OR)

b) i) Explain the functions which are performed at a flexible manufacturing system (FMS) workstation. (8)

ii) Explain the FMS Layout and its application and benefits. (8)

14. a) Discuss the integration of CIM with company strategy which enhances overall business performance and competitiveness. (16)

(OR)

b) i) Explain the critical components of CIM architecture. (8)

ii) How do local area networks (LAN) support communication and data sharing in a CIM-based manufacturing environment? (8)

15. a) How do open systems enhance flexibility and integration in modern manufacturing environments and how does open System Interconnection (OSI) play a role in this? (16)

(OR)

b) What is the significance of data associations in databases and how do they facilitate the creation of meaningful relationship between different data entities? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES

22CY101 – Engineering Chemistry

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are Chromophores? Give an example.
2. What are the different kinds of electronic transitions?
3. List out units of Hardness.
4. What is meant by nanowires?
5. Differentiate between Absorption and adsorption.
6. Define the Reduced phase rule.
7. Explain the electrochemical cell.
8. Define the term Galvanizing.
9. Distinguish between addition and condensation polymerization.
10. What are the anti-knocking agent?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the working, principle, and Instrumentation of UV Visible Spectrophotometer with neat sketch. (8)

ii) Define infrared spectroscopy. Describe various molecular vibration in CO_2 and H_2O. (8)

(OR)

b) i) How can you estimate the amount of sodium by Flame Photometer? (8)

ii) Define how Nickel is estimated by atomic absorption spectroscopy? (8)

12. a) i) How can you estimate the hardness of water sample by EDTA Method? (8)

ii) Describe details on demineralization of water carried out by ion exchange process. (8)

(OR)

b) i) Explain reverse osmosis technique for desalination of brackish water. (8)

ii) Write detail note on Carbon nanotubes. (8)

13. a) i) Discuss the various factors which affect the adsorption of a gas on solid. (8)

ii) Drive Langmuir adsorption isotherm. Write the factor on which adsorption depends. (8)

(OR)

b) i) Draw and discuss the phase diagram of water system. (8)

ii) Discuss technique and application of Pattinson process. (8)

14. a) i) What is an electrochemical series? Write its significance and application. (8)

ii) Derive the Nernst equation for single electrode potential. (8)

(OR)

b) i) What are the various factors influencing corrosion? (8)

ii) Describe the protection of underground pipeline from its corrosion by sacrificial anode method. (8)

15. a) i) Write a detailed note on free radical polymerization mechanism. (8)

ii) Discuss the preparation, properties and uses of TEFLON & NYLON - 6, 6. (8)

(OR)

b) i) Write the determination of calorific values of solid and liquid fuels using bomb calorimeter. (8)

ii) What is the knocking in IC engine, Write its ill effect and prevention of knocking? (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22EN301 – Technical English

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Communication and write its different types.
2. Write short notes on:
   a) Project report
   b) Progress report
3. Firstly, you can get away from the stress of your everyday life and enjoy the wonderful scenery around you and breathe in the fresh air. In addition to this, it is also much cheaper than staying in a bed and breakfast where the prices of the room and food might be very high. Not everyone can afford this. Finally, getting away from the distractions of technology, such as telephones and televisions, means that you have more time to enjoy nature, relax and just talk to people.
   Choose the topic sentence which best fits the paragraph:
   A. Camping saves money for several reasons.
   B. There are several reasons why camping is good for your health.
   C. Camping is popular for several reasons.
4. Complete the sentences with appropriate prepositions.
   1. They arrived ____ Bombay ____ 8:00 p.m. ____ July 30.
   2. My aunt stayed at our house _____ two weeks.
5. What should a subject line be like in an email?
6. Use conditional clauses to complete the sentences.
   a) If he _____ (get) a temperature, I would have called the doctor.
   b) If you start to at 8 am, you _____ (go) to bed earlier.
7. Write any two Telephone etiquettes.
8. What is a Newsletter?
9. List out any four basic steps that are involved in making a PowerPoint presentation effective.
10. What is the purpose of a group discussion?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write minutes of the meeting conducted by the NSS Unit in connection with the Blood Donation Camp. Give details of the date, time, venue, members who attended, topics discussed and the resolutions adopted in your minutes. (8)

ii) Write a survey report on a project that you have conducted to find out the preferences of youth to use two wheelers as mode of transportation. (8)

(OR)

b) i) Write a letter to the customer service manager of Cyska Electronics Pvt. Ltd. complaining about a defect in the speakers purchased from the store. (8)

ii) Write an apology letter from the service manager of Cyska Electronics Pvt. Ltd. promising to exchange the defective speakers. (8)

12. a) i) Complete the dialogue with the correct form of verb: (8)

Rashid: Rahul! Your friend Manas has sent you a postcard. It's from Kerala. It ____ (look) nice.

Rahul: I bet it does!

Rashid: He ____ (write) that it's very hot there. There ___ (be) a lot of tourists. The hotels ____ (be) full. He ____ (say) the restaurants ____ (be) always full!

Rahul: Yes. I'm sure it is. The papers____ (say) that the temperature there is 30C.

Rashid: Then he ___ (write) that he has learnt a bit of Malayalam, and that he gets on well with the people there, especially the women!

Rashid: Look, didn't the newspaper say that there's another strike in Kerala.

Rahul: Yes, Manas won't mind having to stay in Kerala longer!

ii) Choose the correct word. (8)

a) Universities are usually happy to welcome a percentage of senior/mature students.

b) He's had an unusual career road/path from market trader to company owner.

c) Most people aim for the best qualifications they can get in their chosen field/territory.

d) For many people, education is about heightening/broadening their knowledge, not getting a better job.

e) Further/Distance learning means you don't need to be physically present at a college.

f) Just make sure your degree is officially recognised/known by the government.

g) Open University students' essays are usually assessed/criticized by an online tutor.

h) In recent years, universities have started charging scholarship/tuition fees.

(OR)

b) i) Complete the paragraph using the cohesive devices in the brackets below. (8)

(also, but, consequently, firstly, furthermore, however, which , this , in addition)

1) ....., there are obvious advantages to learning English in an English speaking country. 2) ....., there are opportunities to practice listening to and speaking in English every day. 3) ....., students can experience the culture first-hand, 4) ..... is a huge advantage when trying to understand a language. 5) ....., if students are taking language lessons at a school, the teachers will be native speakers. 6) ....., not only will students' speaking and listening skills improve, 7) ..... they will also be able to improve their pronunciation and develop their grammar and vocabulary. 8) ..... being in an English-speaking environment forces us to use the language in order to survive.

ii) Rearrange the following eight sentences in the proper sequence to form a meaningful paragraph. (8)

A) But I always felt somewhere in my mind that I loved acting.

B) He never wanted me to be an actor, as he didn't look upon theatre or acting as respectable vocation.

C) Firstly, there was no tradition of theatre in my family.

D) I am talking specifically of acting, not theatre in general.

E) My parents were old-fashioned.

F) I will answer all your queries a little elaborately.

G) Let alone theatre, arts in general had no place of respect in my family.

H) My father was a government servant.

13. a) As an intern at XYZ consulting Pvt.Ltd, write an email to your internship Project Manager, Mr.Karunesh, informing about the progress that you are making and some difficulties that you are encountering. (16)

(OR)

b) You are a marketing manager of a software firm dealing with computer games, which is planning to introduce PC games based on popular fiction and movies. Submit a report to the CEO about the project. (16)

14. a) Prepare a 5 minute script for a speech on the topic "Artificial Intelligence and Machine Learning". Note that the speech should have a proper introduction and conclusion. (16)

(OR)

b) Assume that you are the student co-ordinator of organizing college sports day, write a Welcome address inviting the Chief guest, Principal, sponsors etc. (16)

15. a) Brief on the instructions that are supposed to be used and avoided in a group discussion. Provide an introduction and eight points on your views on the topic "Chat GPT". (16)

(OR)

b) Elaborate on any eight important tips to make your presentation effective, also list down eight points that should not be adopted while preparing a presentation. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES

22NC301 – NCC Course - II

Time : 3 Hours | Maximum Marks : 100

Part - A (40 x 0.5 = 20 Marks)

Choose the best answer

1. Which social service activity focuses on helping individuals utilize their fullest capacity for their own welfare?
   A) Social Case Work
   B) Social Group Work
   C) Community Organization
   D) Education

2. What can schools do to help prevent HIV?
   A) Teach HIV/STD basics
   B) Promote communication
   C) Provide confidential testing
   D) All of the above

3. What technique involves jamming the foot into a larger crack by twisting the foot into place?
   A) Toe Jam
   B) Foot Jam
   C) Heel-To-Toe Jam
   D) Crack Climbing

4. What is essential for effective critical thinking, according to the text?
   A) Only logical reasoning
   B) Only creativity
   C) A combination of logical reasoning, empathy, analogy and creativity
   D) Specialized learning

5. What is the thermodynamic cycle for the operation of a basic aero-engine?
   A) Brayton cycle
   B) Carnot cycle
   C) Otto cycle
   D) Diesel cycle

6. What are the four basic elements required in a map?

A) Areas, bearings, shapes and distances

B) Latitudes, longitudes, altitudes and directions

C) Scale, symbols, relief, and legends

D) Coordinates, grids, charts and graphs

7. What is the purpose of fuselage?

A) To provide control surfaces

B) To provide space for freight and passengers

C) To increase lift

D) To decrease drag

8. What is the primary purpose of meteorological briefing for aircrew?

A) To provide weather forecasts for flight planning

B) To explain aircraft performance

C) To discuss air traffic control procedures

D) To review emergency procedures

9. What type of gyroscope is used in an Artificial Horizon?

A) Vertical axis earth gyroscope

B) Horizontal axis earth gyroscope

C) Mechanical gyroscope

D) electronic gyroscope

10. What is the primary aim of including aeromodelling in the NCC curriculum?

A) To enhance physical fitness

B) To enhance interest among NCC cadets

C) To develop teamwork skills

D) To improve mental health

Fill in the blanks

11. The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) guarantees at least _____ days of wage employment in a year to every household.

12. The NCC cadets took a pledge to devote at least _____ hours every week towards Swachata.

13. Slithering is also known as _____.

14. Parasailing is also known as _____ or Parakiting.

15. In a turboprop engine, the propeller is driven by a _____ turbine.

16. Air navigation involves guiding an aircraft through the air to arrive at a desired position at a pre-calculated _____.

17. Sleet is the mixture of _____.

18. The International Standard Atmosphere (ISA) defines the mean sea level temperature as _____.

19. The altimeter has _____ capsules each having vacuum or partial vacuum.

20. The basic tools required for aeromodelling include _____, hand drill, and sandpaper.

True or False

21. The Sansad Adarsh Gram Yojana is a centrally sponsored scheme.

22. The NCC participated in the Swachata Pakhwada in 2015.

23. Parasailing in winds over 15 mph is safe.

24. Fast roping was first used in the Falkland War.

25. The operating phases of an aero-engine are intermittent.

26. Relief on maps is indicated using only spot heights or depths.

27. Trim tabs are used to counteract aerodynamic forces.

28. Clouds can only form in the troposphere.

29. The altimeter measures atmospheric pressure.

30. Sir George Caley built a helicopter model in 1796.

Match the Following

(31 to 40) Match the following social issues with their effects:

A. Female Foeticide	1. Fitted with radio receiver sets
B. Government of India	2. Calculated as Pitot - Static
C. Helmet	3. 6,500 feet to 20,000 feet
D. Abseiling	4. Trim Tab, Flap, Air brake
E. Turbo Prop Engine	5. Ratio of distance on map to distance on earth
F. Scale	6. Technique for deploying troops from a helicopter
G. Secondary Controls	7. Uses propeller for thrust
H. Medium Clouds	8. Protect head during flight
I. Dynamic pressure	9. Reduced sex ratio
J. Radio Control Models	10. Implementing Swachh Bharat Abhiyan

Part - B

(10 x 2 = 20 Marks)

Short Answer - Write Any Ten out of Twelve

41. What are the three accepted methods of conducting social service?
42. What are the primary objectives of rural development?
43. How can education contribute to social development?
44. What physical or mental conditions may make parasailing unsuitable for an individual?
45. What are the risks of going too fast or slow during slithering?
46. What are the five operating phases of an aero-engine?
47. What is the Prime Meridian?
48. What materials are commonly used in aircraft construction?
49. Write the concept of atmospheric pressure decrease with height.
50. What is the purpose of the degree marks in an Artificial Horizon?
51. Describe the different types of aeromodels.
52. What is the purpose of radio control models?

Part-C

(08 x 3 = 24 Marks)

Short Answer - Write Any eight out of Twelve

53. Discuss the role of students in removing superstition, blind faith and ignorance.
54. What are the primary objectives of rural development? Explain each objective briefly.
55. a) What is the difference between HIV and AIDS?
    b) What is the window period for HIV detection?
    c) How can mother-to-child transmission of HIV occur?
56. Describe the types of turbo prop engines.
57. Describe the differences between 1/4 million, 1/2 million and 1 million maps.
58. Explain the purpose of variable geometry wings.
59. What information does a met officer provide during a meteorological briefing?
60. Describe the troposphere, stratosphere, mesosphere and thermosphere, including their characteristics.
61. Describe the display and interpretation of an Artificial Horizon.
62. Describe the materials and tools used in aeromodelling.

Part-D

(06 x 6 = 36 Marks)

Short Answer - Write Any six out of eight

63. Explain the causes of female foeticide.

64. Discuss the role of NGOs in promoting social welfare and nation building.

65. Explain the difference between intermittent and continuous processes in engines.

66. Describe the process of flight planning for a pilot.

67. Explain the function of flight control surfaces, including ailerons, elevators and rudder.

68. Describe the structure and composition of the atmosphere.

69. Explain the principle, working and importance of an Air Speed Indicator in flying.

70. Write the general safety code for aeromodel.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2023 Regulations)

CIVIL ENGINEERING

23PTCY201 – Environmental Science and Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the importance of mineral resources.
2. Identify the sources of mal nutrition in Indian children.
3. Compare the biotic and abiotic component in ecosystem.
4. Elaborate on the term endemic species.
5. What is meant by COD and how it is caused?
6. Examine the effect of water pollution on human being.
7. State the term Bio amplification.
8. Mention 3R in solid waste management.
9. Explain sustainable development.
10. List main point in national population policy 2020.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Mention importance of forest and effects of deforestation.	(8)
		ii)	Summarize the causes of land degradation and soil erosion.	(8)
			(OR)	
	b)		Analyze the on effect of modern agriculture on the environment.	(16)
12.	a)	i)	Critically examine tropic levels in ecosystem.	(8)
		ii)	Explain the different types of ecological succession.	(8)
			(OR)	
	b)		Elaborate on hot spots of biodiversity and also explain in-situ and ex-situ methods of protecting the biodiversity.	(16)
13.	a)	i)	Discuss the causes and effects of air pollution.	(8)
		ii)	Distinguish between aerobic and anaerobic decomposition of organic waste in water.	(8)
			(OR)	

b) How is noise pollution caused? Discuss in details about the effect and control measure of noise pollution. (16)

14. a) i) Recall how acid rain is formed and explain its effects on environment. (8)

ii) Interpret disaster management technique used in earthquakes and flood. (8)

(OR)

b) Describe the classification and various technique used in treatment of solid waste. (16)

15. a) i) Identify the urban problem related to energy sources. (8)

ii) Outline rain water harvesting technique with a neat diagram. (8)

(OR)

b) i) Evaluate how HIV is transmitted and how AIDS can be controlled? (8)

ii) Distinguish exponential and logistic population growth. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12CY101 – Engineering Chemistry

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between thermoplastic and thermosetting plastic.
2. Evaluate the need of vulcanization of raw rubber.
3. Define nuclear energy.
4. Nano batteries are the need of future. Justify.
5. Give the classification of refractories.
6. Develop the term refractoriness.
7. Distinguish electroplating and electroless plating.
8. Recall the term electrochemical corrosion and write its types.
9. State Beer-Lambert's law.
10. Identify the term carbon nanotubes and write their types.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Elucidate the free radical mechanism of addition polimerization. (8)

ii) Write the preparation and uses of PVC & Polyurethane. (8)

(OR)

b) i) Elaborate the preparation, properties and uses of synthetic rubber. (8)

ii) Mention the advantages of polymer composites. Explain using FRP as an example. (8)

12. a) i) With a neat sketch explain the functioning of H_2-O_2 fuel cell. (8)

ii) Narrate the principle and applications of solar batteries. (8)

(OR)

b) i) Outline the construction and functioning of lead acid battery. (8)

ii) What is biofuel? Explain the manufacture of biofuel by trans-esterification process and its advantages. (8)

13. a) i) Describe the different types mechanism of lubrication. (12)

ii) Organize the terms thermal expansion and thermal spalling. (4)

(OR)

b) i) Discuss the manufacture, properties and uses of alumina and carborundum. (12)

ii) Analyze anyone synthetic abrasive in detail. (4)

14. a) i) Examine electrochemical series and narrate its applications. (8)

ii) Derive Nernst equation for single electrode potential. (8)

(OR)

b) i) Summarize about differential aeration corrosion and its types. (8)

ii) Inspect the control of corrosion by the use of sacrificial anode and by impressed current cathodic protection. (8)

15. a) i) Explain the principle and instrumentation of UV-Visible spectroscopy with a block diagram. (12)

ii) Interpret about red shift and blue shift. (4)

(OR)

b) i) Illustrate the principle and instrumentation of Atomic Absorption spectroscopy. (12)

ii) How the concentration of sodium is determined by flame photometer? (4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTCY301 – Environmental Science and Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define hydrological cycle.
2. Write any two major cause of land degradation.
3. What does the term "Hot spots of Biodiversity" indicate? Name any two hot spots of biodiversity in India.
4. Interpret ecological pyramids.
5. Explain BOD.
6. Mention any two adverse effects of SO_x.
7. Write the reactions of CFC with ozone which result in ozone hole formation.
8. Recall the term eutrophication.
9. Examine the objectives of waste land reclamation.
10. Calculate the doubling time (Td) if annual growth rate of population is 2%.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss briefly about the effects of modern agriculture. (8)

ii) Enumerate the causes and effects of deforestation. (8)

(OR)

b) i) Examine the major environmental impacts of mineral extraction. (8)

ii) Identify the various methods to be employed for conservation of soil erosion. (8)

12. a) i) Describe the structure and functions of an eco system. (8)

ii) Draw a neat sketch and explain the energy flow through an ecosystem (8)

(OR)

b) i) Explain the methods adopted in India for the conservation of biodiversity. (8)

ii) Write short notes on (i) food chain (ii) food web. (8)

13. a) i) Explain the sources, effects and control measures of noise pollution. (8)

ii) What are oxygen demanding wastes? Show how aerobic and anaerobic oxidations help to decompose such wastes. (8)

(OR)

b) i) Interpret broad categories of water pollutants. Discuss in detail. (8)

ii) Discuss any two control methods in reducing air pollution with a neat sketch. (8)

14. a) i) Discuss green house effect and its consequences on environment in detail. (8)

ii) What is Flood? Enumerate its effect. What measures should be taken to mitigate their disaster? (8)

(OR)

b) i) Explain acid rain. How does it form? What are the major impacts of acid rain? (8)

ii) Describe the types, origin, effects and treatment methods of solid waste management. (8)

15. a) i) What is meant by Rainwater Harvesting? Explain briefly on the purposes served by it. (8)

ii) Describe the various schemes launched for family welfare programs in India. (8)

(OR)

b) i) Define sustainable development. What are the major measures attain sustainability? (8)

ii) How can age structure pyramids serve as useful tools for predicting population growth of nation? Explain with examples. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCY201 – Environmental Science and Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the importance of forest resources.
2. Identify the negative impact of mining to the environment.
3. Define ecosystem with an example.
4. Name the threats to the biodiversity.
5. Discuss anaerobic decomposition of organic compound in water.
6. Spell the safe limit of sound for our ears.
7. State Eutrophication.
8. Identify two important steps to reduce solid waste.
9. Mention the objectives of sustainable development.
10. Predict the ways in which population explosion can be controlled.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	With a neat diagram explain hydrological cycle.	(8)
		ii)	Compare malnutrition, under nutrition and over nutrition with example.	(8)
			(OR)	
	b)	i)	List out different types of mines operating in India.	(8)
		ii)	Enumerate the ways in which land degradation may be controlled.	(8)
12.	a)	i)	Spell the components and their characteristics of forest ecosystem.	(8)
		ii)	Give a brief account of tropic levels and ecological pyramids.	(8)
			(OR)	
	b)	i)	Explain the main sources of threat to biodiversity.	(8)
		ii)	Inspect in-situ and ex-situ conservation methods of biodiversity.	(8)

13. a) i) Interpret the ways in which air pollution can be controlled. (8)

ii) Illustrate about control of air pollution by using cyclone separator and electrostatic precipitator. (8)

(OR)

b) i) Explain the experimental determination of BOD. (8)

ii) Identify the major sources of noise pollution and its control measure. (8)

14. a) i) Outline the causes, effect and control of greenhouse effect. (8)

ii) Examine the ways in which ozone layer depletion can be controlled and also list out the chemical causing ozone layer depletion. (8)

(OR)

b) i) Compare different methods for treatment of solid waste. (8)

ii) Discuss in detail the ways in which flood disaster may be managed. (8)

15. a) i) Analyze the major causes of water scarcity and conservation methods. (8)

ii) Summarize rainwater harvesting with a neat diagram. (8)

(OR)

b) i) Elucidate about exponential and logistic population growth. (8)

ii) Give the full expansion of HIV and AIDS and also discuss ways in which HIV can be controlled. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II & III Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS/MECHANICAL/METALLURGICAL ENGINEERING

18MA204 – Fourier Series and Transforms

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the Fourier constant term b_3 for $xsinx$ in $(-\pi, \pi)$.
2. State the Parseval's identity for the half –range cosine expansion of $f(x)$ in the interval $(0, \pi)$.
3. Classify the partial differential equation $u_{xx} - y^4 u_{yy} = 2y^3 u_y$.
4. State the suitable solution of the one-dimensional heat equation $u_t = a^2 u_{xx}$.
5. Find $L[(t+1)^2]$.
6. State the initial and final value theorems in Laplace transforms.
7. Find the Fourier sine transform of $\frac{1}{x}$.
8. If $F\{f(x)\} = \bar{f}(s)$, then prove that $F\{f(x-a)\} = e^{-ias}\bar{f}(s)$.
9. Find the $Z\{n^2\}$.
10. Form the difference equation from $y_n = a + b3^n$, by eliminating the arbitrary constants a & b.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the Fourier series of f(x) = x^2 in $(0,2l)$. (8)

ii) Find the Fourier series of period 2π for the function (8)
$f(x) = \sqrt{1 - cosx}$ in $-\pi < x < \pi$.

(OR)

b) i) Find the half-range sine series of $f(x) = l - x$ in $(0, l)$. Hence find the (8)
sum of the series $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} \ldots\ldots \infty = \frac{\pi^2}{6}$.

ii) Find the Fourier series of $y = f(x)$ in $(0,2\pi)$ up to the two harmonics for the following values. (8)

x	0	60	120	180	240	300
y	40	31	−13.7	20	3.7	−21

12. a) A uniform string is stretched and fastened to two points l apart. Motion is started by displacing the string into the form of the curve $y = kx(l-x)$ and then releasing it from this position at time $t = 0$. Find the displacement of the point of the string at a distance x from one end at time t. (16)

(OR)

b) A square plate is bounded by the lines $x = 0, y = 0$, $x = 10$, $y = 10$. Its faces are insulated. The temperature along the upper horizontal edge is given by $u(x,0) = x(10-x)$ while the other three edges are kept at 0^0C. Find the steady state temperature in the plate. (16)

13. a) i) Find L $[e^{-3t} + cosh3t + sin4t]$. (8)

ii) Find the Laplace transform of the square wave function $f(t)$ defined by $f(t) = \begin{cases} k \text{ in } 0 \le t \le a \\ -k \text{ in } a \le t \le 2a \end{cases}$ and $f(t+2a) = f(t)$ for all t. (8)

(OR)

b) i) Find $L^{-1}[\frac{1}{(s+1)(s+2)}]$ by using convolution theorem. (8)

ii) Solve $y'' + 4y' + 4y = e^{-t}$, $y(0) = 0$ and $y'(0) = 0$ by using Laplace transform. (8)

14. a) i) Find the Fourier transform of $f(x)$, given by (8)
$f(x) = \begin{cases} 1-x^2, & for\ |x| < 1 \\ 0, & for\ |x| > 1 \end{cases}$

ii) Find the Fourier cosine transform of $f(x) = e^{-ax}, a > 0$ (8)

(OR)

b) i) Find the Fourier transform of $e^{-a^2x^2}$ where $a > 0$. (8)

ii) Evaluate $\int_0^\infty \frac{dx}{(x^2+1)(x^2+4)}$ by using Fourier transform methods. (8)

15. a) i) Find $Z\{r^n sinn\theta\}$. (8)

ii) Find $Z^{-1}\left\{\frac{z^2}{(z-1)(z-3)}\right\}$ by using convolution theorem. (8)

(OR)

b) i) Find the inverse Z-transform of $\left\{\frac{10z}{(z-1)(z-2)}\right\}$. (8)

ii) Solve the equation $y_{n+2} + 4y_{n+1} + 3y_n = 2^n$, given that $y_0 = 0, y_1 = 1$ by using Z-transform. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2022 Regulations)

COMMON TO ALL BRANCHES

22PTMA201 – Mathematics - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Dirichlet's condition.
2. Write the formula for fourier constants to expand $f(x)$ in $(0,2\pi)$.
3. Classify $x^2u_{xx} + 2xyu_{xy} + (1+y^2)u_{yy} - 2u_x = 0$.
4. Write the possible solutions of one dimensional heat equations.
5. Evaluate $L[\cos at]$.
6. State Initial and final Value theoremon Laplace transforms.
7. State Fourier Integral Theorem.
8. Find the fourier cosine transform of e^{-ax}, a>0.
9. Find $Z(n^3)$.
10. Define Unit Step Sequence.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Expand the function $f(x) = sinx, 0 < x < \pi$ in fourier cosine series. (16)

(OR)

b) Find the Fourier series x^2 in $(-\pi,\pi)$.Use Parsevals identity to prove $\frac{\pi^2}{90} = 1 + \frac{1}{2^4} + \frac{1}{3^4} + \frac{1}{4^4} + \cdots$ (16)

12. a) A string is stretched and fastened to two points $x = 0, x = l$ apart. Motion is started by displacing the string into the form $y = k(lx - x^2)$ fromwhich it is released at time $t = 0$. Find the displacement of any point on the string at a distance of x from one end at time t. (16)

(OR)

b) A square plate is bounded by the lines $x = 0, y = 0, x = l, y = l$. Its faces are insulated. The temperature along the upper horizontal edge is given by $u(x,l) = x(l-x)$ while the other threeedges are kept at $0^\circ C$. Find the steady state temperature in the plate. (16)

13. a) i) Find $L^{-1}\left[\frac{2s-3}{(s-1)(s-2)^2}\right]$. (8)

ii) Verify initial and final value theorem for the function $f(t) = 1 + e^{-t}(\sin t + cost)$. (8)

(OR)

b) i) Find the inverse laplace transform $\frac{1}{(s+1)(s^2+4)}$ by convolution theorem. (8)

ii) Solve $\frac{d^2x}{dt^2} - 3\frac{dx}{dt} + 2x = 2$, given $x = 0$ and $\frac{dx}{dt} = 5$ for $t = 0$ using Laplace transform method. (8)

14. a) Express the function $f(x) = \begin{cases} 1 \; for \; |x| \leq 1 \\ 0 \; for \; |x| > 1 \end{cases}$ as fourier integral. Hence evaluate $\int_0^\infty \frac{\sin \lambda cos \lambda x}{\lambda} \, d\lambda$ and find the value of $\int_0^\infty \frac{\sin \lambda}{\lambda} d\lambda$ (16)

(OR)

b) Find the fourier transform of the function $f(x)$ defined by $f(x) = \begin{cases} 1 - x^2 \; if \; |x| < 1 \\ 0 \qquad if |x| \geq 1 \end{cases}$. Hence, provethat $\int_0^\infty \frac{\sin s - scos \, s}{s^3} \cos\left(\frac{s}{2}\right) ds = \frac{3\pi}{16}$ (16)

15. a) i) Evaluate $Z(\cos n\theta)$. (8)

ii) Find $Z^{-1}\left[\frac{10z}{(z-1)(z-2)}\right]$ (8)

(OR)

b) i) Using convolution theorem, evaluate inverse Z-transform of $\left[\frac{z^2}{(z-1)(z-3)}\right]$ (8)

ii) Solve $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ given $y_0 = y_1 = 0$. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VIII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MAOE03 – Sampling Theory and Numerical Methods

(Statistical Tables (Normal, t ,F and χ^2) to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the null hypothesis and alternative hypothesis.
2. Write any two uses of t-distribution.
3. Find an iterative formula to find $\sqrt{N}$ (where N is a positive number).
4. Write the normal equations required to fit a curve of the form $y = ax^b$ by the method of least squares.
5. Find the equation of the curve passing through the points (0,0), (1,1) and (2,20) by Lagrange's interpolation formula.
6. Write the order of error in Trapezoidal rule and Simpson's rule.
7. Solve the equation $y' = 1 - y$, $y(0) = 0$ at $x = 0.1$ by Modified Euler's method.
8. State Adam-Bashforth predictor-corrector formula.
9. Write down the diagonal five point formula to solve the equation $u_{xx} + u_{yy} = 0$.
10. State the explicit formula for the one dimensional wave equation with $1 - \lambda^2 a^2 = 0$ where $\lambda = \frac{k}{h}$ and $a^2 = \frac{T}{m}$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A sample of 100 students is taken from a large population. The mean height of the students in this sample is 160 cm. Can it be reasonably regarded that, in the population, the mean height is 165 cm, and the S.D. is 10 cm? (8)

ii) Samples of two types of electric bulbs were tested for length of life and the following data were obtained. (8)

	Size	Mean	S.D.
Sample I	8	1234 hours	36 hours
Sample II	7	1036 hours	40 hours

Is the difference in the means sufficient to warrant that type I bulbs are superior to type II bulbs?

(OR)

b) i) A sample of size 13 gave an estimated population variance of 3.0, while another sample of size 15 gave an estimate of 2.5. Could both samples be from populations with the same variance? (8)

ii) A total number of 3759 individuals were interviewed in a public opinion survey on a political proposal. Of them, 1872 were men and the rest women. 2257 individuals were in favour of the proposal and 917 were opposed to it. 243 men were undecided and 442 women were opposed to the proposal. Do you justify or contradict the hypothesis that there is no association between sex and attitude? (8)

12. a) i) Solve $e^x - 3x = 0$ by the method of iteration and correct to 4 decimal places. (8)

ii) Solve the system of equations by Gauss-Elimination method. $2x + 3y - z = 5, 4x + 4y - 3z = 3, 2x - 3y + 2z = 2$. (8)

(OR)

b) i) Solve the following system of equations by Gauss-Jacobi method correct to 3 decimal places: (8)

$10x - 5y - 2z = 3, 4x - 10y + 3z = -3, x + 6y + 10z = -3.$

ii) By the method of least squares, fit a straight line to the data given below. Also estimate the value of y at $x = 2.5$. (8)

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

13. a) i) From the data given below, find the number of students whose weight is between 60 and 70. (8)

Weight in Ibs.	0-40	40-60	60-80	80-100	100-120
No. of students	250	120	100	70	50

ii) Using Newton's divided difference formula, find the value of $f(2)$ given the following table: (8)

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

(OR)

b) i) The population of a certain town is given below. Find the rate of growth of the population in 1931 and 1971. (8)

Year	1931	1941	1951	1961	1971
Population (Thousands)	40.62	60.80	79.95	103.56	132.65

ii) Evaluate $\int_{-3}^{3} x^4\,dx$ by using Trapezoidal rule and Simpson's rule with h = 1. Verify your results by actual integration. (8)

14. a) i) Solve $\frac{dy}{dx} = 1 - 2xy$, given $y(0) = 0$, and get $y(0.2)$ by Taylor series method correct to four decimal places. (8)

ii) Apply the fourth order Runge-Kutta method to find $y(0.1)$ given that $y' = -y, y(0) = 1$. (8)

(OR)

b) i) Solve numerically the equation $\frac{dy}{dx} = x + y$, given $y(0) = 1$ using Euler's method for $x = 0.0(0.2)1.0$. (8)

ii) Determine the value of $y(4.4)$ using Milne's method given (8)
$5xy' + y^2 - 2 = 0, y(4) = 1,\ y(4.1) = 1.0049,$
$y(4.2) = 1.0097$ and $y(4.3) = 1.0143.$

15. a) Solve $\nabla^2 u = 8x^2y^2$ for square mesh $u = 0$ on the 4 boundaries dividing the square into 16 sub squares of length 1 unit. (16)

(OR)

b) i) Solve $\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial u}{\partial t} = 0$ given $u(0,t) = 0, u(4,t) = 0, u(x,0) = x(4-x),\ h = 1,$ find the value of u upto $t = 5$ by using Bender-Schmidt method. (8)

ii) Solve by Crank-Nicholson method the equation $u_{xx} = 16u_t$, $0 < x < 1, t > 0$ given $u(x,0) = 0, u(0,t) = 0, u(1,t) = 100t,$ for one time step taking $h = \frac{1}{4}$. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES

22HS201 – Universal Human Values

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What do you mean or human values?
2. What is the need for self-exploration?
3. The needs of the self are qualitative. Illustrate.
4. Define sensations?
5. Explain the feeling of 'respect'.
6. Define 'guidance'.
7. What do you mean by co-existence?
8. Comment on the statement: "Nature is limited and space is unlimited".
9. What is ethical human conduct?
10. What do you understand by holistic technology?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What are the basic guidelines for value education? Explain it. (8)

ii) What are the requirements to fulfill basic human aspirations? What is the program to fulfill the basic human aspirations? (8)

(OR)

b) i) What do you understand by prosperity? What is the difference between prosperity and wealth? How are the two related? (8)

ii) Distinguish between 'human consciousness' and 'animal consciousness'. (8)

12. a) i) Human being is co-existence of the Self and the Body' - elaborate on this statement. (8)

ii) What are the programs for ensuring the health of the body? Explain. (8)

(OR)

b) i) What are the problems that we are facing today because of operating on the basis of pre- conditioned desires and sensation? (8)

ii) Distinguish between the needs of the Self and the needs of the Body. What are the needs of the 'self' and the 'body'? (8)

13. a) i) What is meaning of justice in human relationships? How does it follow from family to world family? (8)

ii) How do you differentiate between intention and competence, when you have to judge the other? Why is it important? (8)

(OR)

b) i) What is the meaning of respect? How do we disrespect others due to lack of right understanding of this feeling? (8)

ii) What are the five dimensions of Human Endeavour? How are they helpful in achieving the comprehensive human goal? (8)

14. a) i) What do you understand by the term 'innateness' in nature? (8)

ii) Define existence? Show that existence is in a form of co-existence. (8)

(OR)

b) i) Distinguish animal order and human order. What is the relation between the two orders? (8)

ii) Explain how there is recyclability and self-regulation in nature. (8)

15. a) i) What do you understand by definitiveness of ethical human conduct? Why is this definitiveness desirable? (8)

ii) Elaborate on competence in professional ethics with an example. (8)

(OR)

b) i) Explain in terms of values, policies and character with appropriate examples. (8)

ii) What are the implications of value-based living at all four levels of living? Explain. (8)

Register Number :

CIVIL

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE301 – Mechanics of Fluids

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the density, unit weight and specific gravity values for water.
2. Why mercury is preferred in manometers?
3. Define metacentric height.
4. Write the uses of flow net.
5. Write the Bernoulli's equation and brief the each components in the equation.
6. Distinguish between laminar and turbulent flow.
7. List the various losses occurring in pipe flow.
8. Name the methods for preventing boundary layer separation.
9. Check whether the equation Q = AV, is dimensionally homogenous, where Q = discharge, A = area and V = velocity of flow?
10. Define distorted models.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Briefly explain the various fluid properties with its units. (16)

(OR)

b) A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity is 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40 cm and the height of fluid in the left from the center of pipe is 15 cm below. (16)

12. a) Determine the total pressure on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the center of the plate is 3 m below the free surface of water. Also find the position of center of pressure. (16)

(OR)

b) Derive the differential form of continuity equation. (16)

13. a) An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50 cm of mercury. Find the rate of flow of oil of specific gravity 0.9, coefficient of discharge of the orifice meter = 0.64. (16)

(OR)

b) Derive the Hagen - Poiseuilles equation for pipe flow. (16)

14. a) Two tanks are connected by three pipes in series of lengths 300 m, 170 m and 210 m and of diameters 300 mm, 200 mm and 400 mm respectively, the head difference between water level is 12 m. Estimate the Discharge of water if co – efficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering: i) minor and major losses ii) neglecting minor losses. (16)

(OR)

b) Analyze the following boundary layer parameters for the velocity distribution $u/U = (y/\delta)^{2/3}$, calculate i) Displacement thickness, ii) Momentum thickness and iii) Energy thickness (16)

15. a) The efficiency "η" of geometrically similar fan is depends upon the mass density of air ρ, dynamic viscosity μ , angular velocity $\dot{\omega}$, diameter of blades D and discharge Q . Perform dimensional analysis using Buckingham's theorem. (16)

(OR)

b) The pressure difference Δp in the pipe of diameter D and length L due to turbulent flow depends on velocity V, density ρ, dynamic viscosity μ, and roughness k(unit is metre). Perform dimensional analysis using Buckingham's theorem. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE102 – Mechanics of Fluids

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Specific gravity and write its unit.
2. Write Newton's law of viscosity.
3. List the factors involved in metacentric height calculation formula.
4. What are the types of fluid flow?
5. State the assumptions made in derivation of Bernoulli's equation.
6. Write the formula used for calculating friction loss in pipes.
7. List the types of losses in pipe flow.
8. Mention any two methods of preventing the separation of boundary layer.
9. Write down the advantages of model analysis.
10. List the advantages of distorted model.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain briefly about various fluid properties. (16)

(OR)

b) A U tube differential manometer connects two pressure pipes A and B. Pipe A contains carbon tetrachloride having specific gravity 1.594 under a pressure of 1.2 kg/cm^2 and pipe B contains oil of specific gravity 0.8 under a pressure of 1.2 kg/cm^2. The pipe A lies 2.5 m above pipe B. Find the difference of pressure measured by mercury as fluid filling "U" tube. (16)

12. a) A circular plate of 4 m diameter is immersed in water vertically. The center of the plate is 3.5 m from the free surface of water. Find the total pressure and the point at which the resultant pressure acts. (16)

(OR)

b) The stream function for a two-dimensional flow is given by Calculate the resultant velocity at P (3, 4). Also find the velocity potential function. (16)

13. a) A venturimeter with inlet and throat diameters 30 cm and 15 cm is used for measure a flow of the water. If Cd = 0.98 and readings in differential manometer with mercury is 20 cm then determine Discharge. (16)

(OR)

b) Derive the Hagen Poiseuilles equation for viscous flow through circular pipes. (16)

14. a) The difference in water surface level in two tanks is 12 m, which are connected by 3 pipes in series of lengths 300 m, 170 m, 210 m and of diameter 300 mm, 200 mm, 400 mm and of coefficient of friction 0.005, 0.0052, 0.0048. Determine the rate of flow. Neglect the minor losses. (16)

(OR)

b) Find the displacement thickness, momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $u/U = y/\delta$, where u is the velocity at a distance y from the plate and $u = U$ at $y = \delta$ where δ = boundary layer thickness. (16)

15. a) Find an expression for the drag force on a smooth sphere of diameter D moving with uniform velocity V in fluid density and dynamic viscosity by using Buckingham theorem. (16)

(OR)

b) In A partially submerged body the resistance R to its motion depends on density ρ, dynamic viscosity μ, length L, velocity v and acceleration due to gravity g. Express R in terms of dimensionless parameters using Buckingham π method. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

CIVIL ENGINEERING

23PTCE102 – Mechanics of Fluids

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Newton's law of viscosity.
2. Differentiate between atmospheric pressure and gauge pressure.
3. How to identify irrotational flows?
4. Recall continuity equation.
5. State the use of Moody's diagram.
6. Write Darcy-Weisbach equation for laminar flow.
7. What is Hydraulic gradient line?
8. Define laminar sub layer.
9. What are repeating variables in dimensional analysis?
10. Define Froude's number.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A plate has an area of 1 m^2.It slides down an inclined plane, having angle of inclination 45° to the horizontal, with a velocity of 0.5 m/s. The thickness of oil film between the plane and the plate is 1 mm. Find the viscosity of the fluid if the weight of the plate is 65 N. (10)

ii) Derive expression for height of capillary rise. (6)

(OR)

b) i) Give an account of different types of manometers and explain how pressure measurements are done? (10)

ii) State and prove Pascal's law. (6)

12. a) i) A trapezoidal 2 m wide at the bottom and 1.2 m deep has side slopes 1:1. Determine i) total pressure ii) Centre of pressure on the vertical gate closing the channel when it is full of water. (8)

ii) A solid cylinder 4 m in diameter and 4 m high is floating in water with its axis vertical. If its specific gravity is 0.6, find the metacentric height. Also state whether equilibrium is stable or unstable. (8)

(OR)

b) i) Discuss the types of flow lines. (8)

ii) A two dimensional flow is described by the velocity components: $U = 5x^2$ and $v = -15x^2y$. Determine the stream function, velocity and acceleration at P(x = 1 m, y = 2 m). (8)

13. a) i) A horizontal venturimeter 300 mm x 150 mm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 0.5 m^3/s. Find the readings of oil-mercury differential manometer. Take venturimeter constant = 0.98. (8)

ii) A fluid of viscosity 8 poise and specific gravity 1.2 is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is 300 N/m^2. Find i) Pressure gradient ii) average velocity iii) Reynold's number of flow. (8)

(OR)

b) Derive Hagen Poiseuille equation for flow of viscous fluid in circular pipes. (16)

14. a) i) At a sudden enlargement of a water main from 300 mm to 540 mm diameter, the hydraulic gradient rises by 15 mm. Calculate the rate of flow. (8)

ii) A main pipe divides into two parallel pipes which again forms one pipe. The length and diameter for the first parallel pipe are 2000 m and 1.0 m respectively, while the length and diameter of the second pipe are 2000 m and 0, 8 m respectively. If the total flow in the main is $3m^3/s$ and the co-efficient of friction for each parallel pipe is same and equal to 0.005, find the rate of flow in each parallel pipe. (8)

(OR)

b) i) The velocity distribution in the boundary layer is given by: $\frac{u}{U} = \frac{y}{\delta}$, where u is the velocity at a distance y from the plate and u = U at y = δ, δ being boundary layer thickness. Find (8)

i) displacement thickness

ii) momentum thickness

iii) energy thickness

ii) What is boundary layer separation? Explain the methods to control separation. (8)

15. a) The resisting force R of a supersonic plane during flight can be considered as dependent upon the length of the aircraft I, velocity V, air viscosity μ, air density ρ and bulk modulus of air K. Obtain the relationship between the variables and resisting force. (16)

(OR)

b) Give the classification of hydraulic models. Explain the merits and demerits of the models. Also write a note on scale effect in models. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE301 – Mechanics of Fluids

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the bulk modulus of elasticity of a liquid which is compressed in a cylinder from a volume of 0.0125 m^3 at 80 kN/m^2 pressure to a volume of 0.0124 m^3 at 150 kN/m^2 pressure?
2. A hydraulic press has a ram of 20 cm diameter and a plunger of 3 cm diameter. It is used for lifting a weight of 30 kN. Find the force required at the plunger.
3. Define Meta Centre.
4. What is mean by convective acceleration and local acceleration?
5. Differentiate Laminar and Turbulent flow.
6. What are the assumptions made in deriving Bernoulli's equation?
7. Define Hydraulic gradient line [HGL] and Total Energy line [TEL].
8. What is boundary layer growth? Also give the reason for boundary layer growth.
9. State Buckingham's π theorem.
10. Write the advantages of model analysis.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) If the velocity distribution of a fluid over a plate is given by $u = ay^2 + by + c$ with the vertex 0.2 m from the plate, where the velocity is 1.2 m/s. Calculate the velocity gradients and shear stresses at a distance of 0 m, 0.1 m and 0.2 m from the plate, if the viscosity of the fluid is 0.85 Ns/m^2. (12)

ii) Find out the minimum diameter of glass tube that can be used to measure water level if the capillary rise in the tube is to be restricted to 2 mm. Consider surface tension of water in contact with air as 0.07357 N/m. Angle of contact = 0^0. (Take density of water as 1000 kg/m^3) (4)

(OR)

b) i) A differential manometer is connected at the two points A and B as shown in Figure.1. At B air pressure is 9.81 N/cm^2 (abs), find the absolute pressure at A. (Take density of water as 1000 kg/m^3) (12)

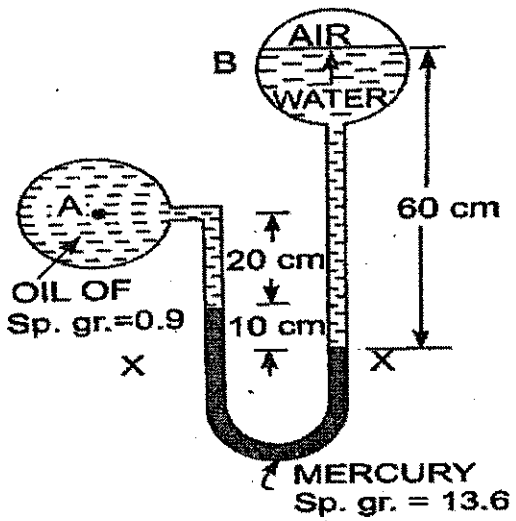


Figure.1

ii) Calculate the specific weight, density and specific gravity of one litre of a liquid weighs 7 N. (4)

12. a) i) A rectangular plane surface is 2 m wide and 3 m deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surface when its upper edge is horizontal and coincides with water surface. (Take density of water as 1000 kg/m^3) (8)

ii) A rectangular pontoon is 5 m long, 3 m wide and 1.2 m high. The Depth of immersion of the pontoon is 0.8 m in sea water. If the centre of gravity is 0.6 m above the bottom of the pontoon. Determine the meta-centric height. The density for sea water = 1025 kg/m^3. (8)

(OR)

b) i) Derive continuity equation in three dimensions in Cartesian co-ordinates. (12)

ii) The stream function for a dimensional flow is given by $\Psi = 2xy$. Calculate the resultant velocity at P (3,4). (4)

13. a) i) The water is flowing through a pipe having diameters 20 cm and 10 cm at section 1 and 2 respectively. The rate of flow through pipe is 35 liters/sec. The section 1 is 6 m above the datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm^2. Find the intensity of pressure at section 2. (Take density of water as 1000 kg/m^3) (10)

ii) A pitot static tube placed in the centre of a 250 mm pipe line has one leg pointing up stream and other perpendicular to that. The mean velocity in the pipe is 75 % of the central velocity. Find the discharge through the pipe if the pressure difference between the two legs is 80 mm of water and take $C_v = 0.99$. (6)

(OR)

b) Derive the Hagon-Poiseuille's equation for laminar flow of fluid in straight and circular pipe with proper assumptions and neat sketch. (16)

14. a) i) An oil of specific gravity 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200 mm at the rate of 60 liters/sec. Find the head lost due to friction for a 500 m length of pipe. Find the power required to maintain this flow. (12)

ii) Enlist any four minor losses with relevant formulae. (4)

(OR)

b) i) Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $u/U=2(y/\delta)-(y/\delta)^2$, where δ = boundary layer thickness. (10)

ii) Discuss in detail about the boundary layer separation phenomena with neat sketch. Also give controlling methods. (6)

15. a) Drag force (F) of a partially submerged body is a function of relative velocity (v). Linear dimension (L), surface roughness (k), fluid density (ρ), viscosity (μ) and acceleration due to gravity (g). Using Buckingham pi theorem method of dimensional analysis obtain an expression for the drag in terms of dimensionless number. (16)

(OR)

b) The efficiency(η) of a fan depends on density(ρ), viscosity of the fluid(μ), angular velocity(ω), diameter(D) of the rotor and the discharge(Q). Derive an expression for efficiency(η) by dimensional analysis and show that, $\eta = \varphi[\mu/(D^2\omega\rho), Q/(D^3\omega)]$ (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE302 – Surveying

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the basic principles of surveying.
2. Mention the different sources of local attraction.
3. Differentiate between level line and horizontal line.
4. Why the horizontal equivalent is not constant?
5. State the transit rule.
6. Mention the fundamental axis of theodolite.
7. List merits and demerits of movable hair method in tachometric survey.
8. Write the name of two method of setting simple curves.
9. How horizontal angle is measured in a total station?
10. List the advantages of GPS survey.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail about classification of surveying. (8)

ii) Categorise the different sources of errors in chain surveying. Distinguish between cumulative and compensating errors. (8)

(OR)

b) i) Define the term local attraction, where do you suspect local attraction? How is it detected and adjusted. (8)

ii) Write a short note on the whole circle bearing system and the quadrantial bearing systems. (8)

12. a) i) In a fly level surveying, starting from bench mark A (R.L = 400.00) and ending with staff station, the following consecutive sights are taken 0.925, 1.205, 2.045, 1.625, 2.215, 2.415, 2.105 and 1.405 Find the R.Ls of point B. (12)

ii) How will you continue levelling across a river? (4)

(OR)

b) i) Explain the Procedure to determine the capacity of a reservoir using a contour map. (12)

ii) What are permanent adjustments? Why they should be done? (4)

13. a) A theodolite was set up at a distance of 150 m from a tower. The angle of elevation to the top of the tower was 10^0 08', while the angle of depression to the foot of the tower was $03^0$12'. The staff reading on the B.M of R.L 50.217 with the telescope horizontal was 0.880. Find the height of the tower and reduced level of the top and foot of the tower. (16)

(OR)

b) A reservoir of bottom size 60 m x 45 m is planned with a depth of 5 m. The side slope is 1.5:1. Calculate the quantity of earth to be excavated. Assume the surface of the ground to be level before excavation. (16)

14. a) A certain distance was measured by a tacheometer and a subtense theodolite. Find the total number of turns in micrometer. (16)

Details from tacheometer are as follows:

Staff intercept = 1.125 m

Angle of elevation = 5°30'

f/i = 100 and f+ d = 0.2,

Details from subtense theodolite are as follows:

Staff intercept = 2.0 m and angle of elevation = 6°00',

Constants, C = 100 and (f+d) = 0.3

(OR)

b) Calculate the reduced levels of the various station pegs on a vertical curve connecting two uniform grades of 0.5 % and – 0.7 %. The chainage and the reduced levels of the point of intersection are 500 m and 350.75 m respectively. Take the rate of change of grade as 0.1 % per 30 m. (16)

15. a) i) Explain the pulse method and phase difference method used in EDMs. (10)

ii) List and discuss the sources of error in GPS. (6)

(OR)

b) i) Discuss the advantage and applications of total station. (6)

ii) Write short notes on drone surveying and its applications. (10)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE302 - Surveying

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Change the following whole circle bearing to reduced bearing : a) 150° 20' b) 342° 30'.
2. Write the formula for correction for curvature and refraction.
3. How elimination of parallax is done in theodolite?
4. Define traversing.
5. Enlist the major characteristics of tacheometer.
6. List the methods used to calculate distances in tachometric surveying.
7. State the principle of least squares.
8. Classify errors.
9. Write down the errors in GPS.
10. Mention the instruments used in modern surveying.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The following readings were observed successively with a leveling instrument. The instrument was shifted after 5th and 11th readings. 0.585, 1.010, 1.735, 3.295, 3.775, 0.350, 1.300, 1.795, 2.575, 3.375, 3.895, 1.735, 0.635, and 1.605. draw a page of level book and determine the R.L of various points if the R.L. of the point on which the first reading was taken is 135.000 m. (16)

(OR)

b) Describe the methods of leveling in detail. (16)

12. a) Discuss about the temporary and permanent adjustments of a theodolite. (16)

(OR)

b) Recommend the various methods of measuring horizontal angle using a theodolite. (16)

13. a) The tacheometer was set up at a station A and the readings on a Vertically held staff at B were 2.255, 2.605 and 2.955, the line of sight being at a inclination of +8° 24'. Another observation on the Vertically held staff at B.M gave the readings 1.640, 1.920 and 2.200, the inclination of the line of sight being +1° 6'. Calculate the horizontal distance between A and B, the elevation of B if the R.L of B.M is 418.685 m. The constant of the instruments were 100 and 0.3. (16)

(OR)

b) Derive the distance and Elevation Formulae for Staff held normal by tacheometry, when the line of sight is at an angle of elevation. (16)

14. a) Highlight on sources, precautions, correction and classification of errors. (16)

(OR)

b) Write a note on (16)
a) Method of equal shifts
b) Normal equation.

15. a) Explain detail about the Total Station with parts and accessories and working Principle. (16)

(OR)

b) Write briefly about the Space, Control and user segments of GPS and their functions. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE303 – Construction Materials and Technology

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the characteristics of good building stone.
2. Define efflorescences in bricks and how it can be prevented?
3. Name the Bogue's compounds of Cement.
4. Define the term "Mortar".
5. Why seasoning of timber is necessary?
6. Give the merits of aluminum in construction.
7. State the requirements of good stairs.
8. Write the necessity of providing Damp proof course in buildings.
9. How the arches are classified?
10. Name the various types of defects in plastering.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain the various types of stone which are used for building works.	(6)
		ii)	Discuss any two test to evaluate the quality of good building stone.	(10)
			(OR)	
	b)	i)	How bricks are classified and explain the process of manufacturing clay bricks?	(10)
		ii)	List and explain the different types of refractory bricks.	(6)
12.	a)		Explain with flow diagrams the dry and wet process of manufacturing of cement.	(16)
			(OR)	
	b)		Discuss in detail about characteristic and function of coarse and fine aggregates.	(16)
13.	a)	i)	Explain the principles of hardened concrete.	(8)
		ii)	Write short notes on various types of special concrete.	(8)

(OR)

b) i) Discuss the various market forms of timbers. (8)

ii) Mention the various uses of steel in construction and list the various market forms of steel. (8)

14. a) Explain the various types of flooring used in construction. (16)

(OR)

b) Discuss the three classifications of roofs based on their functional requirements. (16)

15. a) i) Write short notes on fixture and fastenings for doors and windows. (10)

ii) Write short notes on underpinning. What are the stapes of underpinning? (6)

(OR)

b) i) Discuss the Indian standard on form work plastering and give details about the methods of plastering. (10)

ii) Define the term "pointing" and explain about objectives and methods of pointing. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE502 – Mechanics of Soils

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between Porosity and void ratio.
2. What do you understand by consistency of soil?
3. Mention the assumptions of Boussinesq's solution.
4. What is the principle behind Newmark's influence chart?
5. Write short explanatory notes on quick sand condition.
6. Give the applications of flow net.
7. Differentiate between compaction and consolidation.
8. Define Pre Consolidation Pressure. In what ways is its determination important in soil engineering?
9. UCC strength of a clay was observed as 110 kN/m^2. What is its shear strength?
10. Write down the Mohr's-Coulomb Failure envelope equation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Briefly explain about the I.S Soil Classification system. (16)

(OR)

b) Classify the soils on the basis of the data provided. Where id additional information required? What data are needed? (16)

Soil Identification	$W_{L(\%)}$	$W_P(\%)$	% Passing through 75μ sieve	% of Gravel	% of sand
A	450	50	100	0	0
B	34	20	80	0	20
C	60	30	90	0	10
D	30	Nonplastic	100	0	0
E	35	20	20	60	20
F	20	Nonplastic	10	20	70

12. a) A 12 m thick layer of clay is underlined by a 4 m thick layer of sand. The water table is at a depth of 5 m from the ground surface. The unit weight of clay above the water table is 17 kN/m^3 and below the water table is 20 kN/m^3. Unit weight and sand is 19.1 kN/m^3. Draw the variation of total stress, pore water pressure and effective stress distribution diagrams with depth. (16)

(OR)

b) An annular ring footing of external and internal radii of 12 m and 6 m respectively transmits a pressure of 150 kN/m^2. Compute the vertical stress at a depth of 5 m below the center. (16)

13. a) i) Calculate the coefficient of permeability of a soil sample 6 cm in height and 50 cm^2 in cross sectional area, if a quality of water equal to 430 CC passed down in 10 minutes under an effective constant head of 40 cm. On oven drying, the test specimen weighed 4.98 N. Taking specific gravity of the solids a 2.65, Calculate the seepage velocity of water during the test. (10)

ii) Explain the Constant Head permeability test in detail. (6)

(OR)

b) Derive the expressions to find out coefficient of permeability of layered soil when the flow is (i) Parallel to the bedding plane (ii) Perpendicular to the bedding plane. (16)

14. a) A 2 cm thick laboratory soil sample reaches 50 % consolidation in 45 seconds under double drainage condition. Find how much time will be required for a 12 m thick layer in the field to reach the same degree of consolidation if it has drainage on one side only. (16)

(OR)

b) How will you determine maximum dry density and optimum moisture content in the laboratory? Explain. (16)

15. a) The table gives the data at failure obtained from consolidated undrained tri-axial tests on three identical cylindrical specimens of saturated clay. (16)

Description	Specimen 1	Specimen 2	Specimen 3
All round cell Pressure, σ_3(kN/m^2)	150	300	450
Deviator Stress, σ_d (kN/m^2)	192	341	504
Pore Water Pressure, U (kN/m^2)	80	154	222

Determine the cohesion and angle of shearing resistance for the soil in terms of (1) total stresses and (2) effective stresses.

(OR)

b) Briefly discuss about the Direct shear test with neat diagram and its Limitations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE402 – Mechanics of Soils

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Recall the term phase relationships in the soil with a neat sketch.
2. Define Void ratio and Porosity.
3. Show the importance of Isobar in determining the vertical stresses.
4. The capillary rise in soil A, with an effective size of 0.02 mm, was 60 cm. Estimate the capillary rise in a similar soil B with an effective size of 0.04 mm.
5. Recall the essential properties of Flow nets.
6. Show the factor that affects the Permeability.
7. Identify the limitations of Terzaghi's analysis in one-dimensional Consolidation Theory.
8. Distinguish between compaction and Consolidation.
9. Outline the various factors affecting the Shear Strength of soil.
10. Determine the angle of internal friction of purely cohesionless soil for the normal stress of soil is 60 kg/cm^2, and the shear stress of soil is 70 kg/cm^2.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) In a soil sample, the porosity of soil is 50% with a unit weight of soil of 25 kN/m^3. Calculate (12)
    a) Void ratio
    b) Specific Gravity
    c) Dry density
    d) Unit weight of soil if the soil has 50% saturated
    e) Unit weight of soil if the soil has 100% saturated

    ii) Write down the various classifications of Soil. (4)

(OR)

b) i) To determine the basic properties of soil, a volume of 0.3 m^3 samples was obtained from the site with a moist soil weight of 5.5 N and kept in the oven to dry the sample. The weight was found to be 3.5 N. The specific gravity of solids and mass-specific gravity are 2.60 and 1.70, respectively. Determine (12)

a) Water content
b) Void ratio
c) Porosity
d) Degree of saturation

ii) Explain the procedure to determine any one of Atterberg's limits. (4)

12. a) i) It has been decided to construct a dam where the water table in a deposit of sand 8 m thick is 3 m below the surface. Above the water table, the sand is saturated with capillary water. The bulk density of sand is 20 kN/m^3. Calculate the effective pressure at 1 m, 3 m and 8 m below the surface and plot the variation of total pressure, Natural pressure and effective pressure over the depth of 8 m. (12)

ii) List the various types of stresses that occur in the soil and briefly describe it. (4)

(OR)

b) i) Determine the intensity of vertical pressure and horizontal shear stress at point 4 m directly below 20 kN point load acting at a horizontal ground surface. What will be vertical pressure and shear stress at a point 2 m horizontal away from the axis of loading but at the same depth of 4 m? (12)

ii) Write the importance of the Newmark's Influence chart. (4)

13. a) i) Calculate the coefficient of permeability of a soil sample, 6 cm in height and 50 cm^2 in cross-sectional area, if a quantity of water equal to 430 ml is passed down in 10 min, under an effective constant head of 40 cm. On oven-drying, the test specimen has a mass of 498 g. Taking the specific gravity of soil solids as 2.65, calculate the seepage velocity of water during the test. (10)

ii) Explain any procedure used to find Soil Permeability using the laboratory method. (6)

(OR)

b) i) Explain the construction procedure of Flow nets and also provide a brief explanation of their properties and applications. (10)

ii) Outline the application of the Phreatic line in the seepage analysis. (6)

14. a) The following results were obtained from a standard compaction test on a soil sample. (16)

Water Content (%)	0.10	0.12	0.14	0.16	0.18	0.20	0.22
Mass of soil (kg)	1.70	1.85	1.90	1.87	1.87	1.85	1.70

The Volume of the mould is 850 ml. Calculate and plot the compaction curve to obtain the maximum dry density and optimum water content. Calculate the void ratio, degree of saturation, and theoretical maximum dry density assuming G = 2.70.

(OR)

b) A layer of soft, normally consolidated clay is 20 m thick with a moisture content of 45% The clay has a saturated unit weight of 20 kN/m^3, particle specific gravity of 2.70 and a liquid limit of 60%. A foundation load will be subjected in the layer's center to a 10 kN/m^2 vertical stress increase. The groundwater level is at the surface of clay. Estimate (16)

a) The initial and final effective stresses are at the center of the layer.

b) The approximate value of the compression index (Cc)

The consolidation settlement of the foundation, if the initial effective stress at the center of the soil is 100 kN/m^2.

15. a) A direct shear test was carried out on a cohesive soil sample, and the following results were obtained: (16)

Stresses	Sample 1	Sample 2
Normal stress (kN/m^2)	135	230
Shear stress (kN/m^2)	105	110

What would be the deviator stress at failure if a triaxial test is carried out on the same soil with a cell pressure of 135 kN/m^2?

(OR)

b) A series of consolidation un-drained triaxial tests was conducted on over-consolidation clay and the following results were obtained. (16)

Sample no	Cell pressure (kN/m^2)	Deviator stress (kN/m^2)	Pore water pressure (kN/m^2)
1	120	515	-60
2	230	525	-15
3	450	825	110

Plot the strength envelope for total and effective stress and find the shear strength parameters. If the soil was pre-consolidated to a pressure of 900 kN/m^2, plot the pore pressure parameter Af variation with the over-consolidation ratio.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

CIVIL ENGINEERING

23PTCE101 – Mechanics of Solids

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw stress strain curve for mild steel and brittle material.
2. A rod is subjected to a uniaxial load within linear elastic limit. When the change in the stress is 205 MPa, the change in the strain is 0.001. If Poisson's ratio of the rod is 0.25, find the modulus of rigidity.
3. Relate shear force and bending moment.
4. Sketch the SFD and Bending moment diagram for a cantilever beam of length 'l' carrying a point moment at its free end.
5. Sketch the shear stress distribution of rectangular and I-section beams.
6. The circular bar is subjected to a bending moment of 40 kNm and allowable bending stress in the beam is to be limited to 100 MN/m^2, find the inside diameter of the bar.
7. What is meant by stiffness? Write the formula for stiffness of a close coiled helical spring subjected to axial load.
8. Why is hollow shaft preferred over a solid shaft?
9. A bar of cross-sectional area 600 mm^2 is subjected to a tensile load of 50 kN applied at each end. Determine the normal stress on a plane inclined at 30° to the direction of loading.
10. Find the degree of indeterminacy for the given truss. Shown in figure.1.

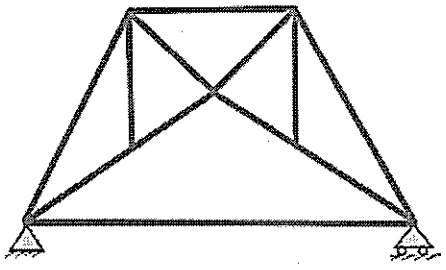


Figure.1.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A concrete column of cross-sectional area 400 mm × 350 mm is reinforced by four longitudinal 40 mm diameter round steel bars placed at each corner. If the column carries a compression load of 350 kN, determine: (16)

i) Load carried by steel and concrete

ii) The compressive stress produced in the concrete and steel bars.

Assume young's modulus of elasticity of steel is 20 times that of concrete.

(OR)

b) A uniform metal bar has a cross-sectional area of 1050 mm^2 and a length of 3.5 m. If the stress at the elastic limit is 160 N/mm^2, what will be its proof resilience? Determine the maximum value of an applied load, which may be suddenly applied without exceeding the elastic limit? Calculate the value of the gradually applied load which will produce the same extension as that produced by the suddenly applied load above. Take E = 2×10^5 N/mm^2. (16)

12. a) Figure.2 shows a beam AB of 6 m acted upon by the forces. Draw the B.M. and S.F. diagrams (16)

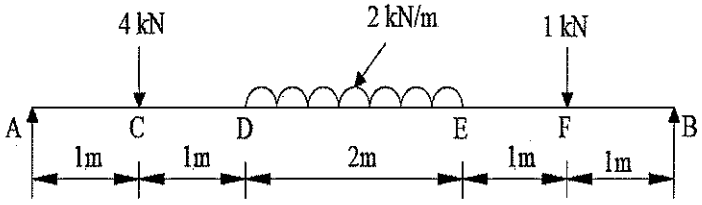


Figure.2.

(OR)

b) Draw the shear force and bending moment diagram for the give overhanging beam in Figure.3 and identify the point of contraflexure. (16)

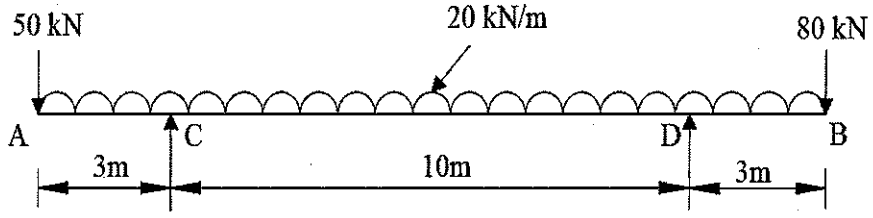


Figure.3.

13. a) i) A steel pipe of 1.5 m diameter and 15 mm thick is running for some distance which carries half of water. What would be the distance of the pipe on which it may freely supported, if bending stress is not exceeded to 60 MN/m^2? Assume unit weight of steel and water are 1000 kg/m^3 and 7650 kg/m^3. (10)

ii) A cantilever beam of length 4 m carries 25 kN at the free end. Determine strain energy stored in the beam. E = 200 Gpa and I = 1000 cm^4. (6)

(OR)

b) i) For the proposed railway track, the steel rail section has been designed with the flange of 20 cm x 3 cm and web of 40 cm and 2 cm. Calculate the maximum shearing stress developed the rail and sketch the shear stress distribution of the section if the shear force acting on the section is 20 kN. (10)

ii) A beam 7 m in length is simply supported at the ends and carries a uniformly distributed load of 8 kN/m length. Determine the strain energy stored in the beam. E = 205 GN/m^2, and I = 1440 cm^4. (6)

14. a) A solid circular shaft transmits 75 kW power at 200 r.p.m. Calculate the shaft diameter, if the twist in the shaft is not to exceed 1° in 2 meters length of shaft, and shear stress is limited to 50 MN/m^2. Take C = 100 GN/m^2. (16)

(OR)

b) For a close-coiled helical spring subjected to an axial load of 300 N having 12 coils of wire diameter of 16 mm, and made with coil diameter of 250 mm, find: (16)

i) Axial deflection

ii) Strain energy stored

iii) Maximum torsional shear stress in the wire.

Take modulus of rigidity as 80 GN/m^2.

15. a) Two mutually perpendicular planes of an element of material are subjected to direct stresses of 105 MN/m^2 (tensile) and 35 MN/m^2 (comp.) and shear stress of 70 MN/m^2. (16)

Find: i) The magnitude and direction of principal stresses and

ii) Magnitude of the normal and shear stresses on a plane on which the shear stress is maximum.

(OR)

b) Truss of 12 m span is loaded as shown in Figure.4. Find the forces in the members of the truss by method of joints. (16)

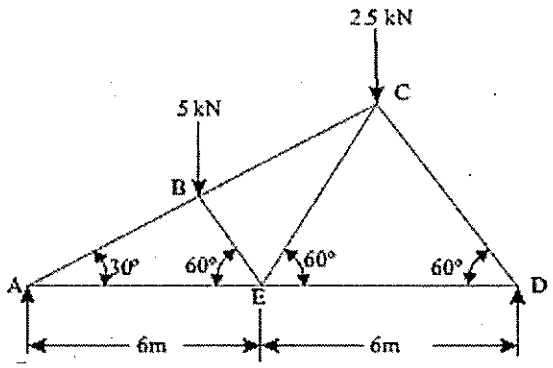


Figure.4.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE501 - Basic Structural Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Influence Line.
2. What are the uses of Influence Line Diagrams?
3. State Muller's-Breslau's Principle.
4. State Betti's Theorem.
5. What are the types of arches?
6. Distinguish between two hinged and three hinged Arches with neat sketches.
7. What is the true shape of cable structures?
8. What is the nature of force in cables?
9. What are the different types of mechanisms?
10. State the principle of Virtual Work.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Using the relevant Influence Line Diagrams, find (i) the maximum bending moment, (ii) the maximum positive and negative shear force at 4 m from the left support of a simply supported girder of span 10 m, when a train of wheel loads of 10 kN, 15 kN, 30 kN and another 30 kN spaced at 2 m, 3 m and another 3 m respectively cross the span with the 10 kN load leading. (16)

(OR)

b) A uniformly distributed load of 5 t/m, longer than span, rolls over a beam of 25 m span. Using Influence Line, determine the maximum Shear Force and Bending Moment at a section 10 m from the left end support. (16)

12. a) A statically determinate beam is shown in figure 1. The beam supports a UDL of 2 kN/m. Draw the influence lines for (16)

a) the vertical reaction at A (5 Marks)

b) the shear at B (5 Marks)

c) the moment at B (6 Marks)

Use Muller's-Breslau's principle.

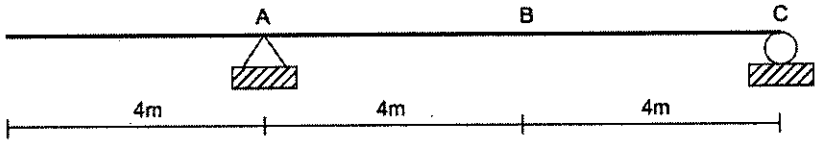


Figure.1.

(OR)

b) A statically determinate beam is shown in figure 2. Assume the span AB = BD = DC = 5 m. The beam is subjected to a live load of 150 kN. Draw the influence lines for (16)

a) the reactions at A

b) the shear force at the left and right of support B

c) the bending moment at the centre of span AB

Use Muller's-Breslau's principle.

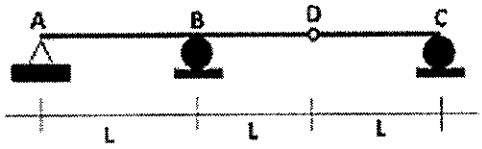


Figure.2.

13. a) A two hinged parabolic arch of span 20 m and rise 4 m carries a UDL of 30 kN/m on the left half of the span. Determine the reactions at the supports and the position and amount of maximum bending moment. (16)

(OR)

b) A parabolic three hinged arch carries a uniformly distributed load of 30 kN/m on the left half of the span. It has a span of 16 m and a central rise of 3 m. Determine the resultant reactions at supports. Determine the bending moment and normal thrust at 2 m from the left support. (16)

14. a) The three hinged stiffening girder of suspension bridge of 100 m span subjected to two-point load 200 kN each 20 m and 40 m respectively from the left-hand hinge. Determine B.M and S.F. in the girder at section at 30 m from left end. Also determine the maximum tension in the cable which has a central dip of 8 m. (16)

(OR)

b) A suspension cable of horizontal span 100 m is supported at two different levels. The left support is lower than right support by 3.5 m. The dip to the lowest point of the cable below the left support is 6 m. The cross-section area of the cable is 4000 mm^2. Determine the UDL that can be carried by the cable, if the maximum stress is 830 N/mm^2. (16)

15. a) A mild steel I section 250 mm wide and 500 mm deep has a mean flange thickness of 30 mm and a web thickness of 15 mm. Calculate the shape factor. (16)

(OR)

b) A continues beam ABC is loaded is shown in figure.3. Determine the required Mp. (16)

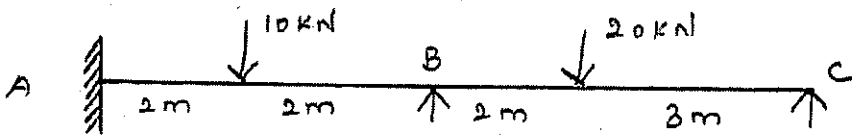


Figure.3.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE501 – Basic Structural Analysis

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by Kinematic Indeterminacy?
2. What is the static indeterminacy for the frame shown below?

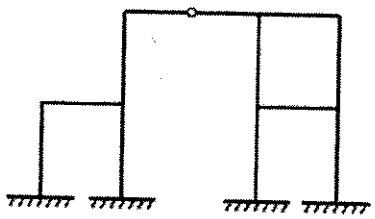


Figure.1

3. State Betti's Theorem.
4. What is lack of fit in a truss?
5. Write short notes on Arch Action.
6. What are the various type of Arches based on its geometry?
7. What are the various components of a Suspension Bridge?
8. What are the main functions of Stiffening Girders in suspension bridges?
9. Define shape factor.
10. Define collapse load.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A Simple girder of 20 m span is traversed by a moving uniformly distributed load of 6 m length with an intensity of 20 kN/m from left to right. Determine the maximum bending moment and maximum positive and negative shear force at section 4 m from left support. Also determine the absolute maximum bending moment that may occur anywhere in the girder. (16)

(OR)

b) Four Equal loads of 150 kN each equally spaced at 2 m apart followed by a uniformly distributed load of 60 kN/m at a distance of 1.5 m from the last 150 kN load cross a simply supported girder of 20 m Span from right to left. Using influence line, calculate the shear force and bending moment at a section 8 m from the left hand support when the leading 150 kN load is at 5m from the left hand support. (16)

12. a) A continuous beam ABC is simply resting on support A and C and continuous over the support B. The Span AB is 8m and BC is 6 m. Draw the influence line diagram for the moment at support B using Muller Breslau's Principle. Assume flexural rigidity is constant throughout the length and calculate the influence line ordinates at 2 m interval. (16)

(OR)

b) Draw Influence line for support reaction at the propped end of a propped cantilever of 7 m span. Calculate the influence line ordinates at 2 m interval. Use Muller Breslau's Principle. (16)

13. a) A Parabolic 3 hinged arch carries a uniformly distributed load of 30 kN/m on the left half of the span. It has a span of 16 m and a central rise of 3 m. Determine the resultant reactions at the supports. Determine the bending moment, radial shear and normal thrust at 2 m from the left support. (16)

(OR)

b) A two hinged Parabolic arch has a span of 60 m and rise of 12 m. A concentrated load 8 kN acts at 15 m from the left hinge. The second moment of area varies as the secant of inclination of the arch axis. Calculate the horizontal thrust and the reactions at the hinge. Also calculate the net bending moment at the section. (16)

14. a) A suspension cable of horizontal spam 95 m is supported at two different levels. The right support is higher than the left support by 4 m. The dip to the lowest point of the cable below the left support is 5 m. The cross section area of the cable is 3500 mm^2. Determine the uniformly distributed load that can be carried by the cable if the maximum stress is limited to 600 N/ mm^2. (16)

(OR)

b) A cable of horizontal span 21 m is to be used to support six equal loads of 40 kN each at 3 m spacing. The central dip of the cable is limited to 2 m. Determine the length of the cable required and also its sectional area if the safe tensile stress is 750 N/mm^2. (16)

15. a) Determine the shape factor for a symmetrical T section which is formed by two rectangular plate of cross section 100 mm X 10 mm. (16)

(OR)

b) A Beam fixed at both ends is subjected to uniformly distributed load W on the right half portion. Determine the value of collapse load Wc. The beam is of uniform plastic moment Mp. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE502 – Foundation Engineering

(Taylor's stability chart may be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between representative and non-representative sample.
2. What are the requirements of good foundation?
3. Sketch the different types of shear failure.
4. State the reasons for differential settlement.
5. Calculate the efficiency for a 2x2 pile group using Feld's rule.
6. Brief on Equivalent Raft approach concept.
7. Show that the factor of safety with respect to height is equal to factor of safety with respect to cohesion.
8. An infinite slope with a slope angle of 30^{o} is 6m high. The soil has cohesion of 35 kPa, angle of internal friction of 18^{o} and unit weight of 18 kN/m^3. Find the factor of safety with respect to cohesion.
9. What are the limitations of Rankine's theory?
10. State the conditions to be satisfied for a Retaining Wall to be stable.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain Static Cone Penetration Test with neat sketch. (10)

ii) Give concise note different types of foundation. (6)

(OR)

b) i) Discuss the different methods of protecting foundation on expansive soil. (10)

ii) How are samplers classified? Explain. (6)

12. a) i) Determine the safe bearing capacity of a square footing 1.5 m x 1.5 m laid at depth of 2 m in a soil having unit weight of 18 kPa, cohesion of 12 kPa and angle of internal friction of 25°. A factor of safety of 2.5 is required against shear failure. Use IS 6403 method. Load is inclined at an angle of 15°to the vertical. Water table is far below ground level. (ϕ = 25°,Nc = 20.7 ,Nq =10.7 ,Nγ = 10.9) (10)

ii) Explain the effect of water table on Bearing Capacity of soil. (6)

(OR)

b) i) Design the plan dimensions of a trapezoidal combined footing carrying two column loads of 2200 kN and 3000 kN acting at a centre to centre distance of 6.5 m. The heavier column is on the property line. TAKE SBC of soil as 200 kPa. (10)

ii) What are the limitations of Plate Load Test? (6)

13. a) i) A 35 cm concrete driven pile passes through the following layers of soil. (10)

Layer1: Depth of layer = 4 m. Loose sand with unit weight of 17 kN/m^3 and ϕ=30°

Layer 2: Depth of layer = 6 m. Medium dense sand with unit weight of 19 kN/m^3 and ϕ=34°

Layer 3: Depth of layer = 5 m. Dense sand with unit weight of 20 kN/m^3 and ϕ=39°

Calculate the safe load carrying capacity of the pile taking a factor of safety of 3. (Nq= 132 for ϕ=39°)

ii) A square group of nine piles passes through a recently filled up material of 4 m depth, the diameter of pile is 30 cm. The pile spacing is 90 cm c/c. If the unconfined compressive strength and unit weight are 50 kN/m^2 and 15 kN/m^3 respectively, compute negative skin friction. (6)

(OR)

b) i) Design a square pile group to carry 900 kN in clay with an unconfined compressive strength of 80 kN/m^2. The piles are 30 cm in diameter and 9 m long. Adhesion factor may be taken as 0.6. (10)

ii) Explain the construction of Under Reamed Pile foundation. (6)

14. a) i) Explain friction circle method for stability analysis of slope. (10)

ii) Explain the stability analysis of finite slopes using swedish circle method. (6)

(OR)

b) i) A canal 3 m deep runs through a soil having cohesion of 15 kPa and angle of internal friction of 15°, void ratio of 0.7 and specific gravity of solids of 2.72. The angle of slope of the banks is 45°. Determine the factor of safety with respect to cohesion when the canal is full upto the top of the bank. What will be the factor of safety in the case of sudden drawdown? (10)

ii) Discuss various slope protective measures generally adopted in the site. (6)

15. a) i) A Retaining Wall of 6 m high has a saturated backfill of soft clay. The properties of clay are γ_{sat} = 18 kN/m^3, unit cohesion C = 18 kN/m^2. Determine (10)

a) expected depth of tensile crack in the soil

b) active earth pressure before the occurrence of crack

c) active earth pressure after the occurrence of crack.

ii) What is meant by plastic equilibrium in soils? Also differentiate between Active and Passive of earth pressure with examples. (6)

(OR)

b) i) A 6 m high Retaining Wall with a vertical back face retains a horizontal homogenous saturated soft clay. The saturated unit weight of clay is 19 kN/m^3. Laboratory tests showed that the undrained shear strength of clay is 17 kN/m^2. Do necessary calculations and draw the variation of active earth pressure on the wall with depth. (10)

ii) Explain Coulomb's Wedge Theory with its assumptions. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE503 – Water Resources Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the merits of Isohyetal method.
2. Name the factors affecting hydrograph.
3. Show various zones of storage in reservoir.
4. What is meant by multipurpose reservoir?
5. Define storage coefficient.
6. State limitations of Darcy's law.
7. Why canals are aligned?
8. Classify different types of canal lining.
9. Identify the causes of waterlogging.
10. Assess the necessity of river training works.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Illustrate hydrologic cycle.	(8)
		ii)	Describe the working principle of a non-recording type rain gauge.	(8)
			(OR)	
	b)	i)	Categorize different types of evaporation.	(8)
		ii)	Examine the process of infiltration.	(8)
12.	a)		Describe the factors to be considered while selecting suitable site selection of reservoir.	(16)
			(OR)	
	b)	i)	How will you find reservoir capacity using mass curve?	(8)
		ii)	Discover how to control reservoir sedimentation.	(8)

13.	a)	i)	Elaborate leaky artesian aquifer.	(8)
		ii)	Recall the assumptions and limitations Dupuit's theory.	(8)
			(OR)	
	b)	i)	Explain recuperation method to find yield from an open well.	(8)
		ii)	Explain with sketch strainer type tube well.	(8)
14.	a)	i)	How canals are generally classified?	(8)
		ii)	Analyze the Kennedy's theory of canals.	(8)
			(OR)	
	b)	i)	Illustrate the components of canal cross section.	(8)
		ii)	Outline the merits of canal linings.	(8)
15.	a)	i)	Identify the preventive measures to be taken to control waterlogging.	(8)
		ii)	Categorize various types of drainage system.	(8)
			(OR)	
	b)	i)	Summarize the behaviors of rivers in detail.	(8)
		ii)	Classify different types of river training works.	(8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE503 – Water Resources Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the various phases of a hydrological cycle.
2. Define Transpiration ratio.
3. State the purpose of storage works in water resources engineering.
4. What is reservoir capacity?
5. Define Aquifer parameters.
6. What is meant by specific capacity of a well?
7. Write down the assumptions made in Kennedy's theory.
8. What do you mean by canal escape?
9. Mention the ill effects of water logging.
10. What is the principle of river training works?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Enumerate the factor affecting runoff process. (8)

ii) Explain any two Automatic Raingauges. (8)

(OR)

b) i) Enlist the uses and limitations of unit hydrograph theory. (8)

ii) Elaborate the components of a hydrograph. (8)

12. a) i) Determine the factors should be considered for reservoir planning. (8)

ii) What are the zones of a storage reservoir? (8)

(OR)

b) i) Illustrate the method of reservoir sedimentation control. (8)

ii) Distinguish single and multipurpose reservoir. (8)

13.	a)	i)	Categorize different types of aquifers with neat sketches.	(8)
		ii)	Derive an expression to obtain the discharge through a confined aquifer.	(8)
			(OR)	
	b)	i)	Classify various types of tube wells.	(8)
		ii)	Analyze the principle of recuperation test of an open well with a neat sketch.	(8)
14.	a)	i)	Summarize the methods of canal alignment.	(8)
		ii)	Evaluate lacey's theory and write its assumptions.	(8)
			(OR)	
	b)	i)	Elucidate components of canal cross section.	(8)
		ii)	Describe the types of canal lining.	(8)
15.	a)	i)	Make a note on surface drainage system.	(8)
		ii)	Identify how to prevent water logging.	(8)
			(OR)	
	b)	i)	Demonstrate behaviors of rivers in detail.	(8)
		ii)	Assess the methods of river training works.	(8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE504 – Design of Reinforced Concrete Elements

(Use of IS456: 2000 and SP 16 Design charts may be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by transformed section?
2. Write the IS code numbers to evaluate dead, live and wind loads.
3. Compare the advantages of doubly reinforced beams over singly reinforced beams.
4. Why it is necessary to provide transverse reinforcement in a one-way slab?
5. What is meant by development length and what is its significance?
6. List the factors that affect the allowable shear in concrete beams.
7. Outline the functions of transverse reinforcement in reinforced concrete column.
8. What is the main difference, in terms of structural behavior, between a short column and a slender column?
9. Under what circumstances does eccentric loading on a footing occur.
10. Sketch the appropriate detailing of waist slab for dog-legged stair case.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Summarize the differences between Working Stress method and Limit State method. (8)

ii) Explain stress- strain behavior of Concrete under uniaxial compression with neat sketches. (8)

(OR)

b) i) Enumerate the different types of loads acting on the structure and discuss about the load combinations. (8)

ii) Discuss about the Standard Concrete Mixes for Reinforced Concrete works. (8)

12. a) Design a reinforced concrete beam of rectangular section using the following data: (16)

Effective span – 8 m;

Working live load – 30 kN/m;

Overall depth restricted to 650 mm;

Use M20 grade concrete and Fe 415 HYSD bar.

Assume width of beam as 300 mm and effective cover at both tension and compression side as 50 mm.

(OR)

b) Design an interior panel of a continuous one way slab for an office floor. The slab is continuous over beams spaced at 4 m intervals. Assume Floor finish of 1 kN/m^2 and live load of 3 kN/m^2. Adopt M20 grade concrete and Fe415 grade steel bars. (16)

13. a) A reinforced concrete beam of rectangular section has a width of 250 mm and effective depth of 500 mm. The beam is reinforced with 4 bars of 25 mm diameter on the tension side. Two of the tension bars are bent up at 45° near the support section in addition the beam is provided with 2 legged stirrups of 8 mm diameter at 150 mm center near the support. If materials used are M25 and Fe415, estimate the ultimate shear strength of the support section. (16)

(OR)

b) Design the reinforcements required for a rectangular beam section with the following data: (16)

Size of the beam: 300 mm x 600 mm.

Factored shear force: 85 kN.

Factored torsion: 40 kN.

Factored bending moment: 100 kNm.

Use M20 grade concrete and Fe415 steel.

14. a) Design the reinforcement in a spiral column of 450 mm diameter subjected to a factored load of 1500 kN. The column has an unsupported length of 3.0 m and is braced against side sway. Use M25 concrete and Fe415 steel. (16)

(OR)

b) A corner column (400mm x 400mm), located in the lowermost storey of a system of braced frames, is subjected to factored loads: P_u = 1200 kN, M_{ux} = 200 kNm and M_{uy} = 110 kNm. The unsupported length of the column is 3.5 m. Design the reinforcement in the column assuming M25 concrete and Fe415steel. (16)

15. a) A reinforced concrete wall 230 mm thick carries a factored load of 600 kN/m inclusive of its self weight. Design a reinforced concrete footing on soil having safe bearing capacity of 150 kN/m^2. Use M20 grade concrete and Fe415 Steel. (16)

(OR)

b) Design an isolated footing for a square column 450 x 450 mm, reinforced by 8 Nos of 25 diameter bars, and carrying a service load of 2300 kN. Assume soil with safe bearing capacity (gross) of 300 kN/m^2 at the depth of 1.5 m below ground. Assume M20 and Fe415 for the footing and M25 and Fe415 for the column. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE503 – Design of Reinforced Concrete and Masonry Structures

(Use of 3370 : 1967 & 1905 : 1987 & IS 456 : 2000 May be Permitted)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Name the common types of foundations.
2. What are the assumptions made in the design of footings?
3. State the difference between cantilever and counterfort type retaining wall.
4. List the forces acting on retaining wall.
5. What is capital or column head?
6. Define the characteristic features of yield lines.
7. What are the forces acting on the dome?
8. Under which conditions the underground water tanks are designed?
9. What is the allowable compressive stress in brick masonry?
10. How will you determine effective length of masonry wall?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A rectangular RCC column of size 400 mm x 600 mm carrying an axial load of 1800 kN. If the safe bearing capacity of the soil is 150 kN/m^2. Design a suitable footing. Use M 25 concrete and Fe 500 steel. Sketch the details of reinforcements in the rectangular footing. (16)

(OR)

b) Design a combined footing for the two columns at a multi-storey building. The columns of size 400 mm x 400 mm transmit a working load of 300 kN each and they are spaced at 5 m c/c.The safe bearing capacity of soil at site is 200 kN/m^2. Adopt M 20 grade concrete and Fe 415 grade steel. Sketch the details of reinforcements in the combined footing. (16)

12. a) Design a cantilever retaining wall to retain earth embankment 4 m height above ground level the density of earth is 18 kN/m^3 and its angle of repose is 30 degrees. Theembankment is horizontal at its top. The safe bearing capacity of the soil may be taken as 200 kN/m^2 and the co efficient of friction between soil and concrete is 0.5.adopt M 20 grade concrete and Fe 415 HYSD bars. Sketch the details of reinforcements in details in the retaining wall (16)

(OR)

b) Design a counterfort type retaining wall to suit the following data: (16)

Height of wall above ground level = 6 m

S.B.C. of soil at site = 160 kN/m

Angle of internal friction = 33 degrees

Density of soils = 16 kN/m

Spacing of counterforts = 3 m c/c

Materials = M20 grade concrete

Fe 415 HYSD bars

Sketch the details of reinforcements in details in the wall.

13. a) Design the interior panel of a flat slab with drops for an office floor to suit the following data: (16)

Size of office floor = 25 m x 25 m

Size of panels = 5 m x 5 m

Loading class = 4 kN/m^2

Materials: M 20 grade concrete Fe 415 steel

(OR)

b) Using virtual work method, obtain the expression for ultimate moment an isotropically reinforced square slab fixed on all edges and subjected to a uniformly distributed load. (16)

14. a) A reinforced concrete dome of 6m base diameter with a rise of 1.25 m is to be designed for a water tank. The uniformly distributed load including finishes on dome may be taken as 2 kN/m^2 adopting M 20 concrete and Fe 500 steel, design the dome and ring beam. Permissible tensile stress in steel = 100 N/mm^2. (16)

(OR)

b) Design a circular tank with a flexible base for capacity of 500000 liters. The depth of water is to be 4m.Free board = 200 mm. Use M20 concrete and Fe 500 steel. Sketch the details of reinforcements in tank walls. (16)

15. a) A column of size 300 x 550mm constructed in first class brick in 1:6 cement mortar using modular bricks size of 200 x 200 x 100 mm and height of pier between footing and top slab is 4.5 m. The strength of the unit may be taken as 10 N/mm^2 calculate compressive stress for applied at eccentricity of 100 mm. (16)

(OR)

b) Explain in brief the step by step procedure of designing an axially loaded column as per BIS Code. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE503 - Design of Reinforced Concrete and Masonry Structures

(IS456-2000, IS 3370-2009, IS 2212 -1991 Permitted)

Assume suitable data if necessary

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the need of raft footing.
2. Write are the assumptions in footings design?
3. State the use of retaining walls.
4. What forces acting on retaining wall?
5. Define yield line theory.
6. State the principle of virtual work.
7. List the types of movement joints in water tank.
8. For what conditions the underground water tanks are designed and checked?
9. What is effective length of brick wall when the wall is continuous?
10. Define the slenderness ratio of a masonry wall.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A rectangular RCC column of size 450 mm x 600 mm carrying an axial load of 2000 kN.If the safe bearing capacity of the soil is 180 kN/m^2. Design a suitable footing. Use M20 concrete and Fe500 steel. Sketch the details of reinforcements in the rectangular footing. (16)

(OR)

b) Design a combined footing for the two columns at a multi-storey building. The columns of size 300 mm x 400 mm transmit a working load of 400 kN each and they are spaced at 5.5 m c/c. The safe bearing capacity of soil at site is 180 kN/m^2. Adopt M20 grade concrete and Fe500 grade steel. Sketch the details of reinforcements in the combined footing. (16)

12. a) Design a cantilever retaining wall to retain earth embankment 4.2 m height above ground level the density of earth is 19 kN/m^3 and its angle of repose is 30 degrees. The embankment is horizontal at its top. The safe bearing capacity of the soil may be taken as 220 kN/m^2 and the co efficient of friction between soil and concrete is 0.5.adopt M20 grade concrete and Fe500 HYSD bars. Sketch the details of reinforcements in the retaining wall. (16)

(OR)

b) Design a counterfort type retaining wall to suit the following data: (16)

Height of wall above ground level = 6.5 m

S.B.C. of soil at site = 180 kN/m

Angle of internal friction = 32 degrees

Density of soils = 18 kN/m

Spacing of counterforts = 3.2 m c/c

Materials = M20 grade concrete

Fe500 HYSD bars

Sketch the details of reinforcements in the wall.

13. a) Design the interior panel of a flat slab with drops for an office floor to suit the following data: (16)

Size of office floor = 24 m x 24 m

Size of panels = 4 m x 4 m

Loading class = 4 kN/m^2

Materials: M20 grade concreteFe415 steel.

(OR)

b) Using virtual work method, obtain the expression for ultimate moment an isotropically reinforced square slab simply supported and subjected to a uniformly distributed load. (16)

14. a) A reinforced concrete dome of 6.5 m base diameter with a rise of 1.4 m is to be designed for a water tank. The uniformly distributed load including finishes may be taken as 2 kN/m^2 adopting M20 concrete and Fe415 steel, design the dome and ring beam. Permissible tensile stress in steel = 100 N/mm^2. (16)

(OR)

b) Design a circular tank with a flexible base for capacity of 600000 litres. The depth of water is to be 4.2 m. Free board = 200 mm. Use M20 concrete and Fe415 steel. Sketch the details of reinforcements in tank walls. (16)

15. a) A column of size 300 x 500 mm constructed in first class brick in 1:5 cement mortar using modular bricks size of 200 x 200 x 100 mm height of pier between footing and top slab is 4.5 m. the strength of the unit may be taken as 10 N/mm^2 calculate compressive stress for applied at eccentricity of 95 mm. (16)

(OR)

b) Calculate the allowable compressive stress on a column 45 cm x 60 cm constructed in first class brick work in 1:5 cement mortar. Using modular brick 200 x 100 x 100 mm, the height of the pier between the footing and the top slab is 5.2 m. The strength of units may be assumed as 10 Mpa. If the load was applied at an eccentricity of 90 mm above the major axis of bending. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

CIVIL ENGINEERING

23PTCE303 – Highway and Railway Engineering

(Use Code of IRC 37-2018; IRC 58-2015 May be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the objectives of transportation planning?
2. Define Right of way.
3. List out the recommended design speed for different classes of urban road.
4. Write short notes on overturning zone.
5. List out the desirable properties of highway materials.
6. Define softening point of bitumen.
7. Define Mud pumping.
8. Find out the expression for sleeper density if the rail length used in a track is 9 m an there are 20 sleepers under one rail length.
9. What are the merits and demerits of off-Track dampers?
10. What is meant by rolling stock?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) History of road development in Indian in a chronological order. (16)

(OR)

b) Draw typical cross section for the following categories (16)

1) ODR Embankment in rural area.
2) MDR Cutting in rural area
3) NH in rural area
4) Two- Lane City road in built-up area

12. a) i) The design speed of a highway is 90 kmph. There is a horizontal curve of radius 200 m on this road. If the maximum allowable speed on the curve. Also determine the extra widening required and length of the spiral transition curve using the following data. (10)

1) Length of wheel base = 6.1 m
2) Pavement width = 7.2 m
3) Number of lanes = 2
4) Rate of introduction of super elevation 1 in 200

ii) Distinguish the difference between SSD and OSD also derive the equation for OSD. (6)

(OR)

b) i) Illustrate the necessity and design of sight distance at intersections with IRC Standard. (10)

ii) In kodaikanal due to deep valley hair-bin bends are proposed by NHAI. Recommend the design criteria for planning hair-bin bends as per IRC. (6)

13. a) In a village a flexible pavement is proposed for the construction. As an engineer, how would you evaluate the stability of the soil subgrade and the thickness of the pavement? Explain briefly. (16)

(OR)

b) Explain the various type of failures in rigid pavement and their causes. (16)

14. a) i) Enumerate the ideal requirement of permanent way. (8)

ii) Discuss the mechanism and effect of conning of wheels. (8)

(OR)

b) i) Evaluate the permissible speed on the curve? If on a 8° M.G track, the average speed of different trains is 50 kmph and allowable cant deficiency is half that of maximum cant deficiency. (8)

ii) Determine the length of transition curve and the offsets at every 15m on a BG track with design speed of 110 kmph. (8)

15. a) i) Explain the requirements and characteristics of ideal crossing also list out the to achieve it. (8)

ii) Mention the various sources of moisture in a railway track. Illustrate your answer with a neat sketch. (8)

(OR)

b) i) Discuss the functions and various requirements of a railway station. (8)

ii) Explain the principal causes governing the resistance due to curves. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE505 – Waste Water Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define time of concentration.
2. State the advantages of using circular section sewers.
3. Differentiate unit operations and unit processes in wastewater treatment.
4. Show the Stoke's equation of discrete particle settling.
5. State the advantages of UASB reactor.
6. Compare the oxidation ditch with oxidation pond.
7. State the need of sludge digestion.
8. List out the common method of sludge disposal.
9. Define dilution factor.
10. Enlist the preventive measures for sewage sickness.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the merits & demerits of separate and combined system of sewage. (8)

ii) Describe the purposes served by an inverted siphon with help of a neat sketch. (8)

(OR)

b) i) Discuss the factors to be considered while selecting pumps for sewerage system. (8)

ii) Explain the methods of estimation of storm water runoff. (8)

12. a) i) Describe the working of gird chamber and its types. (8)

ii) Design a bar screen for a peak average flow of 30 million liter per day. (8)

(OR)

b) i) Discuss the fundamentals of microbiology waste water. (8)

ii) Design a circular primary sedimentation tank to treat an average sewage flow of 5000 m^3/day, suitably assuming the design criteria. (8)

13. a) i) Design a high rate tricking filter for treating sewage of 22 Million lit/day with a raw sewage BOS_5 of 320 mg/l. Assume a recirculation ratio of 1.5 and efficiency of the PST as 35 % and filter as 75 %. Use NRC equation. (8)

ii) Explain the algal – bacterial symbiosis with respect to waste stabilization pond. (8)

(OR)

b) i) Explain the components and the operational principles of activated sludge process. (8)

ii) Describe the various methods of disposal of septic tank effluent. (8)

14. a) Design a sludge digestion tank for 40000 people. The sludge content per capita per day is 0.068 kg. The moisture of the sludge is 94 %. The specific gravity of the wet sludge is 1.02 and 3.5 % of the digestor volume is daily filled with the fresh sludge, which is mixed with the digested sludge. (16)

(OR)

b) Explain the components of a typical house drainage system and its design consideration. (16)

15. a) i) Explain the reclamation and reuse of sewage. (8)

ii) Derive Streeter Phelp's equation. (8)

(OR)

b) i) Draw a typical oxygen sag curve and explain its importance. (8)

ii) Explain the advantages of sewage farming over the method of disposal of sewage by dilution. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE505 – Waste Water Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the types of sewerage system.
2. Distinguish between self-cleansing velocity and non-scouring velocity.
3. Show the BOD demand curve.
4. Give at least two examples for unit operation and unit process in waste water treatment.
5. Discuss the term re-circulation ratio in trickling filter.
6. What is biological film (or) slim layer?
7. Define sludge volume index.
8. What are the stages in the sludge digestion system?
9. Define the dilution factor.
10. What is meant by eutrophication?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Calculate the combined flow discharge of sewage for the given data. Area to be served is 150 hectares. Population density is 50,000. Time of entry is 5 minutes. Time of flow is 20 minutes. Rate of water supply is 135 LPCD. Impermeability factor = 0.45. Assume 80 % of water supplied turns into sewer and peak factor as 1.5. (16)

(OR)

b) Enumerate and explain the various sewer appurtenance with neat sketches. (16)

12. a) Explain the physio-chemical characteristics of sewage and state their environmental significance. (16)

(OR)

b) What is meant by sedimentation tank explain its types with neat sketches? (16)

13. a) Examine the components and the operational principles of activated sludge process with neat sketch. Write its advantages and disadvantages. (16)

(OR)

b) Describe the steps involved in the design of septic tank. And also explain the working of a septic tank with neat sketch. (16)

14. a) A waste water treatment plant produces sludge of 1000 kg dry solids per day with a moisture content of 97 %. The solids are 65 % volatile with specific gravity 1.05 and inorganic solids of specific gravity 2.55. Determine the sludge volume of raw sludge, after dewatering to 70 % and after incineration. (16)

(OR)

b) Explain the 'one' and 'two' pipe system of plumbing and state the conditions under which they are adopted. (16)

15. a) Explain briefly about the methods of sewage disposal. (16)

(OR)

b) Summaries the principle of the self-purification process of river and the various stages of oxygen sag curve. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE506 – Transportation Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate right of way and carriage way with neat sketch.
2. Classify the types of roads as per IRC.
3. What is need for extra widening at curves?
4. Define the term "Lidar Survey".
5. Write the causes of scaling.
6. What is mud pumping?
7. Write the various types of gradients.
8. Define gauge length.
9. Distinguish between railway station and railway yard.
10. Mention the types of level crossings.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Enumerate the engineering surveys conducted for highway alignment. (16)

(OR)

b) What are the requirements of an ideal highway alignment? Explain briefly. (16)

12. a) i) The speed of overtaking and over taken vehicles are 70 kmph and 40 kmph, respectively on a two-way traffic road. If the acceleration of overtaking vehicle is 0.99 m/sec^2. Calculate SSD and OSD. (8)

ii) National highway passing through rolling terrain of heavy rainfall area, R = 500 m. Design length of transition curve. (8)

(OR)

b) i) A vehicle travels at a speed of 60 kmph. Find the super elevation to be provided if the radius of curvature is 220 m. (8)

ii) A vehicle travels in a 2-lane road with a design speed of 80 kmph. Find the amount of extra widening for a radius of curvature of 210 m. (8)

13. a) With neat sketch, illustrate the types of defects in flexible pavements. (16)

(OR)

b) Elucidate the various tests conducted for bitumen. (16)

14. a) Draw a neat sketch of permanent way cross section. Explain the functions of its components. (16)

(OR)

b) Elaborate the engineering surveys for track alignment. (16)

15. a) Draw a neat sketch of points and crossings. Describe its components in detail. (16)

(OR)

b) Classify the stages in construction and maintenance of railway track. Discuss in detail. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CEH302 – Construction Techniques and Equipment

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Name any two types of earthwork equipment used for excavation.
2. Give examples for material handling equipment.
3. Indicate the purpose of a crusher in aggregate production.
4. Specify the significance of pumping equipment in concreting.
5. Compare piles with micro-piles.
6. Draw the schematic view of diaphragm wall.
7. Define cofferdam.
8. Mention two applications of sheet piles.
9. What is meant by vacuum dewatering?
10. Specify the applications of aerial transporting in construction.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss in detail about the selection criteria of equipment used for earthwork operations. (8)

ii) Analyse the importance of hauling equipment in material transportation and mention its uses. (8)

(OR)

b) Describe the working principles and applications of material handling equipment like forklifts and conveyors. (16)

12. a) Explain the operation and roles of crushers, feeders and screening equipment in aggregate production. (16)

(OR)

b) Elaborate the importance and process of producing Ready-Mix Concrete (RMC) and the equipment used for its preparation and transportation. (16)

13. a) Illustrate the equipment used for concreting at construction sites with neat sketches. (16)

(OR)

b) Describe the different types of compaction equipment and explore their roles in soil stabilization and foundation construction. (16)

14. a) Explain the techniques and equipment used for box jacking and pipe jacking in substructure construction projects. (16)

(OR)

b) Discuss the various piling techniques used in substructure construction including driven piles and bored piles with their advantages and limitations. (16)

15. a) Describe concrete paving technology with the suitable equipment used for paving operations. (16)

(OR)

b) Outline the erection techniques used for tall structures with the suitable equipment. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE504 – Estimation,Quantity Surveying and Valuation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How accurate should measurement be?
2. Give the importance of estimation.
3. Give the units of measurements for the following items of work.
   a) Steel reinforcement in R.C.C. Works
   b) 11.5 cm thick partition wall in brick wall
   c) Weathering Course
   d) D.P.C
   e) Brickwork
4. List out the various types of Arches.
5. What are all the appurtenances required for septic tank and soak pit?
6. Write down about the tube well and aqueduct.
7. Outline the factors to be considered for analysis of rate for various items of work.
8. List out the reasons for rejection of all tenders.
9. What are the methods of determining the depreciation?
10. Write a simple note on how to find a depth of a foundation during writing the report for residential buildings.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Briefly explain the different types of Estimates discussing when each one is preferred. (10)

    ii) Write the importance of Estimation. (6)

(OR)

    b) i) Explain the Individual Wall method of building estimating. (10)

    ii) How will you estimate the ventilators, doors and windows? (6)

12. a) Write a detailed specification of the followings (16)

i) Earthwork in excavation in foundations

ii) Cement Concrete 1:2:4

iii) Reinforced Cement Concrete (R.C.C)

iv) Damp Proof course 2.5 cm – 1:1.5:3

(OR)

b) Design and estimate the materials required (cement, sand, aggregate, and steel) for a reinforced concrete arch with a span of 5 m, rise of 2 m, and thickness of 0.25 m. Also determine the reinforcement required for the Arch. (16)

13. a) Prepare a detailed estimate of a Septic Tank for 25 users from the given in figure.1 Septic Tank shall be of first class brick work in 1:4 cement mortars the Foundation and Floor shall be of first class brick work in 1:4 cement mortar the Foundation and Floors shall be of 1:3:6 cement concrete. Inside of septic tank shall be finished with 12 mm cement plaster and floor shall be finished with 20 mm thick plaster with 1:3 cement mortar mixed with standard water proofing compound. (16)

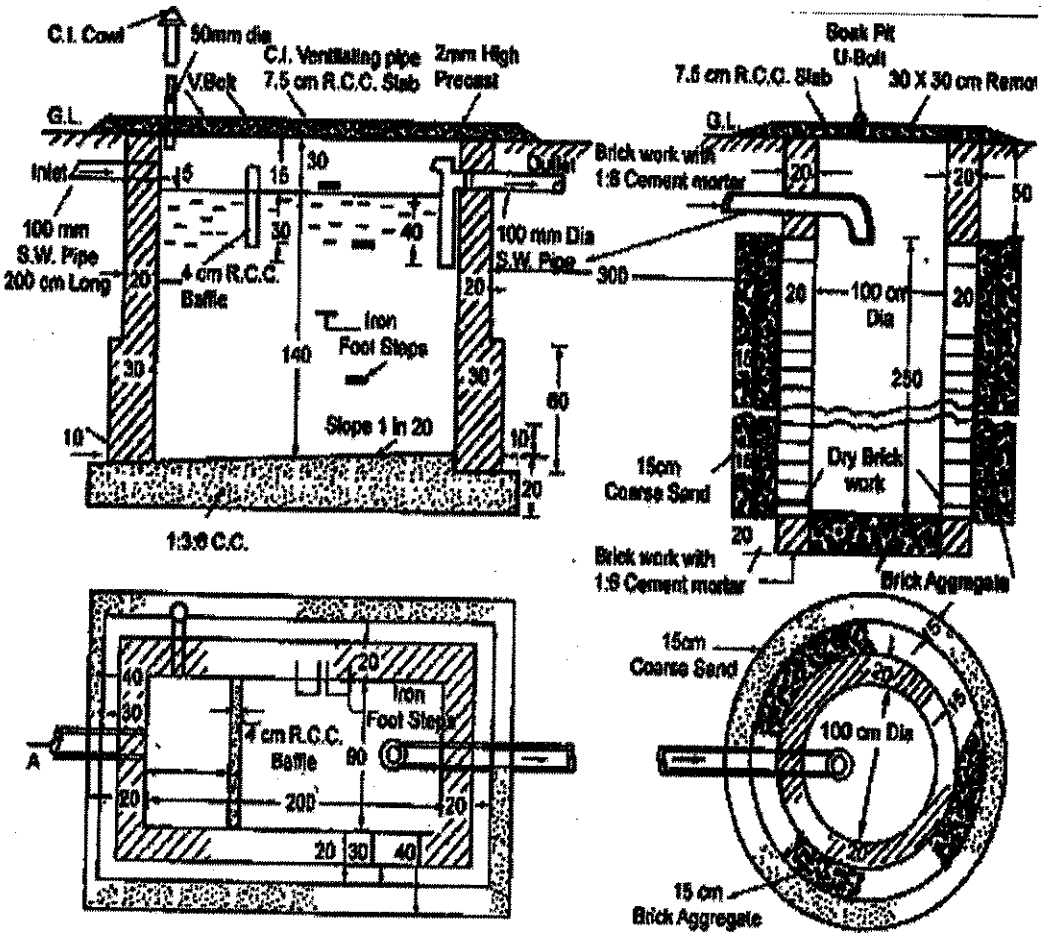


Figure.1

(OR)

b) Calculate the quantities of all items of work for the construction of a Retaining Wall for a length of 20 meter shown in figure.2 (16)

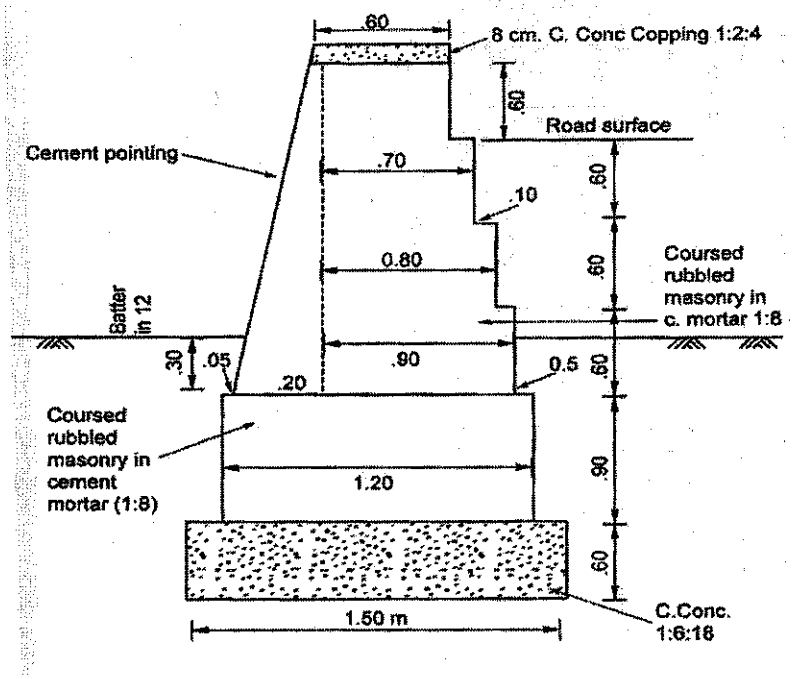


Figure.2

14. a) i) Write the types of Specifications. Also, state their advantages and disadvantages. (8)

ii) Explain the principles of Specification writing. (8)

(OR)

b) i) Explain the briefly about contract document. (8)

ii) Explain the sequential procedure of opening of Tenders. (8)

15. a) Explain the following: (16)

i) Types of lease

ii) Mortgage

iii) Methods of depreciation

iv) Escalation

(OR)

b) Describe the principles for the Report Preparation of Water Supply Scheme. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CEH203 – Environmental Management and Sustainable Development

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the problems in using fertilizers and pesticides.
2. Define overgrazing.
3. Classify various air pollutant.
4. What is meant by thermal pollution?
5. State the objectives of ISO-14000 standard.
6. Enlist the benefits of life cycle assessment.
7. Show the main function of environmental policy.
8. What are the main principles of international treaties?
9. Differentiate energy resources and energy reserves.
10. List out the core elements of sustainable development.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Discuss the effects of over exploitation of minerals.	(8)
		ii)	Illustrate the merits and demerits of constructing big dams.	(8)
			(OR)	
	b)	i)	Identify the effect of timber extraction and mining in forest.	(8)
		ii)	Enumerate the problems due overharvesting of fisheries.	(8)
12.	a)	i)	Describe the causes and effects of noise pollution.	(8)
		ii)	Elucidate the effects of nuclear pollution and its control measures.	(8)
			(OR)	
	b)	i)	Elaborate about nuclear holocaust with case study.	(8)
		ii)	Demonstrate solid waste management in cities.	(8)

13. a) i) Outline the implementation process of Environmental Management System. (8)

ii) Summarize the several stages of EIA process. (8)

(OR)

b) i) Evaluate the steps involved in human health risk assessment. (8)

ii) Investigate the application of GIS on management plan. (8)

14. a) i) Make a note on polluter pays principle. (8)

ii) Analyze Air act with its amendments. (8)

(OR)

b) i) Assess the salient features of National Green Tribunal Act 2010. (8)

ii) Examine the purpose and key objectives of National Environmental Policy. (8)

15. a) i) List out the different types of renewable energy sources. (8)

ii) Discuss the nexus between energy environment and sustainable development. (8)

(OR)

b) i) Enumerate the sustainable development goals. (8)

ii) Describe sustainable development related to climate change. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CEH206 – Waste Management Techniques

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the effects of improper disposal of solid waste on environment.
2. State the principle of solid waste management.
3. Write the importance of proper storage of MSW.
4. Show the purpose of reduction in volume of solid waste.
5. Name the benefits of stationary container system.
6. Distinguish between macro routing and micro routing.
7. What is the necessity for processing of solid waste?
8. List out some recoverable products form off-site processing of a solid wastes.
9. Identify the health effects of open dumping of MSW on land.
10. Write down the composition of landfill gases.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Categorize the various types of Solid Waste in detail.	(8)
		ii)	Enumerate the factors affecting generation rate of Solid Waste.	(8)
			(OR)	
	b)	i)	Describe the social and financial aspects of Solid Waste Management.	(8)
		ii)	Illustrate the role of NGO's in Waste Management.	(8)
12.	a)	i)	Discuss the methods of on-site storage of MSW in India.	(8)
		ii)	Classify the materials used for the storage containers.	(8)
			(OR)	
	b)	i)	Demonstrate the on-site processing of solid wastes in high rise buildings.	(8)
		ii)	Elucidate the advantages of Waste Segregation.	(8)

13. a) i) Summarize the methods of collection of Solid Waste. (8)

ii) Organize various types of Collection Vehicle. (8)

(OR)

b) i) Evaluate the various components and requirements of a Transfer Station. (8)

ii) Identify the important aspects to be considered to select the efficient collection route. (8)

14. a) i) Discuss about Vermi-Composting and In-vessel Composting process. (8)

ii) Analyze the options for processing of Municipal Solid Waste from large cities. (8)

(OR)

b) i) Categorize the various Incineration technologies. (8)

ii) Outline the Pyrolysis process. (8)

15. a) i) Investigate the factor that must be considered in the site selection for Sanitary Landfill. (8)

ii) Examine the different methods of Landfilling. (8)

(OR)

b) i) Summarize the design and operation of Sanitary Landfill with neat sketch. (8)

ii) Assess the adverse effects of a Landfill Leachate. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEH206 – Waste Management Techniques

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. How can Solid Waste Management (SWM) principles be effectively implemented in practical waste disposal and recycling systems?
2. What is called legislation?
3. List the various materials used for waste containers.
4. What is mean by on-site segregation of solid waste?
5. Differentiate between primary and secondary collection.
6. How will you estimate the number of pick-up locations from which wastes can be collected per trip in manually loaded vehicles?
7. What are the off-site processes?
8. Define pyrolysis.
9. Point out the factors to be considered while disposing solid waste.
10. Differentiate between hazardous and non-hazardous waste.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What is a waste? Explain different types of wastes in detail. (16)

(OR)

b) Explain the solid waste characteristics. (16)

12. a) How can the various methods of onsite waste storage be applied in waste management practices? (16)

(OR)

b) How can the public health and economic aspects of waste storage be applied in effective waste management strategies? (16)

13. a) Discuss various types of collection vehicles. (16)

(OR)

b) Define transfer station. Explain the types of transfer station and its factor considered in the design of transfer station. (16)

14. a) What are the objectives of incineration? Explain the working of an incinerator with a neat sketch. (16)

(OR)

b) Explain the techniques and equipments used for resource recovery from solid wastes. (16)

15. a) Describe the design and operation of a sanitary landfill with a neat sketch. (16)

(OR)

b) Write a detail note on collection and treatment of leachate. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CEH306 - Building Valuation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Brief the Valuation of the building.
2. What is the use of book value of the property?
3. Define Depreciation.
4. Define salvage value.
5. What is Annuity?
6. What is Loss of Rent?
7. Brief the factors consider valuation of the raw land.
8. How to calculate the value of agricultural land?
9. Differentiate between negative e value and market price.
10. List the laws related to environment protection in India.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain purpose of valuation and what are the Factors to be Consider in Valuation. (16)

(OR)

b) Write short notes on the following terms (16)

1) Capitalized Value
2) Obsolescence
3) Easement
4) Scrap Value

12. a) Explain in detail about the four methods of calculating depreciation. (16)

(OR)

b) A building has been constructed for Rs.12, 00,000. Assuming its salvage value at the end of 10 years as Rs.2,00,000, determine the amount of depreciation and book value for the 6 years by Straight line method, Constant percentage method and Sinking fund method 4 % rate of interest. (16)

13. a) Calculate the standard rent of a building with the following data: (16)

Cost of land : Rs.2,50,000

Cost of Building : Rs.7,50,000

Expected life of building : 70 years

Returns expected : 5 % on land and 8 % on building.

Annual repairs : 1 % on the cost of building

Sinking fund on 4 % interest basis on 90 % of the cost of building.

Other outgoings : 30 % of the return from the building.

(OR)

b) In a plot of land costing Rs.20,00,000 a building has been newly constructed at a total cost of Rs.80,00,000 including sanitary and water supply works, electrical installation, etc. The building consists of four flats for four tenants. The owner expects 9 percent return on the cost of construction and 7 percent return on the cost of land. Calculate the standard rent for each flat of the building consisting: (16)

1) The life of the building as 60 years, and sinking fund will be created on 4 % interest basis.
2) Annual repairs cost at 1 % of the cost of construction.
3) Other outgoings including taxes at 30 % of the net return of the building.

14. a) Discuss briefly the various methods of valuation of lands. (16)

(OR)

b) A Promoter intends to purchase a land of 1,00,000 sq.m area located in the a big city to develop it into plots D educt 30 % for roads, parks etc. The current sale price of small plots in the neighborhood is Rs.3000 per sq.m. Assume Cost of improving of land leveling and dressing @ Rs.25 per sq.m. Assume Cost of providing metallic roads drainage, water supply and electrification @ Rs.300 per sq.m of whole land. Assume Engineer's and Architect's fees for surveying, planning, sub-dividing and supervising @ 3% on the sale price and assume other miscellaneous expenses @ 1 % on the price. The Promoter wants a net profit of 20 %. Workout the maximum price of the land at which the Promoter may purchase the land. (16)

15. a) Explain the significance of Environment Protection Act with its applications. (16)

(OR)

b) Explain the negative values consequent on environmental impacts relate to the building materials valuations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEH306 – Building Valuation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the objective of conducting a valuation?
2. What does the term "plinth area" refer to?
3. Define effective age of building.
4. Distinguish between economic life and remaining life.
5. What is Standard rent?
6. How the rent for building is fixed?
7. In what ways do gross rent and net rent vary from each other?
8. How does the income approach differ from the market approach in property valuation?
9. List the environmental issues of air pollution.
10. What is the definition of "environmental legislation"?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Enlist and explain the various factors that influence the valuation of a building. (16)

(OR)

b) Enumerate the various types of valuation methods. (16)

12. a) What is depreciation? Explain the various methods of calculating depreciation. (16)

(OR)

b) Write Short note on the following terms: (16)

1) Sinking fund,
2) Outgoings,
3) Capitalized value,
4) Price and Cost,

13. a) Explain in detail the process involved in rental fixation of building. (16)

(OR)

b) Explain the flowing terms with an example: (16)

1) Mortgage lease,
2) Building lease,
3) Occupational lease,

14. a) Explain the various factors that should be considered when valuing land. (16)

(OR)

b) Explain the process for determining the valuation of agricultural lands. (16)

15. a) Describe in detail about laws associated with environment protection act. (16)

(OR)

b) Present a detailed case study examining the impact of environmental issues on property valuation. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING AND METALLURGICAL ENGINEERING

22CE101 – Engineering Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. A vector F starts at a point (2, -1,2) and passes through the point (-1,3,5,). Find its unit vector.
2. State the principle of transmissibility.
3. A uniform ladder of weight W leans against a vertical wall. Assuming the contact surfaces as rough, draw the free body diagram of the ladder with necessary assumptions.
4. What are the equations of equilibrium of a rigid body in three dimensions?
5. Find the radius of gyration of a rectangular area of MI about its base 9×10^4 cm^4 and cross-sectional area 300 cm^2.
6. State perpendicular axis theorem.
7. A body A moves with a constant velocity of 5 m/s along positive X axis and body B moves along positive Y axis with a constant velocity of 3 m/s. Determine the relative velocity of A with respect to B.
8. State the law of conservation of momentum.
9. What do you understand by general plane motion? Give an example.
10. A motor bike wheel of radius 80 cm is moving along a straight road with a speed of 60 km/hr. Find the angular speed of the wheel.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Five forces are acting on a particle. The magnitude of forces are 300 N, 600 N, 700 N, 900 N and P and their respective angles made with the horizontal are 0°, 60°, 135°, 210° and 270°. If the vertical component of all forces is -1000 N, find the value of P. Also calculate the magnitude and the direction of the resultant, assuming that the first force acts towards the point, while all the remaining forces act away from the point. (16)

(OR)

b) A gusset plate of roof truss is subjected to forces as shown in Figure.1. Determine the magnitude of the resultant force and its orientation measured counter clockwise from the positive x-axis. (16)

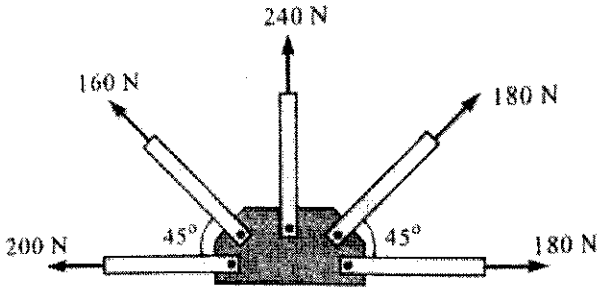


Figure.1.

12. a) Two beams AB and CD are shown in Figure.2. A and D are hinged supports. B and C are roller supports. (i) Sketch the free body diagram of the beam AB and determine the reactions at the support A and B. (ii) Sketch the free body diagram of beam AB and determine the reactions at the supports C and D. (16)

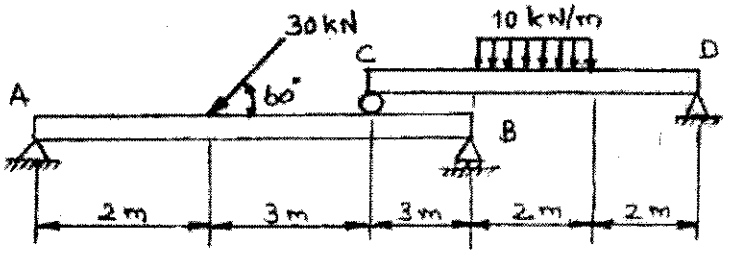


Figure.2.

(OR)

b) A uniform meter rod AB, assumed rigid of mass 0.5 Kg is suspended from its end in an inclined position and a mass of 1 Kg is suspended from a point D, as shown in Figure.3. Determine the tension in each string. Where should the suspended mass be placed in order to get equal tension in the strings? (16)

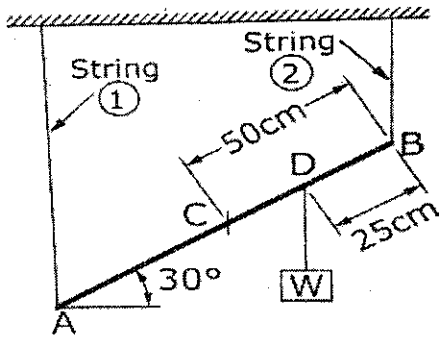


Figure.3.

13. a) Locate the centroid of the sections shown from the Figure.4. (16)

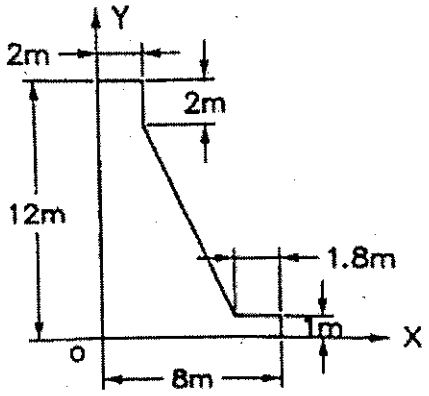


Figure.4.

(OR)

b) For the section shown in Figure.5. Determine the moment of inertia values about (1)-(1) and (2)-(2) axes. (16)

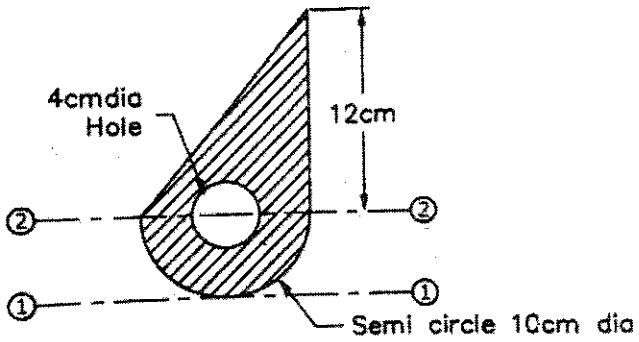


Figure.5.

14. a) Two weights 80 N and 20 N are connected by a thread and move along a rought horizontal plane under the action of a force 40 N, applied to the first weight of 80 N as shown in Figure.6. The coefficient of friction between the sliding surfaces of the wrights and the plane is 0.3. Design the acceleration of the weights and the tension in the thread using work-energy equation. (16)

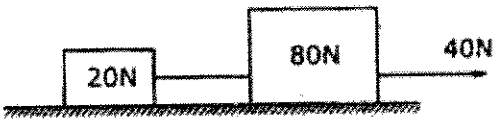


Figure.6.

(OR)

b) Two bodies one of which is 200 N with a velocity of 10 m/s and the other of 100 N with the velocity of 10 m/s move towards each other and impinges centrally. Find the velocity of each body after impact if the coefficient of restitution is 0.6. Find also the loss in kinetic energy due to impact. (16)

15. a) A bar AB of length 1.2 m slides in xy plane as shown in Figure.7. The velocity of the point A is 5 m/s towards right. Determine (i) the angular velocity of the bar (ii) the velocity of the end B and (iii) the velocity of the mid-point of the bar at the instant when the axis of the bar makes an angle of 30° with the horizontal. (16)

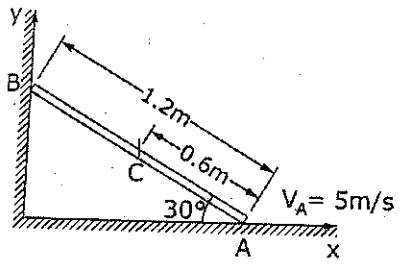


Figure.7.

(OR)

b) Two weights each of 100 N are suspended from a compound pulley as shown in Figure.8. Find (16)

1) Angular acceleration of the pulley
2) Linear acceleration of the blocks A & B and
3) Tension in the string. Take weight of the pulley as 300 N and its radius of gyration 0.25 m.

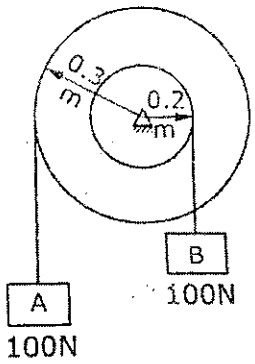


Figure.8.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE404 – Water Supply Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define design period.
2. Enlist the factors affecting per capita demand.
3. Write down the requirements of a good pipe material.
4. Classify valves.
5. State the function of sedimentation tanks.
6. Sketch breakpoint chlorination.
7. How do you regenerate softener?
8. Define RO reject management.
9. List out the various types of distribution network.
10. What is meant by ferrule?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Examine the factors affecting the rate of water demand.	(8)
		ii)	Elaborate the various sources of water.	(8)
			(OR)	
	b)	i)	Enumerate the chemical characteristics of water.	(8)
		ii)	Outline the drinking water quality standards as per BIS.	(8)
12.	a)		Classify intakes.	(16)
			(OR)	
	b)	i)	Describe the laying and testing of pipelines.	(8)
		ii)	Categorize the various types of pumps used for lifting water.	(8)
13.	a)	i)	Sketch and explain pulsator clarifier.	(8)
		ii)	Summarize about sedimentation aided by coagulation process.	(8)
			(OR)	

	b)		Demonstrate the slow sand filter and rapid sand filter with its merits and demerits.	(16)
14.	a)		Investigate the various techniques involved in defluoridation.	(16)
			(OR)	
	b)		Evaluate various methods of demineralization.	(16)
15.	a)	i)	Discuss the functions of service reservoir.	(8)
		ii)	Determine the various methods of leak detection.	(8)
			(OR)	
	b)	i)	Illustrate house service connection with its components.	(8)
		ii)	Discuss the fixtures and fittings in water distribution system with neat sketch.	(8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE405 – Applied Hydraulics and Fluid Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the characteristics of Open channel flow.
2. Write the condition for maximum discharge in circular channel.
3. Distinguish between Gradually varied flow and Rapidly varied flow.
4. What are the conditions for formation of hydraulic jump?
5. Define Impulse.
6. Distinguish between linear momentum and angular momentum.
7. Write down the names of Reaction Turbines.
8. Define Specific speed of turbine.
9. What is the minimum starting speed of Centrifugal Pump?
10. What are the advantages of fitting air vessel in Reciprocating Pumps?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What are the types of flow in Open Channel? Explain. (8)

ii) Determine the slope required for a flow of 1600 litre of water per second for a pipe with the rough concrete lining of 2 m diameter flowing half full. Use Manning`s equation. Assume the value of Manning`s constant as 0.015. (8)

(OR)

b) i) Derive the condition for open channel flow in the case of Rectangular channel section of a given area for most economical condition. (8)

ii) A trapezoidal channel has side slopes of 3 horizontal to 4 vertical. The bed slope of the channel is 1 in 2000. The discharge in the channel is 0.5 m^3/s. Assume Chezy`s constant C = 80. Determine the dimensions of the most economical section. (8)

12. a) i) Derive dynamic equation of Gradually varied flow. (8)

ii) In a rectangular channel of width 0.50 m, a hydraulic jump occurs at a section where the depth of flow is 0.15 m and Froude's Number is 2.5. Determine i) the Specific Energy ii) the Critical and Subsequent depths iii) the Loss of head iv) the Energy dissipated. (8)

(OR)

b) i) What are the types of Surges? Explain. (8)

ii) In the flow through a sluice in a large reservoir, the velocity downstream in the rectangular channel is 5.33 m/s while the flow depth is 0.0563 m. Determine the downstream conditions if a hydraulic jump takes place downstream. Determine the depth after formation of jump, height of jump, loss of energy, percentage of energy dissipated in the jump. (8)

13. a) i) What are the applications of Impulse Momentum equation? Explain. (8)

ii) A jet 30 mm diameter with velocity of 10 m/s strikes a vertical plate in the normal direction. Determine the force on the plate if i) The plate is stationary ii) If it moves with a velocity of 4 m/s towards the jet and iii) If the plate moves away from the plate at a velocity of 4 m/s. (8)

(OR)

b) i) Derive an expression for force exerted on stationary curved vane. (8)

ii) A jet of water 80 mm in diameter and having a velocity of 20 m/s impinges at the centre of a hemispherical vane. The linear velocity of vane is 10 m/s in the direction of jet. Determine the force exerted on the vane. If the jet impinges on a series of vanes attached to the circumference of a wheel, determine the force. (8)

14. a) i) How do you classify Turbines? Explain. (8)

ii) A Pelton Wheel is to be designed for the following specifications: (8)

Shaft Power - 9560 kW
Head - 350 m
Speed - 750 r.p.m.
Overall Efficiency - 85 %
Jet Diameter - not to exceed 1/6 th the Wheel diameter

Determine the following :

1) The Wheel Diameter
2) Diameter of the jet
3) The number of jets required

Assume co-efficient of velocity of jet Cv = 0.985 and speed ratio as 0.45.

(OR)

b) i) What are the types of Draft Tubes? Also discuss about its advantages. (8)

ii) A Kaplan Turbine is to be designed to develop 10 MW. The net available head is 5.8 m. The speed ratio is 2.08 and flow ratio is 0.69. The overall efficiency is 87 % and the diameter of the boss is 1/3 the diameter of the runner. Determine the diameter of the runner, speed and specific speed of the turbine. (8)

15. a) i) Explain briefly working principle of Gear Pump. (8)

ii) The discharge of a centrifugal pump is 0.118 cumecs and it speed is 1450 r.p.m under a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75 %. Determine the vane angle at the outer periphery of the impeller. (8)

(OR)

b) i) Explain in detail the working principle of Double Acting Reciprocating Pump with sketch. (8)

ii) A single acting reciprocating pump of 180 mm bore and 240 mm stroke operates at 40 r.p.m. The slip is 8 %. What is the value of the suction and delivery heads are 6 m and 20 m respectively. Determine i) the discharge ii) the coefficient of discharge iii) the theoretical power required. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE405 – Applied Hydraulics and Fluid Machinery

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate closed conduit flow and open channel flow.
2. State most economical section of channel.
3. Find the critical depth and critical velocity of a water flowing through a rectangular channel of width 5 m, when the discharge is 15 m^3/s.
4. Distinguish between gradually varied flow and rapidly varied flow in open channel.
5. State the impulse momentum equation.
6. Define jet Propelsion.
7. Differentiate the impulse and reaction turbine.
8. State the uses of draft tubes.
9. Define specific speed of pump.
10. State the reasons of negative slip in reciprocating pump.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A concrete lined circular channel of diameter 3 m has a bed slope of 1 in 500. Find the velocity and flow for conditions of Maximum velocity and Maximum discharge. (8)

ii) Derive the expression for most economical rectangular channel. (8)

(OR)

b) i) Find the rate of water through a V-Shaped Channel. Take the Value of C = 55 and slope of bed 1 in 2000 and the apex angle as 60° and depth of flow = 4 m. (8)

ii) The trapezoidal channel of bottom width of 3 m side slope 1.5 h and 1v carries discharge of 10 m^3/sec at a depth of 1.5 m under uniform flow condition the longitudinal slope of channel is 0.001. Compute manning's roughness coefficient of the channel. (8)

12. a) i) Draw specific energy head diagram and mention the salient points. (8)

ii) Calculate the critical depth corresponding to a discharge of 7.5 m^3/sec for the following cases (8)

a) Rectangular channel of width 3 m.

b) Triangular channel of side slope 1 vertical to 1.25 horizontal.

c) Trapezoidal channel of bottom width 2 m and side slope 1 vertical to 1.25 horizontal.

(OR)

b) i) Derive an expression for the depth after the hydraulic jump. (8)

ii) A rectangular channel 2 m wide has a flow with a velocity of 2 m/sec and a depth of flow of 1.25 m. The rate of flow at the downstream end decreases such that the depth of flow is increased to 2 m. Find the absolute velocity of the resulting surge and corresponding new discharge. (8)

13. a) i) A jet of water having a velocity of 40 m/sec impinges without shock on a series of vanes moving at 12 m/sec. the jet is making an angle of 20° with the direction of motion of the vane. Relative velocity at exit is 0.9 times the relative velocity at entrance and the absolute velocity of water at exit is normal to the direction of the motion of the vanes. Find, the vane angles at entrance and exit, work done on the vanes per N of water and efficiency. (16)

(OR)

b) i) In a jet propelled boat water is drawn amid-ship and discharged at the back with an absolute velocity of 20 m/s. If the cross-sectional area of the jet is 200 cm^2 and the boat is moving in sea water with a speed of 8.33 m/s determine: (16)

i) The propelling force on the boat, ii) Power required to drive the pump, and iii) Efficiency of jet propulsion.

14. a) The following data relate to a Pelton wheel : Head - 72 m (16)
Speed of the wheel - 240 r.p.m.
Shaft power of the wheel - 115 kW
Speed ratio – 0.45
Co-efficient of velocity – 0.98
Overall efficiency - 85%
Design the Pelton wheel.

(OR)

b) The external and internal diameters of an inward flow reaction turbine are 1.2 m and 0.6 respectively. The head on the turbine is 22 m and velocity of flow through the runner is constant and is equal to 2.5 m/s. the guide blade angle is 10° and the runner vanes are radial at inlet. The discharge is radial at outlet. Determine i) the speed of the turbine ii) the vane angle at outlet iii) hydraulic efficiency. (16)

15. a) A three - stage centrifugal pump has impeller 400 mm in diameter and 20 mm wide. The vane angle at outlet is 45° and the area occupied by the thickness of the vanes may be assumed 8 percent of the total area. If the pump delivers 3.6 m^3 of water per minute when running at 920 r.p.m. determine: i) Power of the pump, ii) Manometric head and iii) Specific speed. Assume mechanical efficiency as 88 % and manometric efficiency as 77 %. (16)

(OR)

b) A single acting reciprocating pump has a plunger of diameter 150 mm and a stoke 300 mm. the lengths of the suction and delivery pipes are 5 m and 20 m respectively, and their diameter is 75 mm. the suction and delivery heads are 3.5 m and 8 m respectively. Find the pressure head in the cylinder at the beginning, middle and of the suction and delivery stokes. Take f = 0.0075 and speed of the pump = 30 rpm. Find also the power required to drive the pump. Take atmospheric pressure head = 10.3 m of water. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE401 – Strength of Materials

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the advantages of Macaulays method compare to other methods.
2. Define Strain Energy.
3. List the methods of analysis of Indeterminate Beams.
4. A propped cantilever beam carries UDL of w kN/m throughout the span. Write the formula for reaction at propped support.
5. Define slenderness ratio.
6. Write the assumptions in derivation of Euler's equation for columns.
7. Name the reasons for unsymmetrical bending.
8. Define Principal Moment of Inertia.
9. Plot the variations of Hoop and Radial stress distribution along radial direction in thick cylinders.
10. Distinguish between Thin and Thick cylinders.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A simply supported beam of span l, carries UDL of w kN/m throughout the span. Calculate the deflection and slope at supports and midspan. (16)

(OR)

b) A beam of length 4 m is loaded with a single concentrated load of 60 kN at a distance of 3 m from the left end. Using Castigliano's theorem, obtain the deflection under the concentrated load. EI = 2.2 MNm^2. (16)

12. a) A continuous beam ABCD is simply supported at A, B, C and D, AB = BC = CD = 5 m. Span AB carries a load of 30 kN at 2.5 m from A. Span BC carries an UDL of 20 kN/m. Span CD carries a load of 40 kN at 2 m from C. Draw SFD and BMD. (16)

(OR)

b) For the beam shown in Figure.1. Determine the support moments and draw the SFD & BMD. (16)

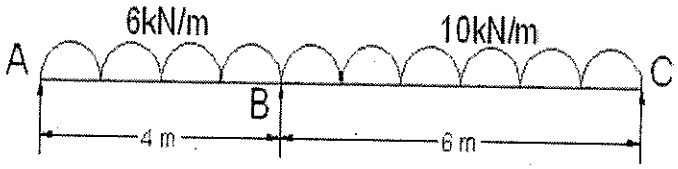


Figure.1

13. a) Derive the expression for Euler's crippling load for a column with both ends hinged. (16)

(OR)

b) A mild steel tube 4 m long, 3 cm internal diameter and 4 mm thick is used as a strut. Determine the crippling load and safe load with factor of safety 3. Assuming E = 200 GPa. When (16)

i) Both ends are fixed

ii) One end is fixed and one end is free.

14. a) Analyze the shear center of 130 X 130 X 12 mm angle section. (16)

(OR)

b) An 80 x 80 x 10 mm angle is used as a simply supported beam over a span of 2.4 m. It carries a load of 400 kN along the vertical axis passing through the centroid of the section. Determine the resulting bending stress on the outer corners of the section along the middle section of the beam. (16)

15. a) A pipe of 600 mm internal diameter and 800 mm external diameter contains a fluid pressure of 8 N/mm^2. Determine the minimum and maximum hoop stress across the section. Also, sketch the radial pressure distribution and hoop stress distribution across the section. (16)

(OR)

b) Explain briefly Failure Theories. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22CE409 – Strength of Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Hooke's law.
2. Draw and explain Mohr's circle for a body subjected to two principle stresses which are unequal and unlike.
3. What do you mean by point of contraflexure?
4. A rectangular beam of 100mm wide and 250mm deep is subjected to a maximum shear force of 50kN. Determine average shear stress.
5. Enumerate the methods to determine slope and deflection of loaded beams.
6. Define slenderness ratio. State the limitations of Euler's formula.
7. How does a thin cylinder fail due to internal fluid pressure?
8. Draw and explain the distribution of radial and hoop stress across the thickness of thick cylinder.
9. What is torsional rigidity of a shaft?
10. List the assumptions made in the Torsion equation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of diameter 30 mm and of length 1.5 m if the longitudinal strain in a bar during a tensile stress is four times the lateral strain. Find the change in volume, when the bar is subjected to a hydrostatic pressure of 100 N/mm^2. Take E = 1 x 10^5 N/mm^2. (8)

ii) A compound tube consists of a steel tube 120 mm internal diameter and 150 mm external diameter and an outer brass tube of 150 mm internal diameter and 170 mm external diameter. The two tubes are of the same length. The compound tube carries an axial load of 900 kN. Find the stresses and the load carried by each tube. Take E for steel as 2 x 10^5 N/mm^2 and the brass as 1 x 10^5 N/mm^2. (8)

(OR)

b) At a certain point in a material under stress the intensity of the resultant stress on a vertical plane is 1000 N/cm² inclined at 30° to the normal to that plane and the stress on a horizontal plane has a normal tensile component of intensity 600 N/cm² as shown in Figure.1. Find the magnitude and direction of the resultant stress on the horizontal plane and the principal stresses. (16)

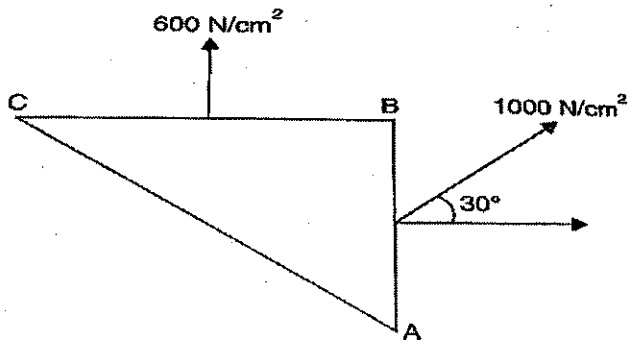


Figure.1

12. a) i) Draw the shear force and bending moment diagrams for a simply supported beam of length 8m and carrying a uniformly distributed load of 10 kN/m for a distance of 4 m as given in Figure.2. (10)

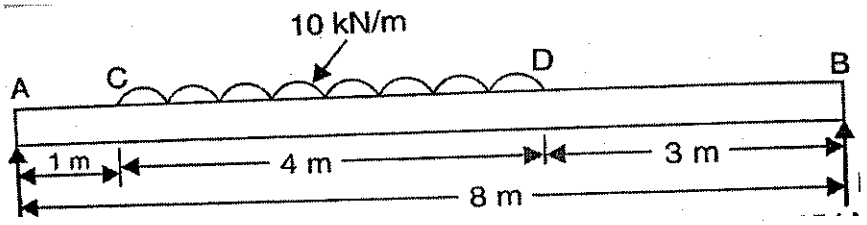


Figure.2

ii) Differentiate between uniformly distributed load and gradually varying load. Draw the shear force and bending moment diagram for a cantilever beam carrying a gradually varying load from zero at free end to w/length at the fixed end. (6)

(OR)

b) What do you mean by simple bending? Write the assumptions made in the theory of simple bending and prove that relation (16)

$$\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$$

13. a) A cantilever of length 2 m carries a point load of 20 kN at the free end and another load of 20 kN at its centre. If E = 10^5 N/mm² and I = 10^8 mm⁴ for the cantilever then determine by moment area method, the slope and deflection of the cantilever at the free end. (16)

(OR)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCEE06 – Ground Improvement Techniques

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List any four purposes of ground improvement in foundation engineering.
2. Mention any four geotechnical problems in black cotton soils.
3. What is meant by drainage?
4. State any two advantages of dewatering technique.
5. Write a note on vibrofloation.
6. Brief the significance of lime piles.
7. Why earth reinforcement are provided?
8. Define geo-textile porosity.
9. Quote a note on the process of grouting.
10. What is meant by expansive soil?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) List the various methods of ground improvement techniques and explain any three. (16)

(OR)

b) i) Discuss about the geotechnical problems in alluvial soil and laterite soil. (12)

ii) How will you select the suitable ground improvement techniques for a particular type of soil? (4)

12. a) Describe about the various drainage techniques. (16)

(OR)

b) i) State the principle of electro osmosis method. List any four advantages of electro osmosis method. Brief the factors influencing the electro osmosis. (12)

ii) Brief about the vaccum method. (4)

13. a) i) Elaborate the process of dynamic compaction and consolidation. (12)

ii) Write a note on the sand pile compaction. (4)

(OR)

b) i) Describe about the preloading with sand drains and fabric drains. (12)

ii) List the merits of any two methods. (4)

14. a) List the various types of reinforcement material and explain them. (16)

(OR)

b) i) Brief about the mentioned properties (thickness, specific gravity, apparent opening size, mass) of the geo-textiles. (8)

ii) Discuss about the functions and applications of geo-textiles in earth reinforcement. (8)

15. a) i) List any six purposes of grouting. (6)

ii) Explain about suspension grout and solution grout. (10)

(OR)

b) i) Describe about cement-based coarse grout and chemical based fine grout. (10)

ii) Brief about compaction grouting and jet grouting. (6)

Register Number:

Government College of Engineering: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

STRUCTURAL ENGINEERING

22STE61 – Advanced Concrete Technology

(IS 456:2000 IS 10262 : 2019 ACI 1211. 1-91 BS 5328 9 PART – 1,2,3,4 is Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the stages of transformation of fresh concrete to hardened concrete?
2. Define plastic shrinkage and drying shrinkage.
3. What are the objectives of concrete mix design?
4. List the factors to be considered in the design of concrete mixes.
5. What is the importance of compressive strength, tensile strength and flexural strength in concrete?
6. Define the action of mineral admixtures in concrete properties.
7. List the factors influencing the properties of fibre reinforced concrete.
8. Distinguish high strength concrete and high performance concrete.
9. In hot weather condition blended cements are advised for construction. Justify the statement.
10. Explain under water concreting methods.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the procedure of determination of modulus of elasticity of concrete and stress – strain behavior of concrete. (16)

(OR)

b) List the various methods for determining workability. Explain in detail any one method used in field to determine workability. (16)

12. a) Discuss the step-by-step procedure of ACI method of concrete mix design. (16)

(OR)

b) Design a concrete mix for the following data as per IS method. Grade of concrete: M 30, Cement - OPC of 53 grade, Zone III sand, workability - 100 mm (slump), 20 mm maximum sized rounded aggregate. Specific gravity of cement, sand and coarse aggregates are 3.15, 2.65 and 2.68 respectively. The water absorption of sand and coarse aggregates is 1 % and 0.2 % respectively. Assume aggregates in dry condition. Assume any missing data suitably. (16)

13. a) What are the methods to enhance the strength properties of concrete? Explain any three methods in detail. (16)

(OR)

b) Explain the properties, effects and uses of various mineral admixtures in concrete. (16)

14. a) Explain light weight concrete. How it is manufactured? What are its properties and advantages? (16)

(OR)

b) Describe the influence of various components of high performance concrete. (16)

15. a) Explain alkali Silica reaction. Write notes on concreting in sea water. (16)

(OR)

b) Explain the sulphate attack on concrete and explain the effect of sea water in concrete. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CEH107 – Advanced Concrete Technology

(Use of IS 456:2000, IS 10262:2019(pg:1to 15) and ACI 211.1.91(pg:1to 13 & 21to 23))

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Classify four major Bogue's compounds.
2. Name the admixtures available in India.
3. Distinguish between 'mean strength' and 'target strength' of concrete.
4. In mix proportioning, why is it desirable to use the minimum quantity of water?
5. Write short notes on shrinkage effect of concrete.
6. Why 'age factor' not taken advantage of in is IS: 456-2000?
7. List out factors affecting durability of concrete.
8. What are the factors that influence the UPV tests results?
9. Define light weight concrete.
10. Define Aspect Raio.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the hydration reaction of important Bogue compounds indicating the product of hydration. (16)

(OR)

b) When are accelerators used in concrete? Explain their limitations. Mention the few compounds that are used as accelerators. (16)

12. a) Design a concrete mix for M30 grade concrete by IS method using the following data. (16)

Characteristics compressive strength 30 N/mm^2

Maximum size of aggregates: 20 mm angular

Degree of quality of concrete: good

Types of exposure: severe

Compaction factor: 0.87

Specific gravity of cement: 3.15

Specific gravity of coarse aggregate: 2.65

Specific gravity of fine aggregate: 2.68

Water absorption of coarse aggregate: 1.2 %

Water absorption of fine aggregates: 1.5 %

Grading of coarse aggregate: confirms to table 2of IS:383-1970

Grading of fine aggregate: confirm to zone 111 of IS 383-1970.

(OR)

b) What are all the factors affecting proportioning of a concrete mix? Discuss each in detail. (16)

13. a) Draw the typical stress strain curve for concrete and explain its salient features. And also explain how you would determine the various elastic moduli for concrete. (16)

(OR)

b) Explain the properties of fresh concrete and relevant tests to be Performed to determine them. (16)

14. a) i) Explain about the durability of concrete in sea water. (10)

ii) Describe the causes of corrosion of steel in concrete. (6)

(OR)

b) i) Explain any two non-destructive tests in concrete. (10)

ii) State the advantages and limitations of UPV method. (6)

15. a) i) Write short notes on: Geopolymer concrete. (8)

ii) What are the types of fibers available in market? Explain how the use of fiber influences the properties of concrete. (8)

(OR)

b) i) What is high performance concrete? Explain the materials used and applications of it? (8)

ii) Explain the various methods of underwater construction. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

STRUCTURAL ENGINEERING

22STE56 – Modern Construction Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between the high strength concrete and high performance concrete.
2. List the advantages of aerocon blocks.
3. Why the special coatings are done to reinforcements which are embedded in the concrete?
4. Quote the merits of M2 panels for wall panels in the construction industry.
5. What is meant by composite materials?
6. State the applications of carbon fibres.
7. Where and why, the water proofing is done for the buildings?
8. What material is used for a facade?
9. Give the advantages of smart materials.
10. Brief the special features of intelligent materials.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe about the manufacturing of high performance concrete. (10)

ii) Elaborate about the fibre reinforced concrete. (6)

(OR)

b) i) Explain about the manufacturing of self curing concrete. (10)

ii) Give a detailed note on the self compacting concrete. (6)

12. a) i) Discuss about the applications of steels and alloy steels in the construction industry. (10)

ii) Give the applications of aluminium and their products in the construction industry. (6)

(OR)

b) i) Describe about the galvalium roofing sheets in the construction industry and state their advantages. (10)

ii) Sketch a M2 panels for wall panels. (6)

13. a) i) Explain about the properties of plastics, their applications in the construction industry and their advantages. (10)

ii) Write a note on reinforced polymers. (6)

(OR)

b) i) Elaborate the properties of reinforced plastic composites, their applications in the construction industry and their advantages. (10)

ii) Give a note on the applications of the composite reinforcement. (6)

14. a) i) Discuss about the various types of water proofing compounds and their applications. (10)

ii) Write the applications and advantages of the non weathering materials in the construction industry. (6)

(OR)

b) i) Describe about the various types of floorings. Also specify what types of floorings are suitable for sugar factory, residential houses and hospitals. (10)

ii) Quote the applications of facade materials. (6)

15. a) i) Explain about the shape memory alloys and piezoelectric materials which are used in the construction. (10)

ii) List the properties of smart materials. (6)

(OR)

b) i) Discuss about the properties and applications of optical fibers and Carbon Fiber Reinforced Concrete (CFRC) in the construction. (10)

ii) Quote the constraints to the development of smart materials. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEPE11 – Municipal Solid Waste Management

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Classify the various types of solid waste.
2. State the role of public awareness in solid waste management.
3. Name the materials used for the storage containers.
4. List out the factors influencing onsite storage.
5. What is container utilization factor?
6. Write any four factors that should be considered in laying out collection routes.
7. Define inertial separation.
8. Mention the end products of pyrolysis of solid waste.
9. How are landfills classified?
10. Identify the purpose of using landfill for waste disposal.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	List out the factors affecting generation rate of solid waste.	(8)
		ii)	Discuss the effects of improper waste disposal in human health.	(8)
			(OR)	
	b)	i)	Demonstrate the role of NGO's in solid waste management.	(8)
		ii)	Illustrate the legislative aspects of MSW.	(8)
12.	a)	i)	Enumerate options for onsite storage methods.	(8)
		ii)	Describe the various onsite processing techniques to collect solid waste.	(8)
			(OR)	
	b)	i)	Evaluate the merits and demerits of waste segregation.	(8)
		ii)	Summarize the impacts on public health and economic aspects of solid waste storage.	(8)

13. a) i) Elaborate the various methods of MSW collection system with flow diagram. (8)

ii) Analyze the routing guidelines to formulate a suitable route for collection vehicles. (8)

(OR)

b) i) Classify the various types of transfer station. (8)

ii) Assess the present scenario in collection of MSW with flow diagram under Indian condition. (8)

14. a) i) Investigate the various mechanical methods of volume reduction of solid waste. (8)

ii) Make a note on resource recovery from solid waste. (8)

(OR)

b) i) Categorize the types and working principle of composting methods. (8)

ii) Discover the advantages and disadvantages of incineration. (8)

15. a) Outline the step-by-step procedure adopted for a design and operation of sanitary landfill with neat sketch. (16)

(OR)

b) i) Examine the methods adopted for the control of leachate movement. (8)

ii) Organize the factors which affect production of landfill gas. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18CE305 – Engineering Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the law of parallelogram of forces.
2. Write down the equilibrium equation for coplanar concurrent and coplanar non concurrent system.
3. With the help of simple illustration, define a free body diagram.
4. State Varignon's theorem.
5. Calculate moment of inertia for rectangular cross section of size b X d.
6. Define Coulomb law of friction.
7. Define D'Alembert's principle.
8. Distinguish between kinetics and kinematics.
9. What are the different types of plane rigid body motion?
10. State impulse momentum equation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Determine the resultant force of system of forces as shown in figure.1. (16)

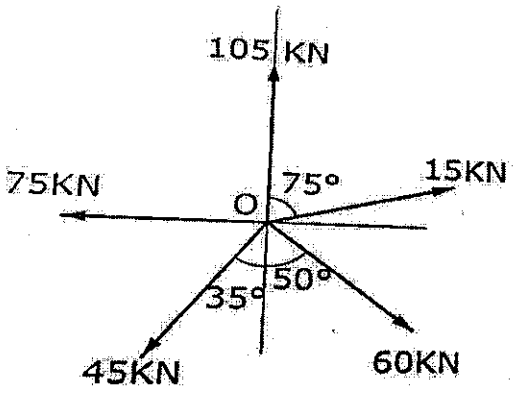


Figure.1

(OR)

b) Determine the resultant of a system of three concurrent forces passing through the origin and points (10, -5, 6), (-5, 5, 7) and (6, -4, -3) respectively. The respective magnitudes of the forces are 1500 N, 2500 N and 2000 N. (16)

12. a) Find the support reaction of the beam as shown in the figure.2. (16)

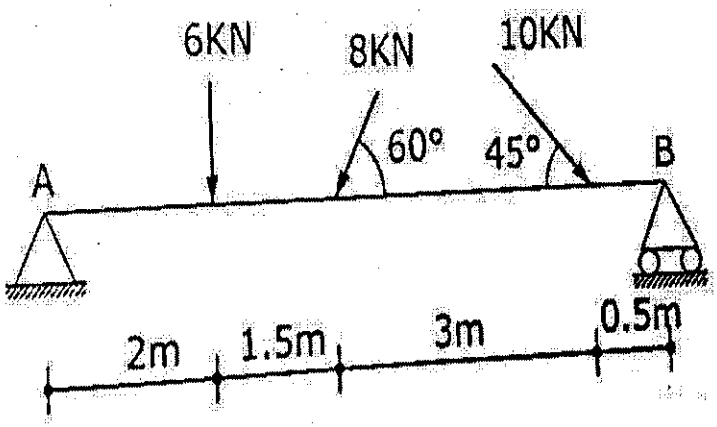


Figure.2

(OR)

b) Four forces of magnitude and direction acting on a square ABCD of side 2 m are shown in the figure.3. Calculate the resultant in magnitude and direction and also locate its point of application with respect to the sides AB and AD. (16)

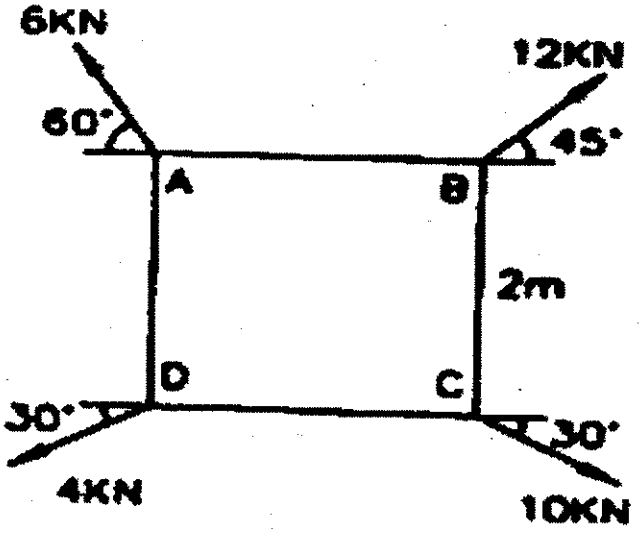


Figure.3

13. a) For a given composite section, find the centroidal axis. Shown in figure.4 (16)

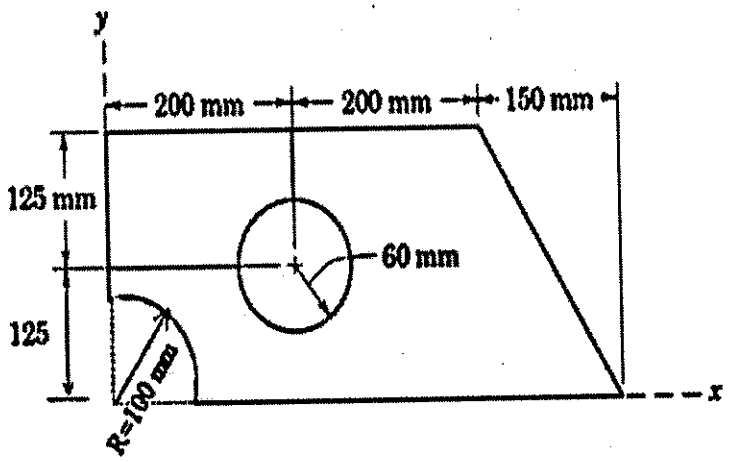


Figure.4

(OR)

b) Determine the Ixx and Iyy about centroidal axis for the given section below. Shown in figure.5 (16)

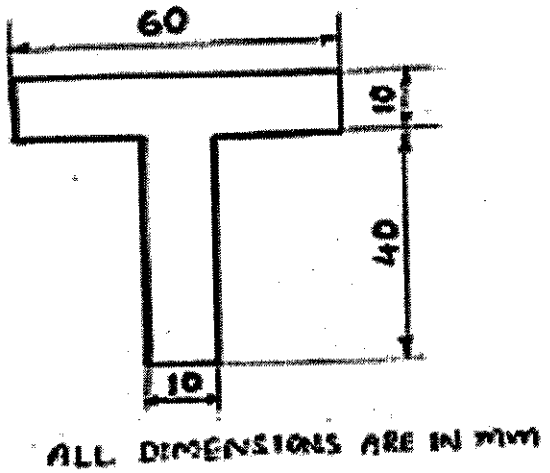


Figure.5

14. a) The position of the particle is given by the relation $S = 1.5t^3 - 9t^2 - 22.5t + 60$, where S is expressed in meters and t in seconds. Determine (i) the time at which the velocity will be zero (ii) the position and distance travelled by the particle at that time (iii) the acceleration of the particle at that time and (iv) the distance travelled by the particle from t = 5s to t = 7s. (16)

(OR)

b) A body of mass 15 kg is initially at rest on a 10° inclined plane. Then it slides down. Calculate the distance moved by the body, on the inclined plane, when the velocity reaches to 6 m/s. The coefficient of friction between the body and the plane is 0.1. (16)

15. a) A block of 500 N is suspended by a tight rope wound round the pulley of weight 200 N and radius 0.5 m, as shown in figure.6. Determine the acceleration of the weight and the tension in the rope. (16)

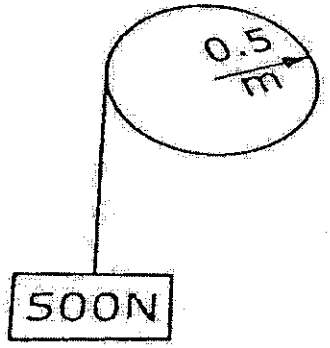


Figure.6

(OR)

b) The speed of a flywheel rotating at 200 rpm is uniformly increase to 300 rpm in 5 seconds. Determine the work done by the driving torque and increase in the kinetic energy during this time. Take mass of flywheel as 25 kg and its radius of gyration as 20 cm. (16)

Register Number:

Government College of Engineering: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE701 – Economics and Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the nature and scope of economics?
2. State the law of demand.
3. List the various types of financing.
4. Define balance sheet.
5. What do you understand by the term 'Joint Stock Company'?
6. Compare monopoly and oligopoly.
7. Write down the uses of organizational chart.
8. Mention the importance of leadership.
9. Define marginal cost.
10. Recall Break even analysis.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the concepts and scope of engineering economics in detail. (16)

(OR)

b) Analyze the various types of elasticity of demand and their usefulness. (16)

12. a) Illustrate the methods of financial statement analysis with their importance. (16)

(OR)

b) Explain the roles and main functions of commercial banks as the controller of credit. (16)

13. a) Outline the various forms of business organizations. (16)

(OR)

b) Summarize the concept and salient features of mixed economy in brief. (16)

14. a) i) Enumerate Henry Fayol's principles of management. (8)

ii) Elucidate any four types of organization. (8)

(OR)

b) i) Compare and contrast early theories of motivation (8)

ii) Discuss in detail about budgetary and non-budgetary control techniques. (8)

15. a) i) Distinguish between traditional costing and activity based costing approach. (8)

ii) Write a brief notes on cost output relations. (8)

(OR)

b) i) Explain the concept of break-even analysis with neat sketch. (8)

ii) Relate managerial uses of break-even analysis. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV & VII Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCEE25 – Municipal Solid Waste Management

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Name any two factors that affect the generation rates in solid waste.
2. Why solid waste is measured in weight basis instead of volume basis?
3. What are the processes involved in onsite processing of solid waste?
4. When will you recommend composting?
5. Recall any few waste collection vehicles.
6. Explain the significance of optimal collection route.
7. List any three difficulties of offsite processing of waste.
8. Distinguish between incineration and pyrolysis.
9. List any two benefits associated with leachate recirculation in a landfill.
10. Classify the various methods of disposal of solid waste.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the sources and types of municipal solid waste management. (8)

ii) Discuss the role of NGO and suggest what should be done to maintain ecologically sound waste management system. (8)

(OR)

b) i) What are the typical per capita waste generation and characteristics of municipal solid wastes in Class I cities of India? How is it different from that of developed countries? (8)

ii) Discuss five-step hierarchy of waste management. (8)

12. a) i) Explain the health and economic aspects of storage of solid wastes relating to Indian conditions. (8)

ii) Summarize the onsite processing operation used in low rise dwellings and medium- high rise apartments. (8)

(OR)

b) i) List and explain the various factors which are to be consider in an onsite storage of solid wastes. (8)

ii) Explain the types of storage method and the materials used for storage containers. (8)

13. a) i) Summarize the routing guidelines to formulate a suitable route for collection vehicles. (8)

ii) Discuss the types of transfer stations based on level of sites. (8)

(OR)

b) i) Elucidate the residential and commercial collection methods being adopted in metropolitan cities like Chennai. (8)

ii) How the nuisance caused by garbage loaded open trucks on high way could be avoided? (8)

14. a) i) Discuss in details about the incineration technologies and air emissions and its control. (8)

ii) Explain about the resource recovery from solid waste. (8)

(OR)

b) i) Characterize and explain the factors influencing the process of composting. State the various practical problems associated with it. (8)

ii) Discuss about the chemical volume reduction. (8)

15. a) i) What is leachate? Discuss the various methods of treatment of leachate and disposal. (8)

ii) Discuss the sanitary land filling process in detail with a neat sketch. (8)

(OR)

b) i) Draw a neat sketch of a sanitary landfill and explain the various components of the sanitary landfill. (8)

ii) Expound in detail about the different methods of landfilling and the operations involved with neat sketches. (8)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE501 – Applied Hydraulic Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between open channel flow and pipe flow.
2. When a channel is said to have a most economical section?
3. Distinguish between the draw down and back water curves.
4. A rectangular channel 2.5 m wide has a depth of flow of 1.3 m, when carrying 8 m^3/sec. Calculate the specific force.
5. Define jet propulsion.
6. How does cavitation occur in hydraulic machine?
7. Define Runway Speed of turbine.
8. Distinguish between Impulse Turbine and Reaction Turbine.
9. What is Negative Slip in a Reciprocating Pump?
10. What is the function of foot valve in Centrifugal Pump?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw the Specific Energy curve and obtain a condition for critical depth. (8)

ii) A triangular gutter of two sides with included angle of 60° conveys water at a uniform depth of 250 mm. If the discharge is 0.04 m^3/sec, determine the gradient of the trough. Assume C = 52. (8)

(OR)

b) i) What are Flow Regimes? Name the types. (4)

ii) Derive the condition for most economical section of a trapezoidal channel and hence determine the dimensions for the following conditions. Discharge Q = 10 m^3/sec, side slope 1 V = 1.5 H, bed Slope 1 in 5000, Manning's N = 0.012. (12)

12. a) i) Derive the dynamic equation for gradually varied flow. (8)

ii) In a hydraulic jump occurring in a rectangular horizontal channel, the discharge per unit width is 2.5 m^3/sec/m and the depth before the jump is 0.25 m. Estimate (i) the sequent depth, (ii) energy loss. (iii) power dissipated per meter width. (8)

(OR)

b) i) With the help of neat sketches, explain the types of Surface Profiles. (6)

ii) A channel of trapezoidal section has a bed width of 5 m, side slope 1 v to 2 H are carries a discharge of 10 m^3/sec on a bed slope of 0.0016. The normal and critical depth is 0.92 m and 0.694 m respectively. The energy coefficient is 1.1 and rugosity coefficient is 0.02. Compute the length of non-uniform flow profile the sections of flow depth 0.9 m and 0.7 m. Use single step – direct step method. Identify the type of GVF profile. (10)

13. a) i) Explain briefly the Angular Momentum principle. (8)

ii) A jet of water of diameter 150 mm strikes a flat plate normally with a velocity of 12 m/sec. The plate is moving with a velocity of 6 m/sec in the direction of the jet and away from the jet. Determine (i) the force excerted by the jet on the plate. (ii) Work done by the jet on the plate per second (iii) power of the jet and (iv) efficiency of the jet. (8)

(OR)

b) i) Derive an expression for the hydro dynamic force when a liquid jet exerts on a series of moving vanes at center. Also determine the efficiency of the jet. (8)

ii) A jet of water 250 mm in diameter impinges normally on a flat plate moving at 2 m/sec in the same direction as that of jet. If the discharge is 0.50 m^3/sec. Determine the force exerted by the jet on the plate. Also determine the work done on the plate per second. (8)

14. a) i) Sketch the different types of Draft Tubes and explain the merits and demerits. (8)

ii) Design a Pelton Turbine to develop a power of 100 kW under a head of 60 m while running at 200 rpm. Assume speed ratio as 0.45, coefficient of velocity as 0.98 and overall efficiency as 0.85. (8)

(OR)

b) i) Classify the various types of hydraulic turbines. (8)

ii) A Kaplan turbine develops 2300 kW at an available head of 32 m. The speed ratio and flow ratios are respectively 2.1 m and 0.62. The diameter of the boss is 1/3 the diameter of the runner. Assuming an overall efficiency of 88%, estimate the diameter, speed of rotation and specific speed of the runner. (8)

15. a) i) Explain the working principle of Centrifugal Pump with neat sketch. (6)

ii) A double acting reciprocating pump has a stroke of 300 mm and a piston of diameter of 150 mm. The delivery and suction heads are 26 m and 4 m respectably including friction heads. If the pump is working at 60 rpm. Determine the power required to drive the pump if the efficiency is 80 %. (10)

(OR)

b) i) What is Reciprocating Pump? And explain working principle of single acting Reciprocating Pump with neat sketch. (6)

ii) A Centrifugal Pump delivers water against a net head of 14.5 m and at a design speed of 1000 rpm. The impeller diameter is 300mm and the outlet width is 50 mm. Determine the discharge of the pump of the manometric efficiency is 95%. (10)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV & V Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCEE04 – Hydrology

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Runoff.
2. What are the various forms of Precipitation?
3. Define Infiltration Capacity.
4. Distinguish between w-index and Φ-index.
5. Define Unit Hydrograph.
6. State the limitations of Unit Hydrograph.
7. How do you determine Recurrence Interval of flood?
8. Define Design Flood.
9. What are the limitations of Darcy's law?
10. State Dupuit's assumptions.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain briefly the various components of Hydrologic Cycle with a diagram. (8)

ii) Explain in detail about Tipping type Raingauge with a sketch. Also discuss about their advantages and disadvantages. (8)

(OR)

b) i) What are the various types of Precipitation? Explain. (8)

ii) How do you determine average Precipitation by Ishohyetal method? Explain. (8)

12. a) i) What are the factors affecting Evaporation? Explain. (8)

ii) How do you control Evaporation in Reservoirs? Explain. (8)

(OR)

b) i) How do you measure Infiltration in the field? Explain. (8)

ii) The rainfall intensity for successive 30 minutes intervals from the beginning of the stuorm up to 4 hours are 0, 1.3, 2.80, 4.1, 3.9, 2.8, 2, 1.8, 0.9 cm/hr. If the surface runoff is 3.60 cm, determine Ø- index. (8)

13. a) i) What are the factors affecting Hydrograph? Explain. (8)

ii) What is S curve Hydrograph? How do you obtain S curve hydrogrpah ordinates? Explain. (8)

(OR)

b) i) How do you derive the ordinates of Unit Hydrograph? Explain. (8)

ii) The ordinates of a 4 hr unit hydrograph is as follows : (8)

Time (hrs)	0	4	8	12	16	20	24	28	32	36	40	44
Ordinate (x 10 cumecs)	0	2	8	13	15	13	9	5	3	2	1	0

Derive the ordinates of 12 hr unit hydrograph by the S-curve method.

14. a) i) Explain briefly about Flood Routing by Muskingum's method. (8)

ii) A flood with the hydrograph as given in the table below enters a river reach; the values of x and K are 0.20 and 0.90 days respectively. Determine the outflow flood hydrograph for the river reach. (8)

Time from start (hr)	0	6	12	18	24	30	36	42	48	54
Flow (x 1000 m3/s)	1	2	7.5	10	7.8	6	4.7	3.6	2.7	2

(OR)

b) i) Explain briefly about Gumbel's method. (8)

ii) Describe in detail about Flood control using (8)

1) Groynes

2) Levees

15. a) i) Explain with sketches the different types of Aquifer. (8)

ii) How do you determine Yield into a well by Recuperation Test? Explain. (8)

(OR)

b) i) Derive an expression for Yield in a well in Confined aquifer. (8)

ii) A 300 mm diameter well fully penetrates an artesian aquifer. The drawdowns in the pumping well is 3 m and the coefficient of permeability of the aquifer is 40 m/day. Assume the radius of influence of the well as 300 m. Determine the discharge from the well. (8)

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE603– Design and Drawing (Concrete and Steel)

(Use of IS456-2000, SP16, IS800 -2007 with steel tables are to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part - A (1 x 60 = 60 Marks)

Answer ONE Question from each part

1. a) Design Counterfort retaining wall to retain 6 m of horizontal backfill. (60)
The Density of the soil is 16 KN/m^3
Safe Bearing Capacity of the Soil = 160 KN/m^2
Angle of internal Friction of Soil = 33^0
Spacing of counterfort is 3 m c/c.
Use M20 concrete and Fe415 Steel.
Draw sectional elevation and sectional plan of counterforts at the base.

(OR)

b) Two columns having cross section of 240 X 240 mm and 300 X 300 mm are loaded with 300 kN and 500 kN respectively. The centre to centre distance between the columns are 4 m. The footing is restricted to 120 mm and 150 mm from first and second column respectively. Design a trapezoidal footing. Take SBC of soil is 100 kN/m^2. Draw reinforcement detailing for the footing. (60)

Part – B (Steel) (1 x 40 = 40 Marks)

2. a) Design a column with single lacing system for given conditions to carry a factored axial load of 1500 KN. The effective height of the column is 4.2 m. (40)
   i) Two channels placed toe to toe.
   ii) Two channels placed back to back.

(OR)

b) Design a welded plate girder (with Thin web plate of 8 mm) of 18 m span to support a UDL (live load) of 60 KN/m over the span with yield stress of steel as 250 N/mm^2. Use IS 800-2007 and steel tables. (40)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE402 – Steel Structural Elements

(IS800-2007, Steel tables to be Permitted, if not given take fy = 250 MPa& fu = 410MPa)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the advantages of steel structures.
2. If a structure is subjected to DL = 3 kN/m^2, LL = 1.5 kN/m^2, Wind load = 1 kN/m^2, Calculate the factored load to be used for limit state of collapse condition.
3. Calculate the bolt value for lap joint with main plate thickness 12 mm. Assume grade of bolt 4.6, minimum pitch and edge distance.
4. What is effective length of weld?
5. List the various modes of failure in Tension members.
6. Under what circumstances, Lug angles are used in tension member connections.
7. Distinguish the mode of failure between Short and Slender columns.
8. Define slenderness ratio, write its limiting value for compression members.
9. Classify the types of sections based on its moment carrying capacity.
10. Write short notes on Web Buckling and Web Crippling.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Briefly explain the various design philosophies in design of structures. (16)

(OR)

b) Explain the various loads and its combinations used in Limit State Design. (16)

12. a) Two plates 10 mm and 16 mm thick are to be connected by double cover butt joint. Design a joint to carry a factored load of 600 kN. Assume 4.6 grade bolts. Assume cover plate thickness as 08 times the thickness of thinner main plate. (16)

(OR)

b) Determine the weld length L required to develop full strength of 200 mm wide and 16 mm thick plate. Assume shop weld with thickness of 8 mm. Shown in figure.1. (16)

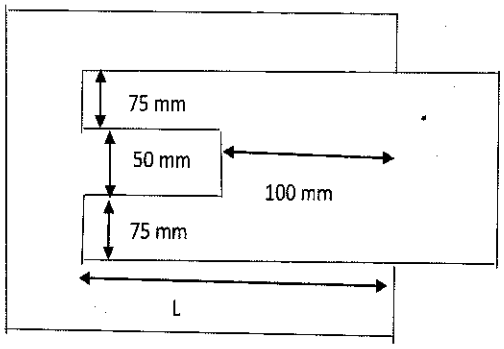


Figure.1

13. a) Design a tension member to carry a service load of 200 kN. The two angles to be placed back to back with long leg outstanding are desirable. The length of the member is 2.9 m. Assume any data if required. (16)

(OR)

b) A single unequal angle ISA 100 × 75 × 6 is connected to a 10 mm thick gusset plate at the ends with six 18 mm diameter holes (for bolts) to transfer tension. Determine the block shear strength of the angle specimen assuming 100 mm leg is connected to gusset plate. Shown in figure.2. (16)

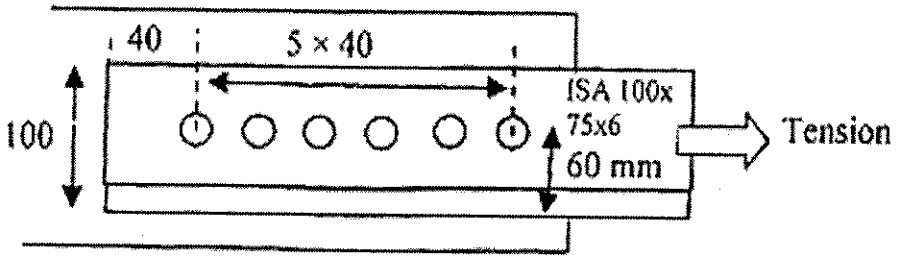


Figure.2

14. a) Briefly explain the step by step procedure for designing Built-up Column using lacing as connecting system. (16)

(OR)

b) Design a built-up column 9 m long to carry a factored axial compressive load of 1100 kN. The column is restrained in position but not in direction in both the ends. Design the column with connecting system as battens with bolted connections. Use two channel sections back-to-back. Use steel of grade Fe410. (16)

15. a) A simply supported beam of 5m span carries an UDL of 8 kN/m (including self weight). Design as laterally supported beam and check for web buckling, crippling and deflection. (16)

(OR)

b) Design a laterally unsupported beam with effective span of 4 m to carry a maximum bending moment and maximum shear of 550 kNm and 200 kN respectively. Assume any data if required. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE403 – Mechanics of Soils

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Sketch the phase relationships diagram for the soil.
2. Recall the term saturated and submerged density.
3. List out the types of soil water.
4. Assess the term pressure bulb and give the practical application.
5. Show the factor that affects the permeability.
6. Outline the properties of flow nets.
7. Summarize the field compaction methods.
8. Identify the limitations of Terzaghi's analysis in one-dimensional consolidation theory.
9. List the tests available to determine the shear strength.
10. Compare confined and unconfined compressive strength of soil.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Brief on the nature of the soil. (8)

ii) A soil sample has a porosity of 40% of the specific gravity of solids 2.70, Calculate (8)

(a) void ratio

(b) Dry density

(c) Unit weight if the soil is 50% saturated

(d) Unit weight if the soil is completely saturated.

(OR)

b) i) Explain in detail the soil classification based on BIS. (8)

ii) How will you assess the soil properties in the field and explain in detail? (8)

12. a) i) Outline on capillary tension and soil suction. (4)

ii) The water table in a deposit of sand 8 m thick is at a depth of 3 m below the surface. Above the water table, the sand is saturated with capillary water. The bulk density of sand is 19.62 KN/m^3. Calculate the effective pressure of 1 m, 3 m and 8 m below the surface. Hence plot the variation of total pressure, neutral pressure and effective pressure over the depth of 8 m. (12)

(OR)

b) i) Brief the application of Newmark's influence chart. (4)

ii) Find the intensity of vertical pressure and horizontal shear stress at point 4 m directly below 20 KN point load acting at a horizontal ground surface what will be vertical pressure and shear stress at a point 2 m horizontal away from the axis of loading but at the same depth of 4 m. Use Westergaurd analysis by taking $\mu = 0$. (12)

13. a) i) In a falling head permeability test, the initial head (t = 0) is 40 cm. The head drops by 5 cm in 10 minutes. Calculate the time required to run the test for the final head to be at 20 cm. If the sample is 6 cm in height and 50 cm^2 in cross-sectional area, calculate the coefficient of permeability, taking the area of standpipe = 0.5 cm^2 (8)

ii) When will you prefer the constant and falling head method and explain any one method in detail. (8)

(OR)

b) i) What is upward flow or Quick condition? Explain in brief. (8)

ii) Explain flow net By Electrical analogy. (8)

14. a) i) List out the factors affecting compaction. (4)

ii) In a Standard proctor test, the mould of one-litre capacity weighs 12.5 N when empty. Successive trials gave the following results (12)

Weight of mould + Wet soil (N)	28.7	29.80	31.2	30.7	30.1
Water content (%)	16.7	17.8	21.1	21.9	22.8

Determine maximum dry density and optimum water content if G = 2.7.

(OR)

b) i) What are the different methods of compaction adopted in the field? (4)

ii) A saturated soil has a compression index of 0.25. Its void ratio at a stress of 15 kN/m^2 is 2.02 and its consolidation coefficient is 3.5×10^{-7} mm/sec. Compute (12)

(a) Void ratio if the stress is increased to 20 kN/m^2

(b) Settlement if the soil stratum is 4m thick.

15. a) i) Give the advantages and limitations of the direct shear test. (4)

ii) The observations for normal load and maximum shear force for the specimens of sandy clay tested in the shear box, 36 cm^2 in area under un-drained conditions are given in the below table. Plot the failure envelope for the soil and determine the value of apparent angles of shearing resistance and the apparent cohesion. (12)

Normal load (N)	Maximum shear force (N)
100	110
200	152
300	193
400	235

(OR)

b) i) Brief on vane shear test and also list out their advantages. (4)

ii) A cylindrical specimen of saturated clay, 4 cm in diameter and 9 cm in overall length is tested in an unconfined compression tester. The specimen has coned ends and its length between the apices of cones is 8 cm. Find the unconfined compressive strength of clay, if the specimen fails under an axial load of 46.5 N. The change in the length of the specimen at failure is 1 cm. (12)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE406 – Concrete Technology

(Use of IS 10262 : 2019 all relevant IS Codes are permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State two properties of fine aggregate.
2. Describe the role-played by gypsum in the hydration reaction of cement.
3. List four objectives of concrete mix design.
4. Calculate quantity of water in liters per bag of cement if w/c is 0.50.
5. State the effect of creep in concrete.
6. Distinguish between: 'gap-grading' and 'bleeding' of concrete.
7. State the uses of two special concrete.
8. What is meant by Aspect Ratio?
9. What is the significance of "standard deviation" in mix design?
10. How sampling of concrete should be done for quality control tests?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail any three laboratory tests conducted on cement as per IS code. (8)

ii) What are chemical admixtures? Explain any four of them. (8)

(OR)

b) i) Explain in detail about any three IS testing procedure for coarse aggregate. (8)

ii) When are retarders used in concrete? Explain their limitations? Mention the few compounds that are used as retarders? (8)

12. a) List out the tests to be conducted on Fresh concrete and explain any two in detail. (16)

(OR)

b) Describe the properties of hardened concrete and explain in detail any two tests to be conducted on it. (16)

13. a) Design a concrete mix proportion for M30 grade of concrete using F type fly ash. Adopt BIS method with the following data: (16)

a) Type of cement – OPC 43 grades
b) Maximum size of aggregate – 20 mm
c) Exposure condition – Mild (RCC)
d) Workability – 100 mm slump
e) Minimum cement content – 320 kg/m3
f) Maximum W/C -0.46
g) Method of placing concrete – Pumping
h) Degree of supervision – good
i) Type of aggregate – Crushed angular aggregate
j) Super plasticizer will be used
k) Specific gravity of fly ash – 2.2
l) Specific gravity of coarse aggregate – 2.80
m) Specific gravity of fine aggregate – 2.75
n) Free surface moisture: Nil for CA & FA
o) Grading of fine aggregate is falling in Zone I

(OR)

b) Design a concrete mix for M55 grade of concrete using IS method with the following data: (16)

a) Type of cement – PPC 53 grades
b) Maximum size of aggregate – 20 mm
c) Exposure condition – severe (RCC)
d) Workability – 130 mm slump
e) Minimum cement content – 330 kg/m3
f) Maximum W/C -0.46
g) Super plasticizer will be used
h) Specific gravity of coarse aggregate – 2.80
i) Specific gravity of fine aggregate – 2.70
j) Water absorption: coarse aggregate – 0.5%, fine aggregate – 1%.
k) Grading of fine aggregate is falling in Zone II

14. a) i) Explain the process of manufacturing light weight concrete. Also write down its applications and advantages. (8)

ii) What is corrosion of reinforcement? Explain remedial measures. (8)

(OR)

b) i) Explain the following: (8)
   i) Ready mix concrete
   ii) Shotcrete.

ii) In what way the behavior of FRC can be used for seismic-resistant design? Explain. (8)

15. a) i) What tests are necessary to check the adoptability of a particular mix proportion for field use? (8)

ii) Discuss in detail the sampling and acceptance criteria of concrete as per IS code. (8)

(OR)

b) i) Explain the significance of characteristics strength with respect to probability factor R? (8)

ii) Discuss in detail about the statistical quality control of concrete. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE201 - Basic Structural Steel Design

(Use of IS 800 – 2007 & Steel tables are permitted)

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the loads acting on a structure.
2. Define fatigue.
3. Classify the types of bolts used for structural purposes.
4. Mention the advantages of welded connection over bolted connection.
5. Classify the modes of failure in Tension member.
6. State the use of lug angle.
7. Distinguish column and strut.
8. Define effective length of a column.
9. Define plastic modulus.
10. What is web crippling?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Highlight on design philosophies for structural steel. (8)

ii) Enumerate on the various limit states to be considered in design of steel structures. (8)

(OR)

b) i) Discuss on sectional classification and properties of structural steel. (8)

ii) Outline on Factor of safety for loads and materials. (8)

12. a) A tie member of a roof truss consists of 2 ISA 90 mm X 60 mm X 10 mm. The angles are connected on either side of 12 mm gusset plate and the member is subjected to a pull of 400 kN. Design the welded connection. (16)

(OR)

b) Determine the design strength of a 22 mm diameter bolt for the cases given below (16)

a) Lap joint

b) single cover butt joint with 12 mm cover plate

c) double cover butt joint with 10 mm cover plates

Main plate is 16 mm thick. Use 4.6 grade bolts.

13. a) Identify the suitable design for a tension splice for a tension member sections 160 mm x 10 mm and 250 mm x 12 mm. The member is subjected to a pull of 200 KN. (16)

(OR)

b) A tension member of a truss consists of a single channel ISLC 150@141.3 N/m and is subjected to a factored tension of 300 kN. Design the connection of the member to a gusset plate using lug angles. Provide welded connection. (16)

14. a) Find the suitable design for a laced column for an axial load of 1200 kN with an effective span of 7.5 m has one end fixed and other end hinged. Use channels for main members and an angle for lacing. (16)

(OR)

b) A steel column ISHB 400 @ 759.3 N/m is subjected to a factored axial load of 2000 kN. Design a slab base plate for the column. Assume that the bearing surfaces of the column and base plate are machined and the concrete footing is of M20 grade. (16)

15. a) A simply supported steel joist of 4 m effective span is laterally supported throughout. It carries a total udl of 40 kN (service load inclusive of self weight). Design an appropriate section using steel of grade Fe 410. (16)

(OR)

b) Design rolled steel I section for a simply supported beam with a clear span of 6 m. It carries a UDL 50 kN/m excluding self weight of the girder. The beam is laterally supported. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE201 - Basic Structural Steel Design

(IS 800-2007)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What kind of loads is considered as accidental loads?
2. Define characteristic load.
3. What does 4 and 6 imply for bolts of grade 4.6?
4. Under what circumstances are black bolts not recommended?
5. Compression members are more critical than tension members. Comment.
6. State the parameters that affect the strength of compression member.
7. What is meant by lateral torsional buckling of a beam member?
8. List the section classification of beams as per IS 800-2007.
9. List any four tension members used in the buildings and bridges.
10. Write down the different modes of failure of tension members.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in detail about different structural loads acting on a steel structure with codal provisions. (16)

(OR)

b) Compare Load and resistance factor design, working stress method and limit state method. (16)

12. a) i) An ISMC 250 is used to transmit a factored load of 650 kN. The channel section is connected to a gusset plate of 10 mm thick. Design a fillet weld if the overlap is limited to 250 mm. Use slot welds if required. (8)

ii) Design a butt joint to connect two plates 180 mm x 10 mm (Fe 410 grade) using M 20 bolts. (8)

(OR)

b) i) The plates of a 8 mm thick tank are connected by a single bolted lap joint with 20 mm diameter bolts at 60 mm pitch. Calculate the efficiency of the joint. Assume ultimate strength of plate as 410 MPa and assume 4.6 grade bolts (8)

ii) Design a connection to join two plates of size 250 x 12 mm of grade Fe 410, to mobilize full plate tensile strength using shop fillet welds, if (1) a lap joint is used (2) a double cover butt joint is used. (8)

13. a) i) Design a suitable angle section to carry a factored tensile force of 180 kN assuming a single row of M 20 bolts and fy = 250 MPa. (8)

ii) Discuss the various factors affecting strength of the tension members. (8)

(OR)

b) i) Discuss the design procedure of a tension member. (8)

ii) Discuss the design steps involved for Lug angles. (8)

14. a) Design a built-up column 9 m long to carry factored axial load of 1000 kN. The column is restrained in position but not in direction at both the ends. Provide Single lacing system with bolted connections. Assume steel of Grade Fe 410 and bolts of grade 4.6. Design the column with two channels placed back to back. (16)

(OR)

b) Design a double angle discontinuous strut to carry a factored load of 175 kN. The length of the strut is 3.0 m between intersections. The two angles are placed back to back and are tack bolted. Consider the following cases. (16)

1) Angles are placed on opposite sides of the gusset plate.

2) Angles are placed on same side of the gusset plate.

15. a) Design a laterally supported beam of effective span of 5 m for the following data. Grade of steel: Fe 410. Maximum bending moment: M=150 kNm. Maximum shear force: V = 200 kN. (16)

(OR)

b) A simply supported beam of 4.0 m effective span is laterally supported throughout. It carries a total uniformly distributed load of 40 kN inclusive of self weight. Design an appropriate section using steel of grade Fe 410. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

CIVIL ENGINEERING

23PTCE301 – Basic Structural Steel Design

(Use of IS 800-2007 and steel tables to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the different types of loads to be considered in steel design?
2. Compare partial safety factor and factor of safety.
3. List different methods of welding.
4. Explain the terms pitch, end and edge distance of bolt joint with a sketch.
5. Discuss tension splice.
6. What is net effective area?
7. Distinguish laced and battened column.
8. List the types of compression members.
9. What are the classification of steel sections?
10. Under which circumstances, compound sections are required.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe about the various design philosophies used for steel design. (16)

(OR)

b) Explain briefly about the types, properties and behaviour of structural steel sections. (16)

12. a) A 100 x 10 mm plate is to be welded to another plate 150 x 10 mm by fillet on three sides .The size of weld is 6 mm. Find out the necessary overlap length of the plate for full strength of the joint. Take allowable tensile stress in plate equal to 150 MPa and allowable stress in weld as 108 MPa. (16)

(OR)

b) Two plats (Fe 410 grade steel), each 300 mm x 16 mm are to be connected using 20 mm diameter bolts of grade 4.6 to form a lap connection. The connection is to transfer a service load of 375 KN .Calculate number of bolts required for connection with minimum pitch and end distance for bolts. (16)

13. a) Design a single angle section to carry a tension of 250 kN. The end connection is to be done using M20 bolts of 4.6 grade. The yield and ultimate strength of steel used are 250 MPa and 410 MPa respectively. (16)

(OR)

b) A single unequal angle ISA 90 x 60 x 6 mm is connected to a 12 mm thick gusset plate at the ends with 6 nos of 16 mm diameter bolts of grade 4.6 arranged in a single row. Determine the design tensile strength of the angle if the gusset is connected to 90 mm leg. (16)

14. a) Explain the step by step procedure for finding the load carrying capacity of a compression member. (16)

(OR)

b) Design a suitable slab base for a column section ISHB 400@ 822 N/m, Supporting an axial load 500 kN. The base plate is to rest on a concrete pedestal of M20 grade concrete. Assume any data necessary. (16)

15. a) Determine the plastic modulus of an I-section beam having top flange dimension 120 x 10 mm, bottom flange dimension 100 x 8 mm and web dimension 100 x 15 mm thick. (16)

(OR)

b) Design a laterally supported beam for the following data. Effective span = 4 m (16)

Maximum bending moment = 550 kNm

Maximum shear force = 200 kN

Grade of Steel: Fe 410

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

STRUCTURAL ENGINEERING

22STC11 – Advanced Structural Analysis

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Constrained Forces.
2. State the terms: Virtual force & Constrained displacements.
3. Compare Flexibility and Stiffness Method.
4. Brief about element stiffness to system stiffness.
5. Define a Primary Structure.
6. Define the force Transformation Matrix.
7. What is displacement Transformation Matrix?
8. List the Properties of Stiffness Matrix.
9. What is matrix tridiagonalization?
10. What are the advantages of sub-structuring technique?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain briefly about the methods of structural analysis. (8)

ii) Compute the displacement and force at co-ordinates from Virtual Work method. (8)

(OR)

b) i) Explain briefly about the Principle of Superposition. (8)

ii) Derive the equation of structures with a single co-ordinate of structures. (8)

12. a) Explain the method of application of Betti's Law in matrix method of Structural Analysis. (16)

(OR)

b) Develop a stiffness matrix for the beam shown in figure.1. (16)

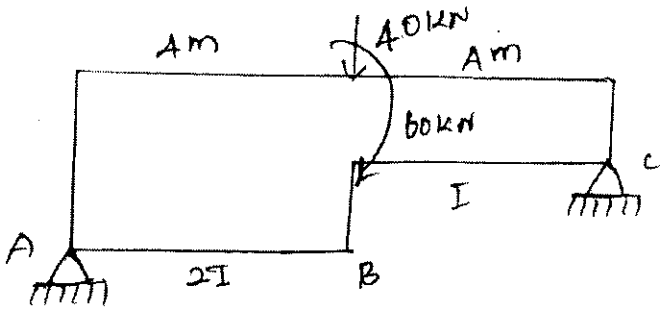


Figure.1.

13. a) Analyse the continuous beam shown in the Figure.2 by force method, draw BMD. (16)

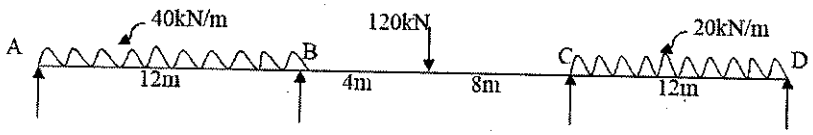


Figure.2.

(OR)

b) Statically indeterminate frame shown in Figure.3. Carries a load of 80 kN. Analyse the frame by matrix flexibility method. A and E are same for all members. (16)

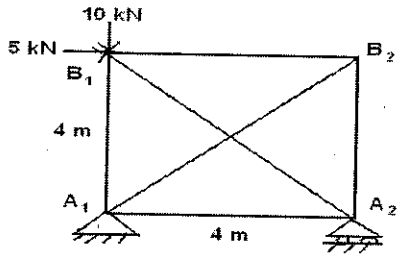


Figure.3.

14. a) Analyse the continuous beam by Stiffness method as shown in Figure.4. Sketch the BMD. (16)

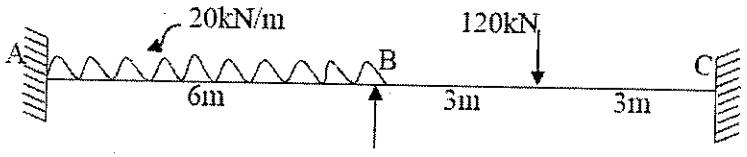


Figure.4.

(OR)

b) Analyse the frame by Stiffness matrix method shown in the Figure.5. and draw BMD. (16)

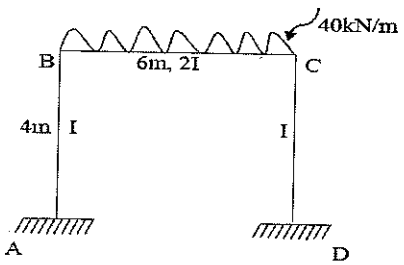


Figure.5.

15. a) Discuss briefly about the significance of computer programming and software packages in structural analysis. (16)

(OR)

b) Explain Subtracting technique using stiffness and flexibility method with tridiagonalization. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE601 – Advanced Structural Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down the general slope deflection equation and state what each term represents.
2. Write the fixed end moment for a UDL distributed for the full span.
3. Explain Flexural Rigidity of Beams.
4. Illustrate about carry over factor with an example.
5. Identify the reasons due to which sway may occur in portal frames.
6. Define External and Internal indeterminacy.
7. Write down the rotation matrix for 2D beam element.
8. Summarize the properties of stiffness matrix.
9. Differentiate global and local coordinate.
10. Why discretization of a structure is important in finite element method.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Calculate the bending moments at A and B for the two-span continuous beam ABC by slope deflection method. EI is constant. Shown in Figure.1. (16)

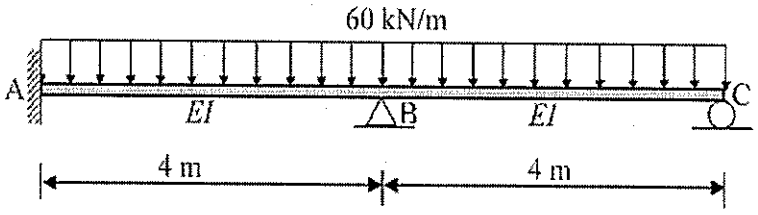


Figure.1

(OR)

b) Analyse the portal frame ABCD shown in Figure.2. below by slope deflection method and also sketch the bending moment diagram. (16)

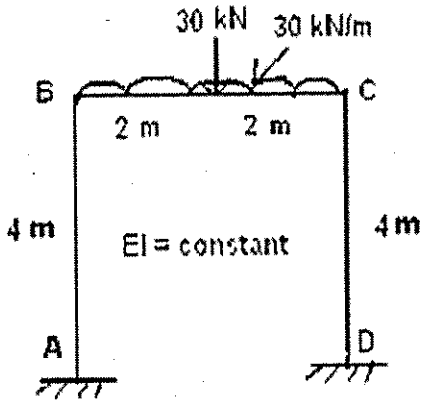


Figure.2.

12. a) Calculate the moment at B for the two-span continuous beam ABC by Moment distribution method. EI is constant. Shown in Figure.3 (16)

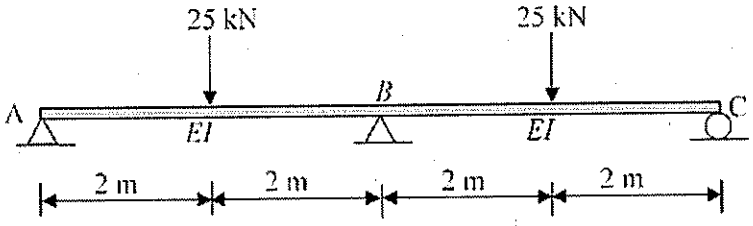


Figure.3

(OR)

b) Analyze the portal frame shown in the figure.4 below using moment distribution method and draw the bending moment diagram. EI Constant. (16)

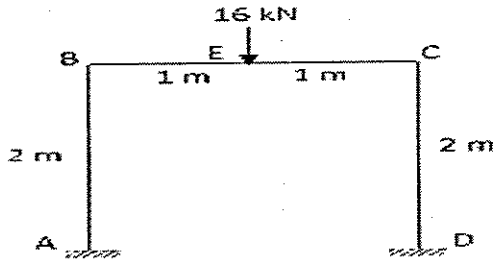


Figure.4

13. a) Analyze the continuous beam ABC shown in Figure.5. by flexibility matrix method and draw the bending moment diagram (16)

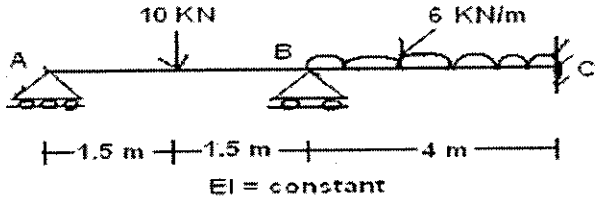


Figure.5

(OR)

b) Briefly explain the step by step procedure of determining bending moment in a portal frame by flexibility method. (16)

14. a) A two span continuous beam ABC is fixed at A and simply supported over the supports B and C. AB = 6 m and BC = 4 m. Moment of inertia is constant throughout. A uniformly distributed load of 20 kN/m acts over AB and a single concentrated load of 6 tons acts at mid span of BC. Analyse the continuous beam by stiffness matrix method. (16)

(OR)

b) Explain in detail about the procedure of determining the forces in the members of pin-jointed frames (Truss) by stiffness method. (16)

15. a) A fixed beam AB of length 6 m is carrying a uniformly distributed load of 6 kN/m over the left half of the span. Determine support moments and reactions using finite element method. (16)

(OR)

b) Explain in detail on the step by step procedure of solving a 2D truss using finite element method. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE602 - Foundation Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write any two requirements of good foundation.
2. Define soil exploration.
3. What are assumptions in Terzaghi's bearing capacity theory?
4. List out the various causes of settlement?
5. Give the importance of spacing of pile in group action.
6. What are the reasons for the settlement of pile groups?
7. What are the different methods used for analysis of finite slope?
8. Write down the formula for calculating factor of safety with respect to cohesion.
9. Give the minimum factor of safety for the stability of a retaining wall.
10. Differentiate active and passive earth pressure.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain standard penetration test. Write its advantages and its limitation. Discuss correction on penetration value. (16)

(OR)

b) Briefly explain various types of foundation with neat sketches. (16)

12. a) Define differential settlement. What are the causes? Explain the remedial measures to be taken to minimize the differential settlement. (16)

(OR)

b) A square footing located at a depth of 1.5 m below the ground surface in cohesion less soil carries a column load of 1280 kN. The soil is submerged having an effective unit weight of 11.5 kN/m^3 and an angle of shearing resistane of 30°. Find the size of the following for Fs = 3 by Terzaghi's theory of general shear failure. (16)

13. a) i) How the settlement of a group of piles can be determined? (6)

ii) Explain the different classification of piles with neat sketches. (10)

(OR)

b) i) Explain the various methods of Hammer driving. (8)

ii) Explain the static method for estimating the load carrying capacity of a single pile driven in cohesive less soil (sand). (8)

14. a) Explain the Culmann's graphical procedure for determining the lateral earth pressure with neat diagram. (16)

(OR)

b) i) What do you mean by finite and infinite slopes? Explain with examples. (8)

ii) Derive an equation to find out stability of infinite slopes. (8)

15. a) Explain the Rankine's theory for various backfill condition to calculate active state earth pressure. (16)

(OR)

b) i) Explain coulomb's wedge theory. (8)

ii) Discuss the effect of line load on retaining wall. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE302 – Surveying

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Contouring.
2. State the principles of Surveying.
3. State Bowditch's rule.
4. What are the temporary adjustments in Theodolite?
5. What is use of Anallatic lens?
6. Write the principles behind the Tachometric Surveying.
7. List out the errors in Surveying.
8. What is method of equal shifts?
9. List out the advantages of Total Station.
10. What is GPS?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The following consecutive readings were taken with a level on continuously sloping ground at a common interval of 20 meters: 0.602, 1.234, 1.860, 2.574, 0.914, 1.936, 2.872, 0.568, 1.824, 2.722. The Reduced Level of the first point was 192.122 m. Calculate the Reduced Levels of the points and also the gradient of the line joining the first and the last points. (16)

(OR)

b) Write the characteristics and uses of Contours with neat sketch. (16)

12. a) Enumerate the step by step procedure for measurement of horizontal angle by Repetition and Reiteration methods. (16)

(OR)

b) The following traverse table gives the date of consecutive coordinates in respect of a closed theodolite traverse PQRSP. What is the magnitude and direction of error of closure in whole circle bearing? (16)

Station	Northing	Southing	Westing	Easting
P	400.75 m			300.5 m
Q	100.25 m		99.25 m	
R		199.0 m	399.75 m	
S		300.0 m		200.5 m

13. a) A tachometer was set up at a station P and the following readings were obtained on vertically held staff. The constants of the instrument were 100 and 0.1. Determine the horizontal distance between P and Q and reduced level of Q. (16)

Instrument station	Staff station	Vertical angle	Hair readings (m)	Remarks
P	B.M	- 4°22'	1.050, 1.103, 1.156	R.L. of B.M. =1958.300m
	Q	+ 10°00'	0.952, 1.055, 1.158	

(OR)

b) Explain about Subtense Bar method and Tangential Tacheometry with illustrations. (16)

14. a) What is the Principles of Least squares and how do you carry out the correction with method of equal shifts? (16)

(OR)

b) Enumerate the survey adjustments with neat sketches. (16)

15. a) What is GPS? Explain its working principle and applications with suitable illustrations. (16)

(OR)

b) Enumerate the Total station working principle and its applications. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE304 – Structural Analysis - I

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. What is meant by determinacy?
2. Define real forces.
3. Quote the definition for influence lines.
4. When the maximum negative shear force occurs in a structure?
5. Mention the advantage of using the arches in the structure.
6. Recall the different types of arches.
7. Write the uses/ applications of the anchor cables.
8. Where the suspenders are used?
9. State the principle of virtual work.
10. Differentiate between plastic stage and elastic stage.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Determine the virtual forces in the steel truss shown in Figure 1. The cross sectional area of each member is A = 400 mm^2 and E = 2 X 10^5 N/mm^2. (16)

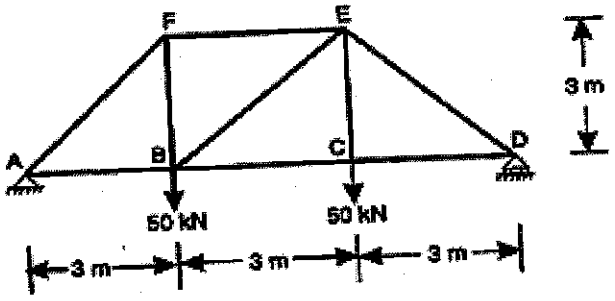


Figure.1.

(OR)

b) In the truss shown in figure.2 no load acts. The member AB is 4 mm too short. The cross sectional area of each member is A = 300 mm^2 and E = 200 GPa. Determine the vertical displacement of joint C. (16)

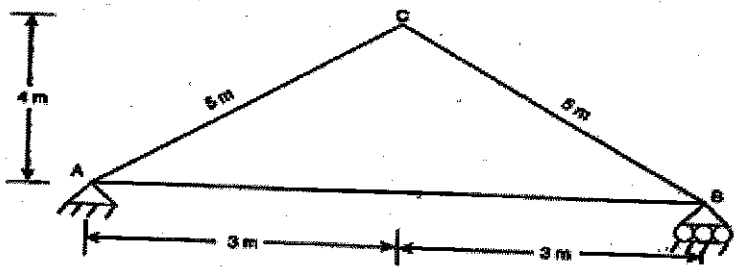


Figure.2.

12. a) A girder having a span of 18 m is simply supported at the ends. It is traversed by a train of loads as shown in figure.3, the 50 KN loading. Find the maximum bending which can occur i) under the 200 KN load and ii) under 50 KN load, using influence line diagrams. (16)

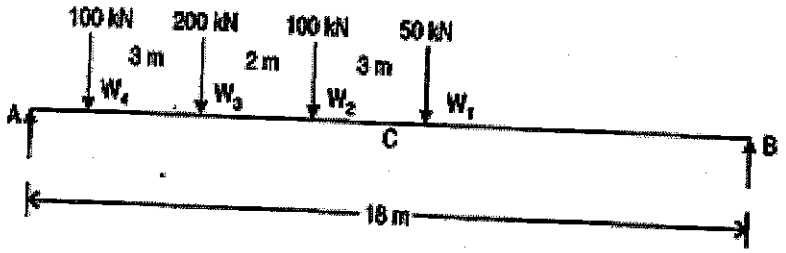


Figure.3.

(OR)

b) Determine the influence line for RA for the continuous beam shown in figure.4. Compute the influence line ordinates at 1m intervals. (16)

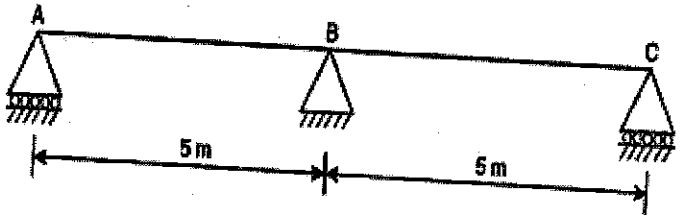


Figure.4.

13. a) A parabolic 3 hinged arch of span 'l' m is subjected to an UDL of w/m run over the entire span. Find the horizontal thrust and bending moment at any section XX. (16)

(OR)

b) A three hinged arch of span 40 m and rise 8 m carries concentrated loads of 200 KN and 150 KN at distances of 8 m and 16 m from the left end and an UDL of 50 KN/m on the right half of the span. Find the horizontal thrust. (16)

14. a) A light cable, 18m long, is supported at two ends at the same level. The supports are 16m apart. The cable supports three loads of 8, 10 and 12 N dividing the 16 m distance in four equal parts. Find the shape of the string and the tension in various portions. (16)

(OR)

b) A suspension cable is supported at 2 points 25 m apart. The left support is 2.5 m above the right support. The cable is loaded with a uniformly distributed load of 10 KN/m throughout the span. The maximum dip in the cable from the left support is 4 m. Find the maximum and minimum tensions in the cable. (16)

15. a) Derive the shape factor for the rectangular section and a circular section. (16)

(OR)

b) Determine the shape factor of the given I section shown in the given figure.5 (16)

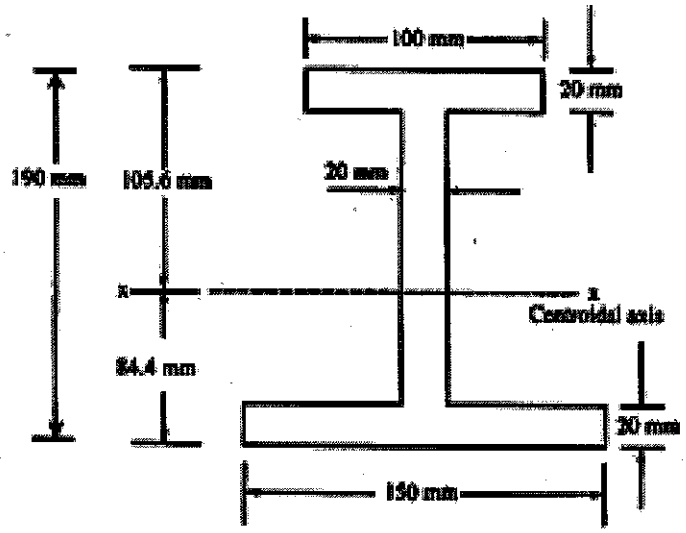


Figure.5

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

CIVIL ENGINEERING

23PTCE302 – Structural Analysis - I

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the equation for calculating static indeterminacy for pin jointed plane truss.
2. Where do you get rolling loads in practice?
3. List the uses of influence line diagram.
4. Plot the influence line diagram for support reaction in simple supported beam.
5. Distinguish between two hinged and three hinged arches.
6. State the Eddy's theorem for arches.
7. List the different types of cable structures.
8. Why stiffening girders are necessary in the suspension bridges?
9. Derive plastic section modulus for rectangular cross section.
10. Write down the formula for shape factor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A uniformly distributed load of 30 kN/m of 6 m long crosses the beam with span of 30 m. Calculate the maximum shear force, bending moment at sections 5 m, 10 m and 15 m from the left support. Construct the shear force and bending moment diagram. (16)

(OR)

b) Two wheel loads of 70 kN and 150 kN crosses a span of 10 m from left to right. 70 kN wheel is ahead of 150 kN wheel. Determine absolute maximum positive and negative shear force absolute maximum bending moment. (16)

12. a) A single moving load of 10 kN moves on simply supported beam of span 200 m. Draw the influence lines for shear force and bending moment for a section 50 m from the left support, also plot the Influence lines for points at which the maximum shear and maximum bending moment and find its values. (16)

(OR)

b) Analysis the IL for force in member BC and CI for the given truss. The height of the truss is 9 m and length of each segment is 9 m. Shown in figure.1. (16)

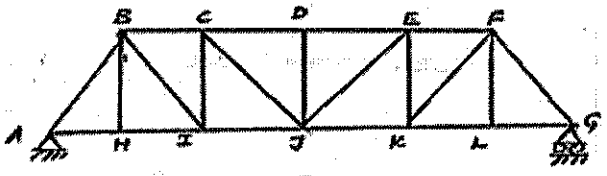


Figure.1

13. a) A three hinged parabolic arch carries an UDL of 30 kN/m on left half of the span, it has a span of 15 m and central rise of 3 m. Determine the resultant reaction at supports, bending moment and radial shear at a section 2 m from left support. (16)

(OR)

b) A two hinged parabolic arch has a span of 60 m and rise of 12 m carries a point load of 7 kN at 15 m from left hinge. If second moment of area varies as the secant of the inclination of the arch axis, calculate the horizontal thrust and reaction at supports. (16)

14. a) A suspension cable having supports at the same level has a span of 30 m and a maximum dip of 3 m. The cable is loaded with a UDL of 10 kN/m throughout its length. Evaluate the maximum tension and length of the cable. (16)

(OR)

b) A three hinged stiffening girder of a suspension bridge of 100 m span subjected to two point loads 10 kN each placed at 20 m and 40 m respectively from the left hand hinge. Determine the bending moment and shear force in the girder at section 30 m from each end. Also determine the maximum tension in the cable which has a central dip of 10 m. (16)

15. a) Calculate the shape factor of the I-section with top flange 100 mm wide, bottom flange 150 mm wide, 20 mm thick and web depth 150 mm and web thickness 20 mm. (16)

(OR)

b) Calculate the collapse load for the beam shown in figure.2 (16)

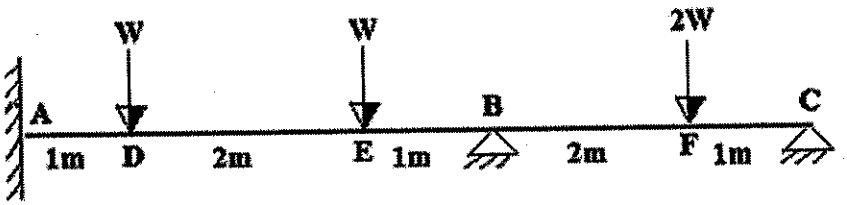


Figure.2

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE401 - Environmental Engineering - I

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the importance of water supply system.
2. Define design period.
3. List the sources of groundwater.
4. Mention the uses of well.
5. State the factors affecting selection of pump.
6. Differentiate pipe from pump.
7. What is sedimentation?
8. Outline on coagulation.
9. State any two functions of distribution system.
10. How are leaks identified?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Comment on water supply schemes and system prevailing in India. (16)

(OR)

b) The population of a town as per past census records are shown below. Forecast the population in the year 2031 and 2041 using any two methods of population forecast. (16)

Census year	1941	1951	1961	1971	1981	1991	2001	2011
Population	44642	50487	56816	63859	71454	78543	88131	100290

12. a) Describe on any two of subsurface water sources. (16)

(OR)

b) Highlight on various types of wells. (16)

13. a) Classify pipes. Explain each in detail. (16)

(OR)

b) With neat sketch, explain centrifugal pump. (16)

14. a) With the help of a flow chart, explain water treatment process. (16)

(OR)

b) Describe the process of using slow sand filters for filtration. (16)

15. a) Suggest a type of reservoir suitable for water distribution. (16)

(OR)

b) Justify on the types of valves used in distribution system. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE403 – Structural Analysis - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Castigliano's second theorem.
2. List the advantages of Influence lines.
3. Write the slope deflection equation for a beam.
4. List the possible sway conditions occur in portal frames.
5. Define carry over factor.
6. What is distribution factor?
7. Give the flexibility matrix for a beam element.
8. State the relationship between flexibility and stiffness.
9. Define stiffness in terms of load and moment separately.
10. Define degrees of freedom.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the following: (16)

(i) Principle of superposition

(ii) Castigliano theorems

(iii) Maxwell's Betti's theorem

(iv) Muller Breslau's principle

(OR)

b) Draw the influence line for Reaction at A (R_A) and Reaction at B (R_B) for a continuous beam ABC of span AB = BC = 6 m which is simply supported at A, B & C. Compute the ordinates at every 1.5 m intervals. Take EI = constant. (16)

12. a) Analyse the continuous beam shown in Figure.1 using slope deflection method and draw BMD. (16)

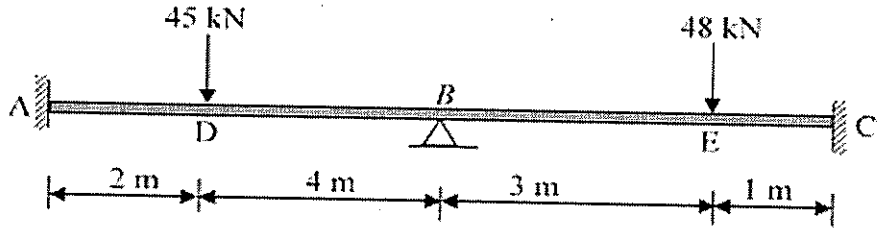


Figure.1

(OR)

b) Analyse the frame using slope deflection method and draw BMD. Shown in figure.2. (16)

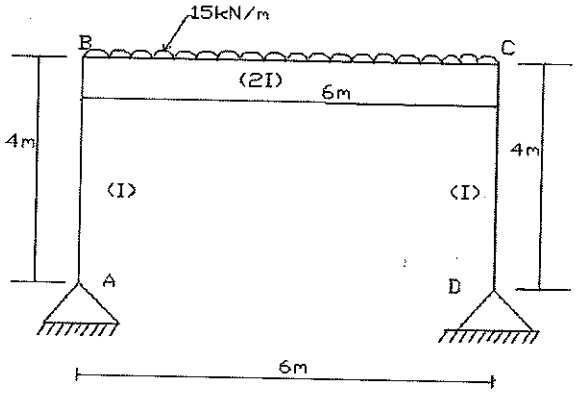


Figure.2

13. a) Analyse the beam using moment distribution method and draw BMD. Take EI as constant. Shown in figure.3. (16)

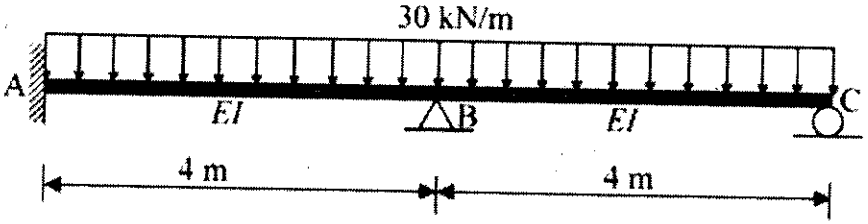


Figure.3

(OR)

b) Analyse the portal frame using moment distribution method and draw BMD. Take EI as constant. Shown in figure.4. (16)

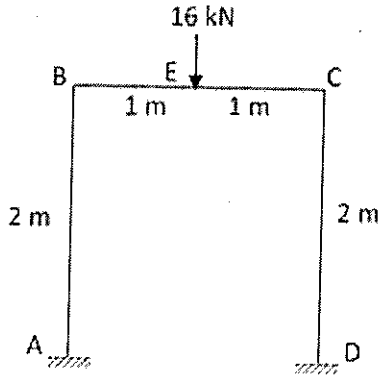


Figure.4

14. a) Analyse the beam shown in Figure.5 using flexibility method. (16)

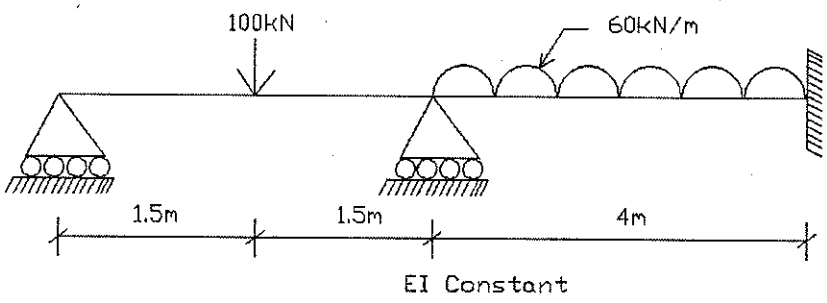


Figure.5

(OR)

b) i) Differentiate Flexibility and Stiffness method. (8)

ii) Explain the procedure of Flexibility method. (8)

15. a) Analyse the continuous beam shown in Figure.6 by stiffness method. (16)

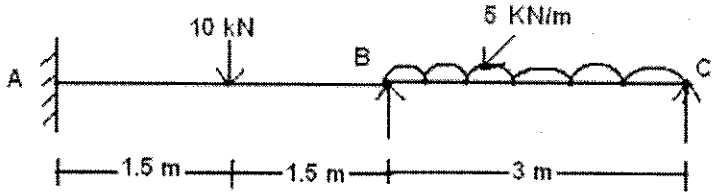


Figure.6

(OR)

b) Analyse the frame using stiffness method. The values of AE, L are listed below shown in Figure.7. (16)

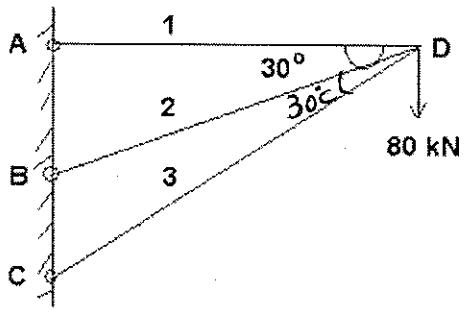


Figure.7

Member	AE	L
AD	400	400
BD	461.9	461.9
CD	800	800

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE404 – Design of Steel Structures

(IS 800-2007 and Steel Tables are permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Difference between bolted connection & welded connections.
2. Write the equation for combined shear and tension.
3. List the types of steel chimneys.
4. Why lining for chimney is needed?
5. What is mean by P-δ effect or structure effect?
6. Define shear connectors.
7. What is web buckling and web crippling?
8. What is a plate girder? Where is it used?
9. Draw neat sketches of various types of roof trusses.
10. Name the components of steel roof truss.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Design a seat connection for a factored beam end reaction of 110 kN. The beam section is ISMB250 @ 365.9 N/m. Connected to the flange of column section ISHB200 @ 365.9 N/m. Using bolted connection. Steel is of grade Fe410 and bolts of grade 4.6. (16)

(OR)

b) Design a stiffened seat connection for an ISMB350 @ 514 N/m. Transmitting an end reaction of 320 kN (due to factored loads) to a column section ISHB300@ 576.8 N/m. Steel is of grade Fe410 and bolts of grade 4.6. (16)

12. a) Design a self-supporting steel chimney of 100 m height. The diameter of the cylindrical shell is 4 m. The chimney has a 100 m thick brick lining supported on the shell. (16)

(OR)

b) A self-supporting steel chimney is 60 m high and has a diameter of 3 m at the top. Design the foundation and the riveted points. The horizontal pressure may be assumed as 1.50 kN/m^2. Bearing stress in cement concrete is 4.0 N/mm^2. (16)

13. a) Write the step by step procedure for the design of beam column. (16)

(OR)

b) Design the base plate for an ISHB 300 column subjected to a factored axial load of 800 kN and a factored moment of 40 kNm in the major axis. Assume M25 concrete for the foundation and grade Fe 410 steel. (16)

14. a) Design a welded plate girder for a simply supported bridge deck beam with clear span of 20 m, subjected to the following: Dead load including self weight = 20 kN/m, Imposed load 10 kN/m, Two moving loads = 150 kN each spaced 2 m apart. Assume that the top compression flange of the plate girder is restrained laterally and prevented from rotating. Use mild steel with f_y = 250 MPa. Design as an unstiffened plate girder with thick webs. (16)

(OR)

b) Explain the design principles of gantry girder. (16)

15. a) Design an I section purlin for an industrial building to support a galvanized corrugated iron sheet roof. (16)

Given:

Spacing of the trusses = 5.0 m

Spacing of purlins = 1.5 m

Inclination of main rafter to horizontal = 300

Weight of galvanized sheet taking into account laps and connecting bolts = 130 N/m^2

Imposed load = 1.5 kN/m^2

Wind load = 1.0 kN/m^2

(OR)

b) Write the step by step procedure for design of roof truss. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CE502 – Foundation Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the methods of soil exploration.
2. Write a note on floating foundation.
3. Mention the types of failure in soil.
4. Define Settlement.
5. List the factors considered for the selection of pile type.
6. Define group settlement ratio.
7. What are the various methods for improving the stability of slopes?
8. What is stability number?
9. Compare Couloumb's wedge theory with Rankine's theory.
10. Is granular materials are preferred for the backfill of a retaining wall? Why?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) How soil exploration is carried out? Enumerate in detail. (16)

(OR)

b) Explain the types of foundation with suitable sketches. (16)

12. a) A square footing located at a depth of 1.5 m below the ground surface in Cohesionless soil carries a column load of 1280 kN. The soil is submerged having an effective unit weight of 11.5 kN/m^3 and an angle of shearing resistance of 300. Show and find the size of the footing for Fs = 3 by Terzhaghi's theory of general shear failure. (16)

(OR)

b) An RCC foundation of size 18 m x 36 m have a uniform pressure of 180 KN/m^2 on a soil mass with modulus of elasticity 45 KN/m^2.Determine the immediate settlement Assume poisons ratio as 0.5. (16)

13. a) Define pile foundation. Briefly discuss about the type of pile and their functions. (16)

(OR)

b) Elaborate the following, i) Under reamed piles ii) Negative skin friction iii) Pile Cap and Settlement of pile group in clay (16)

14. a) How a slope is analyzed using Swedish slip circle method? Derive an expression for the factor of safety. (16)

(OR)

b) Calculate the safe height for an embankment rising 700 to the horizontal and to be made with a clayey soil having unit weight of 20 kN/m^3, Á= 150 and a cohesion of 20 kN/m^2. Factor of safety = 2.5. Value of stability number = 0.14. (16)

15. a) A smooth rigid retaining wall of 6m high carries a uniform surcharge load of 12 kN/m^2. The backfill is clayey sand possessing the following properties. Γ =16.0 kN/m^3, φ = 25°, and c = 6.5 kN/m^2 for a retaining wall system, the following data were available: i) Height of wall = 7 m. ii) Properties of backfill: γd =16 kN/m^3, φ = 35° iii) Angle of wall friction, δ = 20° iv) Back of wall is inclined at 20° to the vertical (positivebatter) v) Backfill surface is sloping at1:10. Find the following (16)

   a) Active earth pressure

   b) Passive earth pressure

(OR)

b) A retaining wall 10 m high retains a cohesionless soil having an angle of internal friction of 300. The surface of the soil is level with the top of the wall. The top 3 m of the fill has a unit weight of 20 kN/m^3 and that of the rest is 30 kN/m^3. Find the magnitude per metre run and point of application of the resultant active thrust. Assume φ the same for both the strata. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE504 - Estimation, Quantity Surveying and Valuation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the purpose of estimation.
2. Distinguish between load bearing and framed structures.
3. Estimate the quantities of brickwork and plastering required in a wall 4 m long, 3 m high and 30 cm thick. Calculate also the cost if the rate of brickwork is Rs.32 per cu.m and of plastering is Rs.8.50 per sq.m.
4. List out the various types of arches.
5. An approach road 2 km long is to be constructed. Work out the quantity of materials required i.e. stone metal and bricks for Data given below:
   Length = 2 km; Metalled width = 3.60 m
   Soiling of bricks = 10 cm; Wearing coat of stone metal = 12 cm
6. Distinguish between Tube Well and Open Well.
7. Define Analysis of Rates.
8. Distinguish between detailed specification and general specification.
9. Write the purpose of Valuation.
10. What are the principles of Report Preparation?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the different methods of Estimates. (16)

(OR)

b) Discuss briefly the types of Estimates. (16)

12. a) Prepare a detailed estimate of a part of a wall of a building from the given plan and section shown in figure.1. Calculate the following using long wall – short wall method. (16)

1) Earthwork excavation in foundation
2) Lime concrete in foundation
3) First class brickwork in foundation and plinth

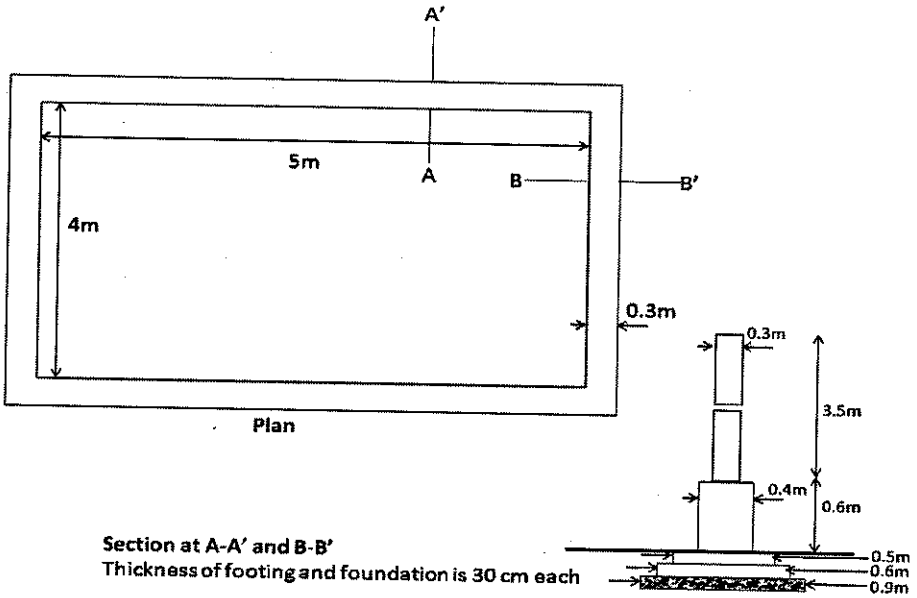


Figure.1

(OR)

b) Prepare a detailed estimate of a part of a wall of a building from the given plan and section shown in figure.2. Calculate the following using centre line method. (16)

1) Earthwork excavation in foundation
2) Lime concrete in foundation
3) First class brickwork in foundation and plinth
4) Brickwork in superstructure

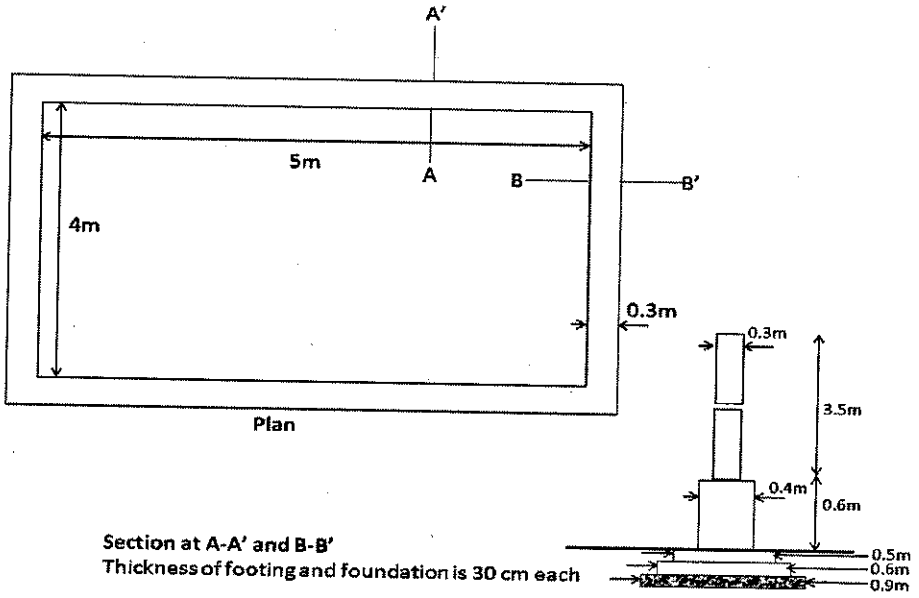


Figure.2

13. a) Prepare an estimate for the construction of a Macadam Road shown in figure 3. for 1.5 km length having the following specifications: (16)

Formation width of the road - 10 m

Average height of bank – 80 cm

Side slopes of bank - 2:1 (Horizontal: Vertical)

Metalled width of road - 3.70 m

Soling shall be of over burnt bricks laid flat.

Intercoat of metalling shall be of stone ballast 12 cm. Thick loose layer compacted to 8 cm. Top coat of metalling shall be of stone ballast 9 cm. Thick loose layer compacted to 6 cm. Side shall be provided with bricks on end edging. For bridges and culverts, and other miscellaneous items, provide lump sum amount Rs.50,000/- per kilometer.

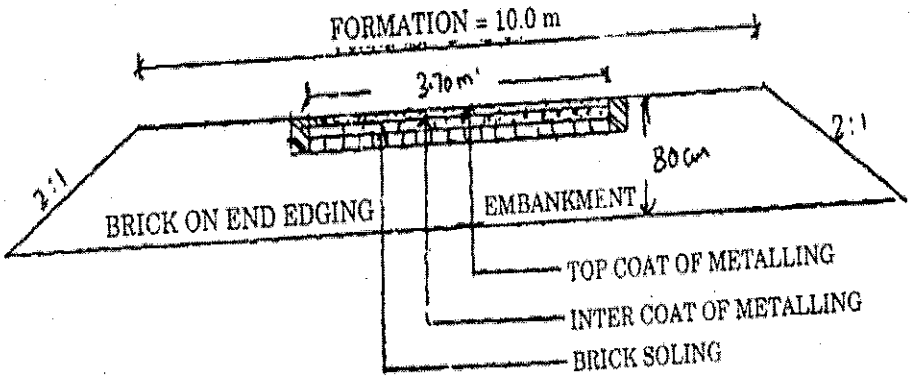
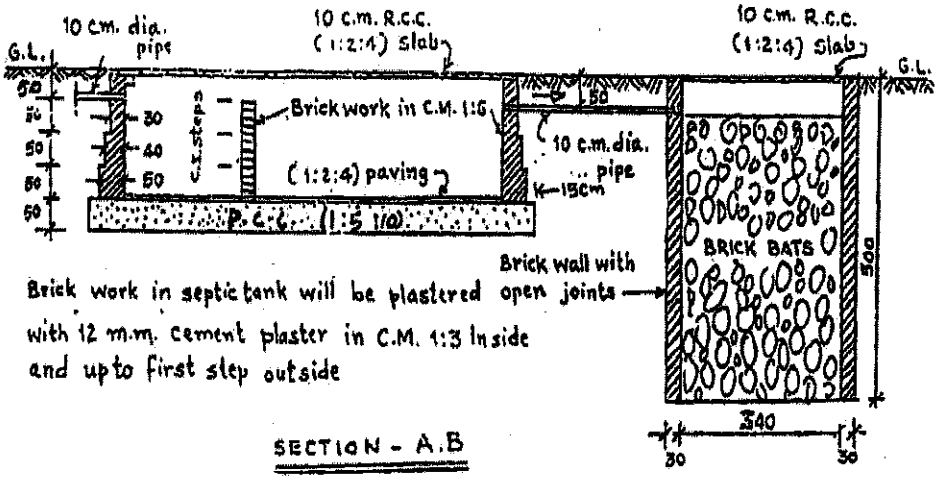


Figure.3

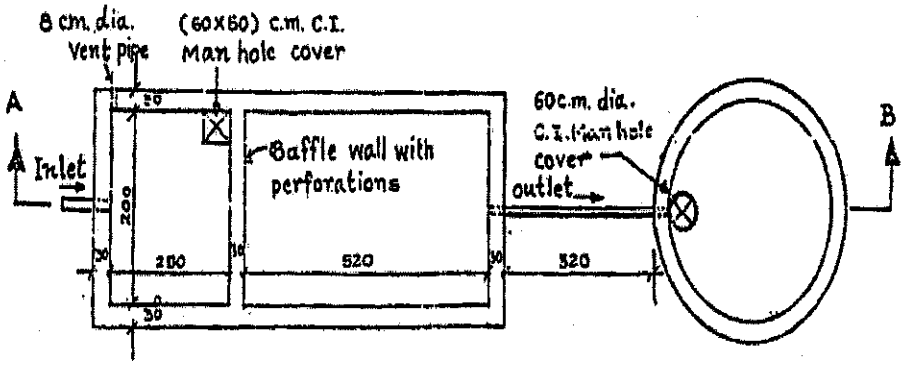
(OR)

b) Estimate the quantity of following items of septic tank shown in figure.4. (16)

1) Earth work
2) Cement concrete
3) Brick bats
4) Brick work
5) RCC cover slab
6) Internal plastering



SECTION - A.B



PLAN

(All dimensions are in Centimeter)

SEPTIC TANK WITH SOAK PIT

Figure.4

14. a) What are the important particulars in Tender Documents? Discuss. (16)

(OR)

b) Describe the various types of contract system. (16)

15. a) Prepare a Report on the estimate for construction of water supply scheme. (16)

(OR)

b) Write a Report to accompany an estimate for Residential building for an Executive Engineer. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE304 – Structural Analysis - I

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Give an example for kinematic indeterminacy.
2. Write a note on equivalent load.
3. Define influence line.
4. Recall the statement of the Muller Breslau Principle.
5. Mention the advantage of using the arches in the structure.
6. Give the significance of the bow string girder in an arch.
7. Reproduce the purposes of anchor cables.
8. What is meant by suspenders?
9. Quote the definition for load factor.
10. List any two differences between plastic stage and elastic stage.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What is meant by rolling loads? List the four main issues due to rolling loads such as train on the railway track. (4)

ii) Give a detailed note on the following with suitable sketches. (12)

a) Single point rolling loads

b) Uniformly distributed rolling loads (shorter than span and longer than span)

c) Two point loads at a fixed distance apart.

d) Several point loads at fixed distance apart.

(OR)

b) A truck with axle loads of 40 kN and 60 kN on a wheel base of 5 m rolls across a 10-m span. Compute the maximum bending moment and the maximum shearing force. (16)

12. a) A girder having a span of 18 m is simply supported at the ends. It is traversed by a train of loads as shown in figure.1, the 50 KN loading. Find the maximum bending which can occur (16)

i) Under the 200 KN load and

ii) Under 50 KN load, using influence line diagrams.

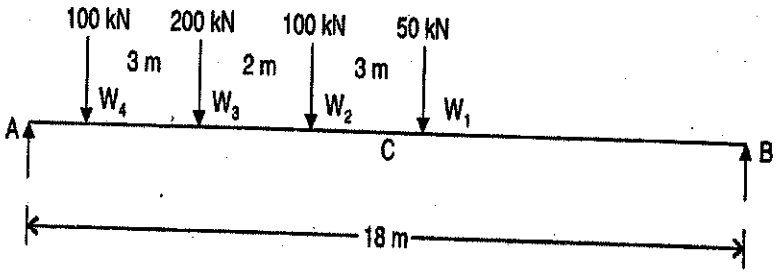


Figure.1.

(OR)

b) Draw the ILD for the forces in members JK, JD and JC of the truss shown in figure.2. The load moves along the bottom chord of the truss. Compute the maximum value of these forces due to a long uniform moving load of 10 kN/m and a concentrated moving load of 60 kN. (16)

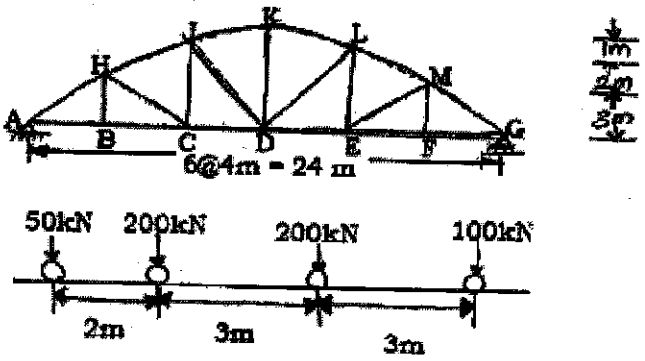


Figure.2.

13. a) A three hinged arch of span 40 m and rise 8 m carries concentrated loads of 200 KN and 150 KN at distances of 8 m and 16 m from the left end and an UDL of 50 KN/m on the right half of the span. Find the horizontal thrust. (16)

(OR)

b) A three hinged circular arch of span 16 m and rise 4 m is subjected to two point loads of 100 KN and 80 KN at the left and right quarter span points respectively. Find the reactions at supports. Find also the bending moment, radial shear and normal thrust at 6 m from left support. (16)

14. a) A suspension cable is supported at 2 points 25 m apart. The left support is 2.5 m above the right support. The cable is loaded with a uniformly distributed load of 10 KN/m throughout the span. The maximum dip in the cable from the left support is 4 m. Find the maximum and minimum tensions in the cable. (16)

(OR)

b) A three hinged stiffening girder of a suspension bridge of 100 m span subjected to two point loads 10 kN each placed at 20 m and 40 m, respectively from the left hand hinge. Determine the bending moment and shear force in the girder at section 30 m from each end. Also determine the maximum tension in the cable which has a central dip of 10 m. (16)

15. a) Find the shape factor of the given I section shown in the given figure.3. (16)

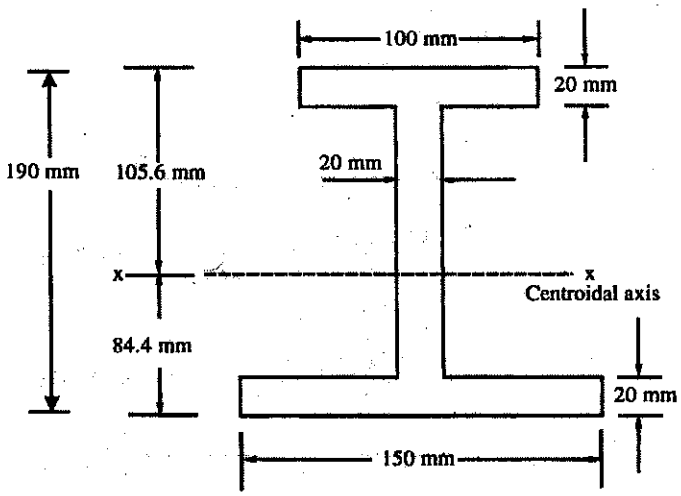


Figure.3.

(OR)

b) Find the shape factor of the given T section shown in the given figure.4. (16)

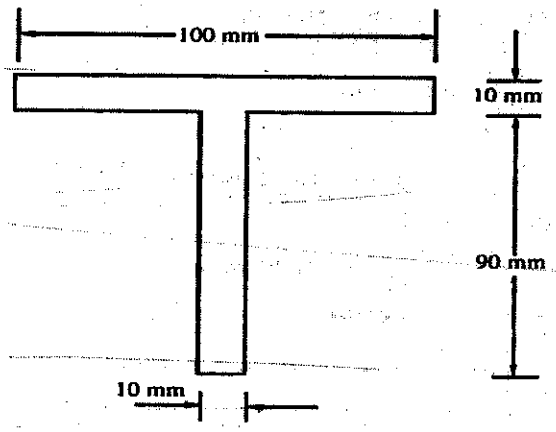


Figure.4.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE403 – Structural Analysis - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish statically determinate and statically indeterminate structures.
2. State Castigliano's theorem.
3. Write the fixed end moment for a fixed beam with triangular loading with intensity zero at the supports.
4. A rigid frame has a total of 10 joints including support joints. Which method would you prefer for analysis out of slope deflection and moment distribution methods? Why?
5. In a member AB, if the moment of -10kNm is applied at A, what is the moment carried over to B?
6. Distinguish the distribution factor and stiffness factor.
7. For a prismatic beam element, if the stiffness matrix is $2EI/l \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$. Find the flexibility matrix.
8. Calculate the flexibility matrix for the given element stiffness matrix of $K = \begin{vmatrix} 3 & 5 \\ 2 & 4 \end{vmatrix}$.
9. Calculate the kinematic indeterminacy for the following support conditions.
   a) Both ends are fixed
   b) One end fixed and the other end free
   c) Both ends are hinged.
10. Write about the element stiffness matrix and its generalized form.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Using Castigliano's theorem, calculate the mid-span deflection of the beam shown in Figure.1. (16)

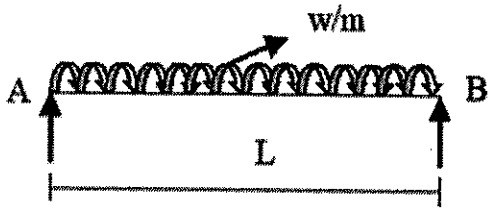


Figure. 1

(OR)

b) Draw the influence line for M_B of the continuous beam ABC simply supported at A & C using Muller Breslau's principle. AB= 3 m, BC = 4 m. EI is constant. (16)

12. a) Calculate the bending moments at A, B, and C for the two-span continuous beam ABC shown in Figure.2. EI is constant. (Use Slope Deflection method). (16)

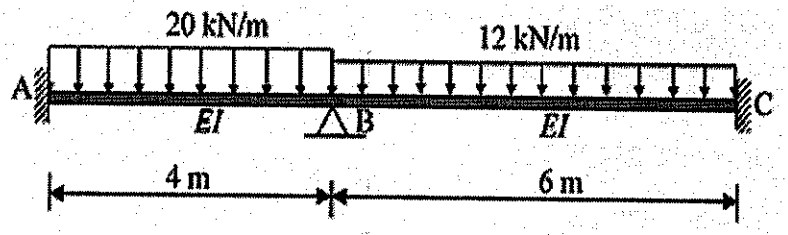


Figure.2.

(OR)

b) Analyze the frame shown in Figure.3 by slope deflection method and draw a bending moment diagram. (16)

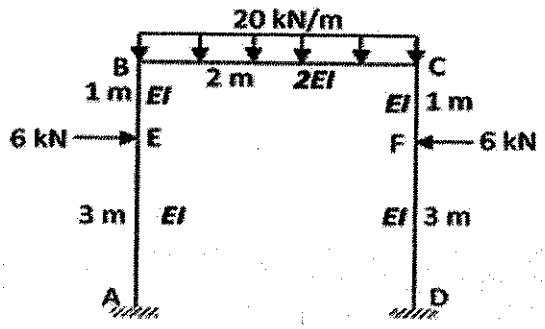


Figure.3

13. a) A continuous beam ABC consist of span AB = 4 m and BC = 4 m, the ends A and C being fixed. AB and BC carry uniformly distributed loads of intensity 5 kN/m and 2 kN/m respectively. The beam is of uniform section throughout. What are its support moments? Draw the bending moment diagram for the beam using the moment distribution method. (16)

(OR)

b) Analyze the frame shown in Figure.4 by the moment distribution method and draw a bending moment diagram. (16)

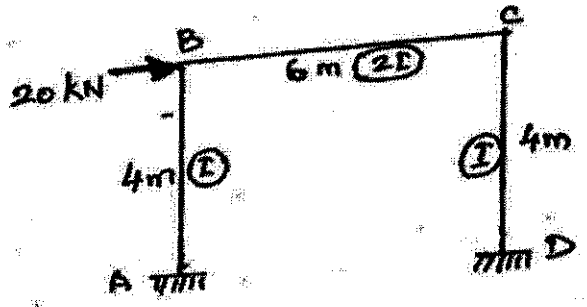


Figure. 4.

14. a) Analyze the continuous beam shown in Figure.5 by the flexibility matrix method. (16)

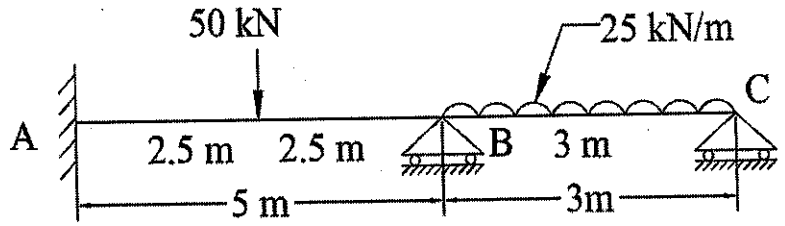


Figure.5.

(OR)

b) Analyze the Portal frame shown in Figure.6 by the matrix flexibility method. (16)

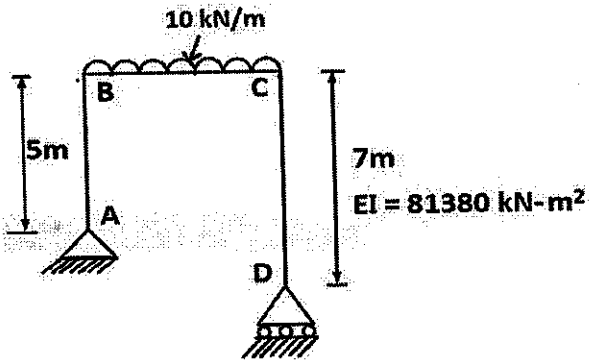


Figure.6.

15. a) Analyze the beam shown in Figure.7 by matrix stiffness method. (16)

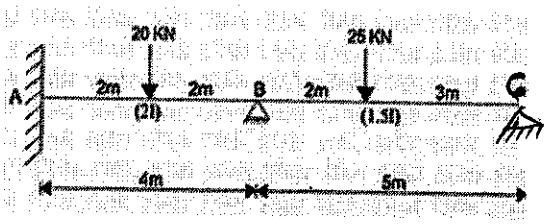


Figure.7.

(OR)

b) Analyze the frame shown in Figure.8 by system stiffness matrix method. (16)

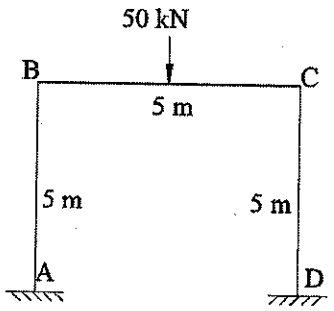


Figure.8.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

CIVIL ENGINEERING

23PTCE103 – Concrete Technology

(IS 456:2000; IS10262-2019 Pg: 1 to 15 codes to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down the qualities of water used for construction.
2. List the materials used for formwork.
3. State the reasons for segregation and bleeding.
4. Differentiate tangent modulus and secant modulus.
5. Why design mix is preferred nowadays?
6. List the factors affecting mix design.
7. Under what circumstances guniting is preferred?
8. What is the role of aspect ratio in fiber reinforced concrete?
9. Define coefficient of variance.
10. Specify the term acceptance criteria.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	With neat sketch, explain the method to determine setting time of cement.	(8)
		ii)	Write a note on accelerator and retarders.	(8)
			(OR)	
	b)	i)	Enumerate with sketch, any two tests conducted on aggregates.	(8)
		ii)	Sketch and explain the form work provision for slab.	(8)
12.	a)	i)	Explain about any one workability test conducted on concrete.	(10)
		ii)	Brief about stress strain characteristics of concrete.	(6)
			(OR)	
	b)	i)	With neat sketch discuss about any one non destructive test on concrete.	(10)
		ii)	Write a note on thermal properties of concrete.	(6)

13. a) Design a concrete mix for M 30 grade of concrete using 20 mm crushed angular aggregates for the following details using IS method. Type of cement – OPC 53 grade, Workability – 100 mm slump, Degree of control – Good, Type of exposure – severe, Specific gravity of cement – 3.15, Specific gravity of coarse aggregate – 2.74, Specific gravity of fine aggregate – 2.70, water absorption of coarse aggregate and fine aggregate – 0.5 % and 1 % respectively. Grading of sand confirms to zone-I of IS:383-2016. Usage of 2 % superplasticizer with 1.145 specific gravity is permitted. (16)

(OR)

b) Design a M30 grade of concrete using ACI method for the following datas: Specific gravity of cement, Fine aggregate, Coarse aggregate are 3.15, 2.61 and 2.68 resp. Bulk density of cement, Fine aggregate, Coarse aggregate are 1440 kgm^3, 1550 kg/m^3 and 1460 kg/m^3 resp. Sand – Grading zone I, Fineness modulus of sand – 2.8, Rodded density of Coarse aggregate – 1590 kg/m^3, Required slump – 75 mm. (16)

14. a) i) Discuss the methods of underpinning. (10)

ii) Describe the process of epoxy injection. (6)

(OR)

b) i) Explain in detail the methods of corrosion protection. (10)

ii) Brief why ready mixed concrete is gaining more popular nowadays. (6)

15. a) Discuss about the need for quality control of concrete along with the frequency of sampling. (16)

(OR)

b) Explain about the statistical analysis of test results and how quality control is maintained? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E.Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE502 – Foundation Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the different objectives of site investigation.
2. List the uses of Bore log report.
3. Classify the components of settlement.
4. Differentiate between local shear failure and general shear failure.
5. Define negative skin friction.
6. List the different types of piles according to their functions.
7. Give the minimum factor of safety for the stability of a retaining wall.
8. State the causes for failure of slope.
9. Enumerate the assumptions made in Rankine's theory.
10. State the stability conditions to be checked for the retaining wall.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Illustrate with neat sketch about the electrical conductivity method of soil exploration. (8)

ii) Demonstrate are the various factors affecting quality of samples. (8)

(OR)

b) i) Illustrate and explain the static cone penetration test procedure and list out its limitations. (8)

ii) Discuss the floating foundation different from a traditional shallow foundation. (8)

12. a) i) Illustrate the elastic and plastic equilibrium zones according to Terzhaghi's bearing capacity analysis. (8)

ii) Determine the depth at which a circular footing of 2 m diameter be founded to provide a factor of safety of 3, if it has to carry a safe load of 1600 kN. The foundation soil has c = 10 kN/m^2, ϕ = 30° and unit weight = 18 kN/m^3. Use Terzhaghi's analysis. (8)

(OR)

b) i) Discuss about the Plate load test for determining the bearing capacity of foundation. (8)

ii) A rectangular footing 3m x 2m exerts a pressure of 100 kN/m^2 on a cohesive soil Es = 5 x 10^4 kN/m^2 and μ = 0.5. Estimate the immediate settlement at the centre, assuming (8)

(a) the footing is flexible

(b) the footing is rigid

13. a) i) Classify the pile foundation based on method of installation and load transfer mechanism. (8)

ii) A concrete pile 30 cm diameter is driven into a medium dense sand (φ = 35°, γ = 21 kN/m^3, k = 1.0, tan δ = 0.7, Nq = 60). For a depth of 8m, Find the safe load. Taking a factor of safety of 2.5, if the water table rises to 2 m below the ground surface take γw = 10 kN/m^2 . Assume necessary data if available (8)

(OR)

b) i) Discuss the method of obtaining ultimate load and also allowable load on a single pile from pile load test. (8)

ii) A group of 16 piles of 50 cm diameter is arranged with a center to center spacing of 1 m. The piles are 9 m long and are embedded in soft clay with cohesion 30 kN/m^2. Bearing resistance may be neglected for the piles. Adhesion factor is 0.6. Determine the ultimate load capacity of the pile group. (8)

14. a) i) Discuss in details on the method of estimating the active earth pressure on a retaining wall by using the Culmann's method. (8)

ii) Describe the methods of slope protection measures. (8)

(OR)

b) i) Explain Bishop's simplified method. Derive an expression for the factor of safety. (8)

ii) Determine the safe height of a slope which is to be constructed at an angle of 300 with the horizontal. The required factor of safety with respect to both cohesion and angle of internal friction is 1.5, and the soil has the following properties: C = 10 kN/m^2, Φ=22.5° and density = 20 kN/m^3. Taylor's stability numbers for mobilized friction angles of 22.5° and 15° are, respectively, 0.016 and 0.046. (8)

15. a) A retaining wall with smooth vertical back is 8m high and retains a two layer sand back fill. The top layer is 3m high having Ø = 300 and Y = 20 kN/m^3. The bottom layer is 5m having Ø = 350 and Y = 22 kN/m^3. Determine the total active earth pressure and point of its application. (16)

(OR)

b) i) State the assumptions in Rankine's theory. Derive an expression for Active and Passive pressure. (8)

ii) Discuss the principles of the design of retaining walls. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE601 – Environmental Engineering - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Self-Cleansing velocity.
2. What are the various factors affecting the Design Period?
3. Distinguish between unit operations with unit processes.
4. Distinguish between BOD and COD.
5. What is aeration period in an Activated Sludge Plant?
6. Define Recirculation Ratio.
7. Write the purpose of Dewatering.
8. Write the need of sludge digestion.
9. Write down the various waste water reclamation techniques.
10. What is meant by dilution factor?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The rainfall distribution of an area is as follows. The total area is 36 Hectares and the maximum rainfall is 5 mm/hour. Estimate the total runoff if the population density is 250/hectares. (16)

TYPE OF AREA	% OF AREA	RUN OFF COEFFICIENT
Roof	20	0.9
Pavement	20	0.85
Housing	5	0.8
Roads	15	0.4
Lawns	35	0.1
Wooden Area	5	0.05

(OR)

b) i) Enumerate the various joints used for Sewer. (8)

ii) Illustrate the various types of Pumps. (8)

12. a) Discuss the composition and characteristics of Sewage. (16)

(OR)

b) i) Define BOD. Also explain about its significance. (8)

ii) Explain in detail about classification of Screens with their applications. (8)

13. a) Explain the principle and mechanism of Trickling Filter with suitable sketches. (16)

(OR)

b) i) Discuss briefly about Lagoons. (8)

ii) Explain about Septic Tank in detail. (8)

14. a) Examine the systems of Plumbing with its pros and cons. (16)

(OR)

b) i) Illustrate about Waste Stabilization Ponds? Explain the working principle of aerobic stabilization pond. (6)

ii) Determine the BOD of river water at the discharge point of the treated sewage from a town having a BOD of 30 mg/l discharged at the rate of 5 m^3/s into a river having a flow of 30 m^3/s and no BOD. (10)

15. a) i) Explain about Oxygen Sag Curve and its importance. (8)

ii) Explain about sewage disposal by Dilution. (8)

(OR)

b) i) Name the various actions involved in the Self-Purification process of a stream and explain them briefly. (8)

ii) State the Indian standards for sewage disposal on land and conditions favouring it. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE602 – Water Resources Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the various phases of a hydrological cycle.
2. Define unit hydrograph.
3. Write the purpose of storage work.
4. Differentiate single and multi reservoir.
5. Classify aquifer.
6. What are the factors considered for site selection of a tube well?
7. Define canal alignment.
8. Why is canal lining carried out?
9. Mention the types of drainage.
10. Write the importance of river control.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain any two Automatic Rain gauges. (16)

(OR)

b) The land use and soil characteristics of a 5000 ha watersheds are as follows. (16)

Soil: Not a black soil. Hydrologic soil classification : 60% is group B and 40% is group C

Land use:

Hard surface area 10%

Waste land 5%

Orchard (without understory cover) = 30%

Cultivated (Terraced) Poor condition = 55%

Antecedent rain: The total rainfall in past 5 days was 30 mm. the season is dormant season.

a) Compute the runoff volume from a 125 mm rainfall in a day on the watershed.

b) What would have been the runoff if the rainfall in the previous 5 days was 10mm?

12. a) Discuss the planning stages adopted in site selection of reservoir. (16)

(OR)

b) Explain various storage zones of reservoir with neat sketch. (16)

13. a) Explain the types of aquifers in detail. (16)

(OR)

b) Describe the estimation of yield of an open well by constant level pumping test and Recuperation test. (16)

14. a) Compare and contrast Kennedy and Lacey's theory. (16)

(OR)

b) Highlight the role of GIS application in distribution system. (16)

15. a) Describe waterlogging with its causes, effects and importance. Also suggest remedial measures to control it. (16)

(OR)

b) Give an account on classification and method of river training works. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCEE06 – Ground Improvement Techniques

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List out major geotechnical problems in alluvial soil.
2. Why is ground improvement technique necessary?
3. Illustrate a well point system.
4. Define seepage in soil.
5. List the various methods of in-situ densification of cohesive soil.
6. Brief on the concept behind preloading with sand drains.
7. What are the different types of soil reinforcing materials?
8. Give a few applications of reinforced earth.
9. Mention the basic requirements of grout.
10. List a few chemicals used for soil stabilization.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the factors influencing the selection of ground improvement technique. (10)

ii) Analyze the geotechnical problems associated with clay soil. (6)

(OR)

b) i) Enumerate the different methods of improving the ground. (10)

ii) Give a concise note on geotechnical problems related with laterite soil. (6)

12. a) i) Plan a dewatering method in detail for granular soils and explain with the aid of neat sketches. (10)

ii) Briefly discuss the seepage analysis for two dimensional flows. (6)

(OR)

b) i) Elaborate on the vacuum method of lowering water table in clay soil. (10)

ii) What are the precautions to be followed in electro-osmotic dewatering? (6)

13. a) i) Discuss in detail the method of dynamic compaction of cohesionless soil and dynamic consolidation of cohesive soil. (10)

ii) Brief on the principle of vibro-flotation method of ground improvement. (6)

(OR)

b) i) What are the methods available for the installation of stone columns? Explain with neat sketches. (10)

ii) Compare and contrast sand drains and fabric drains. (6)

14. a) Explain the principle and components of reinforced earth for ground improvement. (16)

(OR)

b) Elaborate the use of geotextiles in filtration, drainage and separation functions with examples. (16)

15. a) Discuss the various methods of grout injection and the need for grout monitoring. (16)

(OR)

b) Explicate the stabilization of expansive soil with traditional stabilizers. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCEE04 – Hydrology

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. Differentiate between convective and cyclonic precipitation.
2. List the merits of Isohyetal method.
3. Enlist the various forms of precipitation.
4. Define Effective rainfall.
5. State time of concentration.
6. Write the purpose of deriving synthetic unit hydrograph.
7. State food rooting.
8. List the methods of estimation of flood.
9. Differentiate between confined and unconfined aquifers.
10. Write the basic equation and its assumptions, which govern the movement of water in porous media.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the methods of determining the average depth of rainfall over an area. (8)

ii) Describe the working principle of a non-recording type rain gauge with neat sketch. (8)

(OR)

b) i) Describe the various types of precipitation and how do you measure rain fall. (8)

ii) The rain gauge station X was in operative for a part of a month during storm occurred. The storm rainfall recorded at the three surrounding stations A, B, and C was 75, 55, and 85 mm respectively. If the average annual rainfall of the stations A, B, C, and X are 780, 660, 850 and 700 mm respectively. Estimate the storm rainfall of station X. (8)

12. a) i) Discuss various methods of measurement of Evaporation. (8)

ii) Describe the Water budget method for estimating recharge. (8)

(OR)

b) i) What is Infiltration Indices? Explain deferent types of indices. (8)

ii) The infiltration capacities of an area at different intervals of time are indicated below. Find an equation for the infiltration capacity in the exponential form. (8)

Time (hrs)	0	0.25	0.5	0.75	1.00	1.25	1.50	1.75	2.00
Infiltration capacity (cm/hr)	10.5	5.65	3.20	2.18	1.50	1.25	1.10	1.0	1.0

13. a) i) Explain the Runoff Estimation using any Empirical Equations. (8)

ii) Elaborate components of hydrograph also explain in detail about the characteristics of streams. (8)

(OR)

b) i) Explain in detail about the synthetic unit hydrograph method. (8)

ii) Monthly rainfall value of the 50 % dependable year at a site selected for construction of an irrigation tank is given below. Estimate the monthly and annual runoff volume of the catchment area 1500 ha. (8)

Month	June	July	Aug	Sep	Oct
Monthly rainfall (mm)	90	160	145	22	240

14. a) i) Explain the methods for estimation of flood. (8)

ii) Describe the control measures of flood. (8)

(OR)

b) i) Describe the procedure for estimating a T-year flood using gumbels method. (8)

ii) Describe the various steps involved in method of reservoir routing. Explain any one of the method in detail. (8)

15. a) i) Describe the method of determining the aquifer parameters using the pumping test data. (8)

ii) Illustrate and describe four artificial recharge structures with clear diagrams. (8)

(OR)

b) i) Describe the formation constants that characterize an aquifer. (8)

ii) Explain transmissibility and storage coefficient affect well performance. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEH106 – Experimental Techniques and Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by photo elasticity? Write any two application.
2. Classify the different types of errors in measurement.
3. Outline the characteristics of Structural Vibrations.
4. Differentiate seismogram and seismograph.
5. What is the use of sound level meter?
6. Define Geometric similitude.
7. Classify the different types of cracks.
8. Classify the various types of strengthening for concrete distress.
9. Illustrate the factors that influence the results of rebound hammer.
10. Invent the use of laser in Structural Testing.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Define strain gauge. Write short notes on Classification, principle and its application. (16)

(OR)

b) Classify the different types of pressure measuring devices briefly with neat sketch. (16)

12. a) Describe in detail the principle of working and uses of a LVDT. (16)

(OR)

b) Define X-Y Plotter and explain its working principle. (16)

13. a) Write short notes on venturi meter and flow meter. (16)

(OR)

b) Explain in detail about wind tunnel and its uses in structural anlysis. (16)

14. a) Describe the various types of damages to structures due to corrosion and explain the steps involved to repair those damages. (16)

(OR)

b) Detail about the demolition Techniques for Controlled blasting. (16)

15. a) Explain in detail of ultrasonic testing principle, components and its applications with neat sketch. (16)

(OR)

b) Write short notes on Destructive testing and non Destructive testing procedure on Structures. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEH301 – Smart Materials and Smart Structures

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Enumerate the reasons for the need of a smart structure.
2. List few of the smart materials.
3. Discuss the effect of temperature in measurement of strain.
4. Write a note on strain rosette with a sketch.
5. What is the role of a sensor?
6. Compare chemical and Bio-chemical sensing in structural assessment.
7. List the functions of an actuators in a smart structure.
8. Discuss about electro rheological phenomenon.
9. What are geometrical processors?
10. Write a note on optimized control algorithm.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the functions of various sensing and actuation systems in smart structures. (16)

(OR)

b) Discuss in detail about the use of smart materials in structures with its advantages. (16)

12. a) Write in detail about the techniques used in the measurement of strain using strain gauges. (16)

(OR)

b) Briefly explain on the role of Wheatstone bridge and Pressure transducer in measuring instruments. (16)

13. a) List the sensor types. Explain any two of the sensors with its working principles and application. (16)

(OR)

b) What are fiber optic techniques? Explain in detail the fiber optic chemical sensing systems and distributed measurements. (16)

14. a) What are the different actuator materials used in smart structures? Explain any two of them with its advantages. (16)

(OR)

b) Explain in detail about the role of actuators in smart structures. (16)

15. a) Write briefly about:

1) Data acquisition, (8)

2) Signal processing, (8)

(OR)

b) Explain in detail:

1) Linear control system, (8)

2) Non – linear control system, (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE402 – Design of Steel Structural Elements

(Use of IS 800-2007 and steel tables to be Permitted, if not mentioned take fy = 250 MPa, fu = 410 MPa)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Name the various conditions coming under limit state of serviceability.
2. List the advantages of steel structures.
3. List the advantages and limitations of welded connections.
4. Calculate bolt value for 20 mm 4.6 grade bolt, subjected to single shear and bearing.
5. Define block shear failure in tension members.
6. Determine the net area and gross area for an angle section. Take diameter of bolt is 18 mm. Shown in figure.1.

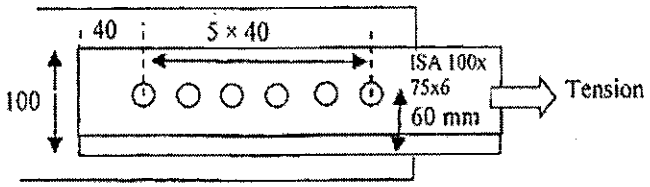


Figure.1

7. Define slenderness ratio.
8. Why yield strength is not used in calculating the load carrying capacity of long columns?
9. Distinguish between laterally supported and unsupported beam.
10. List the reasons for web buckling and web crippling.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Brief about various design methodologies followed in steel structural design with its advantages and limitations. (16)

(OR)

b) Explain the various loads and its combinations to be considered while designing a steel structure as per limit state method. (16)

12. a) Two flat plates of 10 mm and 16 mm thick are to be joined by double cover butt joint. If a joint has to carry a factored load of 200 kN with cover plate thickness of 8 mm on both sides, design a bolted connection. Take 4.6 grade 20 mm bolts. Assume width of plate as 300 mm. (16)

(OR)

b) A tie member of cross section 75 X 8 mm connected to a 12 mm thick gusset plate need to transmit a factored load of 150 kN. Design a fillet weld if overlap of the members are restricted to 70 mm. (16)

13. a) Design a tension member to carry a service load of 250 kN. The two angles to be placed back to back with long leg outstanding are desirable. The length of the member is 2.9 m. Assume if any data's required. (16)

(OR)

b) Design a splice for tension members 150 X 10 mm and 200 X 12 mm. The member need to transfer a factored tensile load of 250 kN. Take 4.6 grade 16 mm diameter bolts for connection. (16)

14. a) Design a built-up column 9 m long to carry a factored axial compressive load of 1000 kN. The column is restrained in position but not in direction in both the ends. Design the column with lacing connecting system with bolted connections. Use two channel sections back-to-back. Use steel of grade Fe410. (16)

(OR)

b) Briefly explain the step by step procedure for designing built-up column using batten as connecting system. (16)

15. a) Design a laterally supported beam to carry a factored bending moment and shear force of 145 kNm and 190 kN respectively. Span of the beam is 5.8 m. (16)

(OR)

b) Design a laterally unsupported beam of effective span 4 m has to carry a factored bending moment of 500 kNm and factored shear force of 180 kN. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEPE29 – Dynamics and Earthquake Resistant Design of Structures

(IS 1893, IS 13920, IS 4326 code books are permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Classify the types of damping.
2. Comment on logarithmic decrement.
3. Define degrees of freedom.
4. What is shear building concept? Draw a shear building idealization diagram.
5. What is mean by epicenter?
6. State the concepts of response spectrum.
7. Identify the term Peak Ground Acceleration (PGA).
8. Define ductility ratio.
9. Draw the shapes of building configurations.
10. Discuss about drift.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the equation of motion for undamped free vibration of SDOF system using following methods. (16)
    a) Simple harmonic motion method
    b) Newton's method
    c) Energy method
    d) Rayleigh's method
    e) D'Alembert's principle

(OR)

b) A vibrating system consisting of a weight of 1000 kN and a spring stiffness of 80 kN/m is viscously damped so that the ratio of two consecutives amplitude is 1 to 0.85. Determine: i) Logarithmic decrement ii) natural frequency iii) damping ratio iv) damping coefficient and v) damped natural frequency. (16)

12. a) Derive the following for free vibration of undamped two DOF system. (16)

a) Characteristic equation

b) Natural frequencies

c) Mode shapes

(OR)

b) Determine the natural frequencies and mode shapes for the system shown in figure.1 (16)

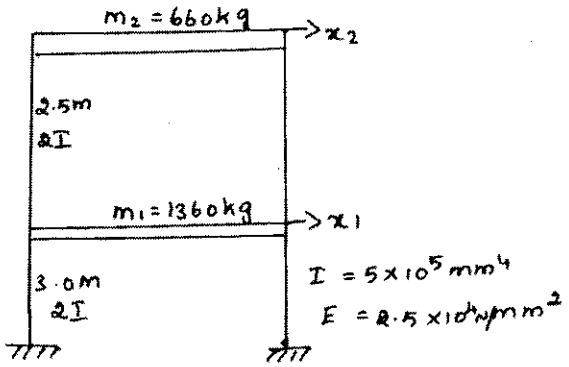


Figure.1.

13. a) i) Explain briefly about plate tectonic theory with neat sketches. (8)

ii) Explain briefly about elastic rebound theory with neat sketches. (8)

(OR)

b) i) What are the causes of earthquake? Explain in detail. (8)

ii) Explain in detail about (8)

a) Types of earthquake

b) Earthquake measuring scales

14. a) A four storey R.C frame building as shown in figure.2 is situated at Chennai. The height between the floors is 3.5 m and total height of a building is 14 m. The dead load and live load is lumped at respective floor. The soil below the foundation is assumed to be hard rock. Assume building is intended to be used as a hospital. Determine the total base shear and distributed lateral force at each floor as per IS 1893 (16)

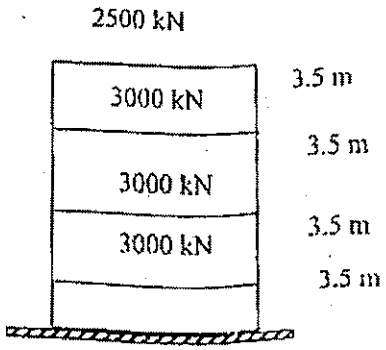


Figure.2.

(OR)

b) Plan and Elevation of a four-storey reinforced Concrete office building is Shown in figure.3 (16)

Number of storey = 4

Zone = III

Live load 3 kN/m²

Columns = 450 x 450 mm

Beams = 250 x 400 mm

Thickness of slab Thickness = 150 mm

Thickness of Wall = 120 mm

Importance factor = 1

Structure type = OMRF Building

Determine design seismic lateral load and Storey Shear force distribution.

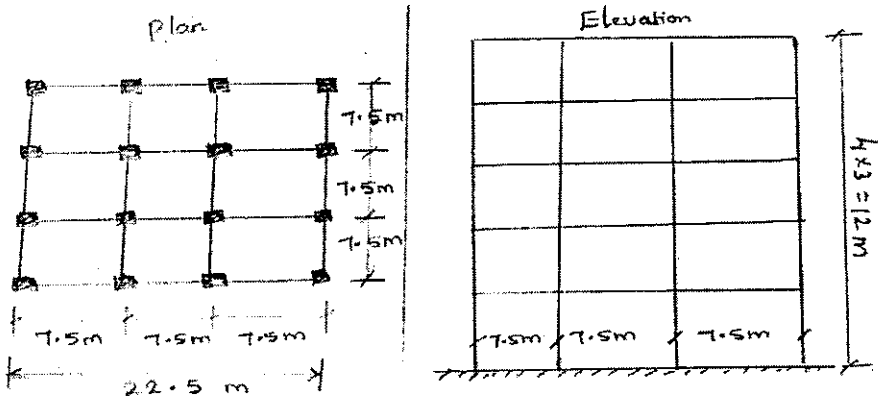


Figure.3.

15. a) Write short notes on base isolation and seismic dampers. (16)

(OR)

b) Explain briefly about the types of plan irregularities and vertical irregularities of building with neat sketches. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE603 – Engineering Economics, Estimation & Costing

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Elasticity of Demand.
2. Write Short Note on GDP and GNP.
3. What are the objectives of Monetary Policy?
4. List out any four functions of Commercial Banks.
5. Write the uses of Break Even Analysis.
6. Differentiate the fixed cost and variable cost.
7. Define Urbanisation.
8. What is the difference between the organised and the unorganised sector of employment?
9. Write Short Note on Cost Sensitive index.
10. What are the uses of computer in quantity surveying?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in detail about the basic principles and methodology of Economics. (16)

(OR)

b) Explain in detail about the factors influencing in changes in supply. (16)

12. a) Explain in detail about the various functions of Central Bank and its role in Economic Development. (16)

(OR)

b) Explain in detail about the Monetary Policy tools and their impact on the economy. (16)

13. a) What are the characteristics of Sole Proprietorship? Bring out its advantages and disadvantages. (16)

(OR)

b) Draw the Break Even Chart and explain its components. Also mention its advantages and limitations. (16)

14. a) Explain in detail about the Post Independence period Economical Development plans implemented in India. (16)

(OR)

b) Discuss in detail about the various direct and indirect instruments of monetary policy in India. (16)

15. a) The plan and the sectional elevation of a building is given in the figure 1. (16)

Estimate the following quantities:

i) Earthwork in excavation in foundation.

ii) Concrete in foundation.

iii) Brickwork in foundation and plinth.

iv) Brickwork in Superstructure.

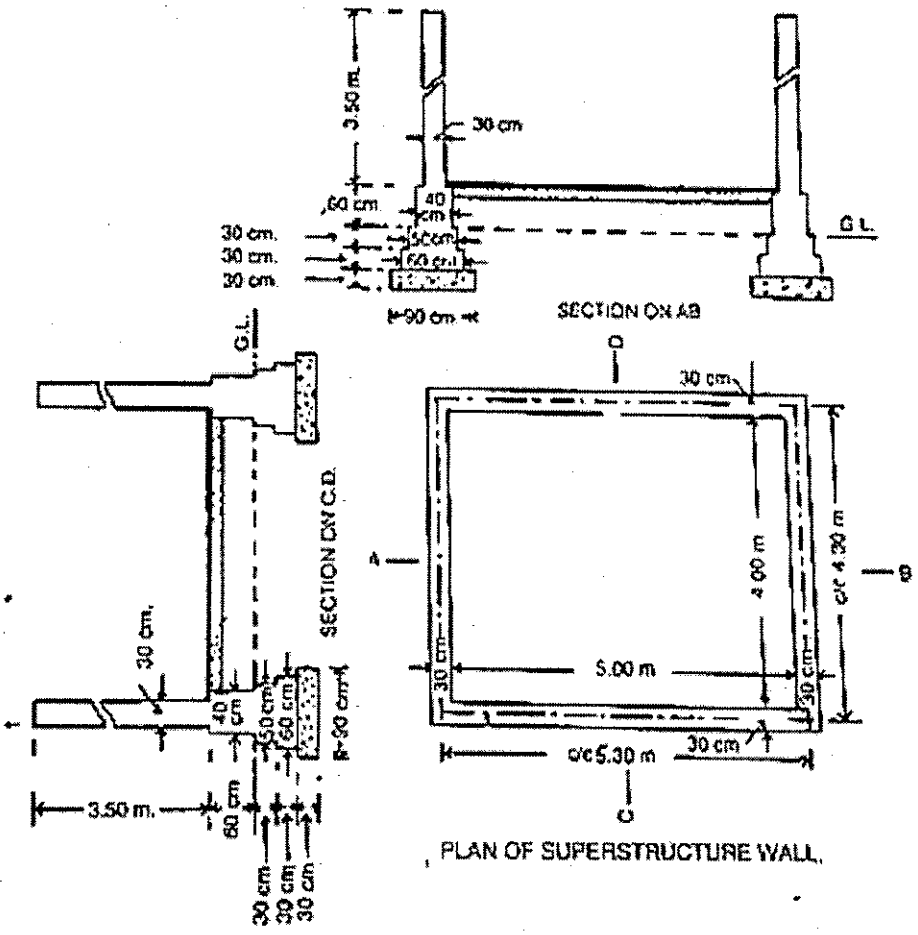


Figure:1

(OR)

b) Describe in detail about the Rate Analysis of Civil Works – its Elements and Requirements. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VIII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE801 – Construction Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term work task.
2. Brief a note on coding systems.
3. Sketch a sample bar chart.
4. Mention the important software's used for scheduling processes in construction industry.
5. Quote the importance of project budget.
6. Schedule update and budget update are mandatory. Justify.
7. Why the safety is given higher order of the preference in the construction industry?
8. What is meant by sampling?
9. List the various types of projects.
10. Differentiate between the information transfer and information flow.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss about the development of construction plans. (10)

    ii) Brief about the various construction methods. (6)

    (OR)

    b) i) Explain the process of estimating the resource requirements. (10)

    ii) Give a note on how to estimate the activity duration. (6)

12. a) Explain the critical path scheduling for the following activities shown in figure.1 by CPM. (16)

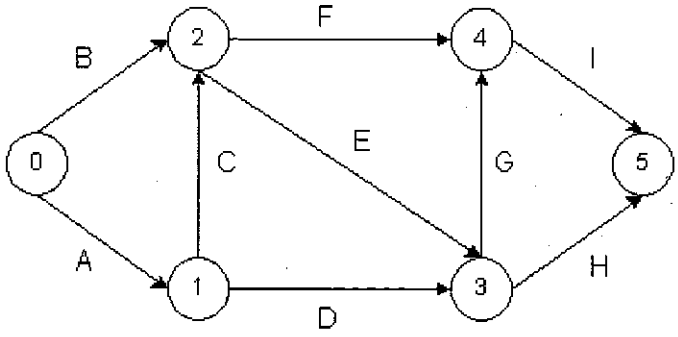


Figure.1.

(OR)

b) i) Describe about the resource oriented scheduling. (10)

ii) Write step by step procedure on how to improve the scheduling process in the construction industry. (6)

13. a) Explain the process involved in the forecasting for activity cost control and the significance and importance of the forecasting for activity cost control. (16)

(OR)

b) Write a detailed note on the following. (16)

1) Schedule control
2) Schedule update
3) Budget update
4) Schedule information

14. a) i) Describe the process of organizing the quality and safety in the construction site. (10)

ii) Quote a detailed note on work specifications pertaining to safety and quality. (6)

(OR)

b) i) Discuss about the quality control in the construction site by any two statistical methods. (10)

ii) Give a detailed note on material specifications pertaining to safety and quality. (6)

15. a) i) Explain the various types of project information. (10)

ii) List the uses of the project information. (6)

(OR)

b) i) Elaborate about the centralized database management systems. (10)

ii) Write a detailed note on databases and application programs. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEPE10 – Air Pollution Monitoring and Control

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the sources of air pollutants.
2. Mention the methods of air quality sampling.
3. State the role of meteorological factors in the dispersion of air pollutants in the atmosphere.
4. Define plume rise.
5. What is meant by Venturi scrubbers?
6. What is catalytic Incinerator?
7. Name some air pollution control efforts.
8. Write down the power of regulatory agencies.
9. Classify sources of noise pollution.
10. What is sound pressure level?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Classify air pollutants. (8)

ii) Demonstrate the effects of air pollutant on human beings. (8)

(OR)

b) i) Make note on global warming. (8)

ii) Identify the causes of ozone layer depletion. (8)

12. a) i) Categorize various types of environmental lapse rate. (8)

ii) Sketch wind rose diagram. (8)

(OR)

b) i) Analyze the factors affecting the atmospheric dispersion of air pollutants. (8)

ii) Describe the assumptions made in the Gaussian Model. (8)

13. a) Elaborate the working principle of electro static precipitator with its advantage and disadvantage. (16)

(OR)

b) i) Demonstrate the factors affecting selection of control equipment. (8)

ii) Summarize about control of gaseous contaminants by absorption method. (8)

14. a) i) Evaluate the significance of air quality monitoring. (8)

ii) State the air quality standards. (8)

(OR)

b) i) Assess air pollution control acts and regulation in India. (8)

ii) Make a note on Environmental Impact Assessment. (8)

15. a) i) Examine the various effects of noise pollution on human health. (8)

ii) Distinguish between continuous, intermittent and impulsive noise. (8)

(OR)

b) i) Describe the control measures to reduce noise. (8)

ii) Enumerate preventive measures of noise pollution. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18CEOE04 – Mechanics of Deformable Bodies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Hooke's law.
2. Define Poisson's ratio.
3. Define shear force and bending moment.
4. State the assumptions made in the theory of simple bending.
5. State the relationship between the torque (T), the angle of twist (θ), and the length (L) of a circular shaft.
6. Define the term "stiffness" of Helical spring.
7. State the differences between "Engineering Stress" and "True Stress" in a tension test.
8. Write the difference between "residual stress" and "applied stress".
9. Define fatigue fracture and explain its significance in engineering design.
10. What is the purpose of the Charpy Impact Test?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A bar of length 4 m has a rectangular cross-section with a width that varies linearly from 50 mm at one end to 100 mm at the other end, and a constant depth of 20 mm. The bar is subjected to a tensile force of 150 kN at one end. Determine the maximum stress in the bar and the point at which it occurs. (16)

(OR)

b) A rectangular bar of length 2 m, width 50 mm, and thickness 20 mm is subjected to a tensile force of 100 kN. Determine the stress, strain, and deformation of the bar. Assume that the material has a Young's Modulus of 200 GPa and a Poisson's ratio of 0.3. (16)

12. a) A cantilever beam of length 6 m carries a point load of 20 kN at its free end. Determine the shear force and bending moment diagrams for the beam. (16)

(OR)

b) A circular beam of length 6 m, diameter 250 mm is subjected to a point load of 50 kN at its midpoint. Determine the shear stress distribution across the diameter of the beam at the point of application of the load. Also, calculate the maximum shear stress. (16)

13. a) A hollow circular shaft of outer diameter 120 mm and inner diameter 80 mm is subjected to a torque of 15 kNm. Determine the maximum shear stress, angle of twist, and polar moment of inertia of the shaft. Assume G = 80 GPa. (16)

(OR)

b) A helical spring has a stiffness of 10 N/mm and is subjected to a force of 50 N. Determine the resulting deflection of the spring. Also, calculate the work done by the spring and the strain energy stored in the spring. Assume the spring is made of a material with a modulus of rigidity of 80 GPa. (16)

14. a) A rectangular tensile specimen made of a brittle material is subjected to a tensile load. The specimen has a length of 200 mm, width of 20 mm, and thickness of 10 mm. If the specimen fails at a load of 50 kN, determine: (16)

(a) The ultimate tensile strength (UTS) of the material

(b) The fracture stress of the material

(c) The strain at fracture of the material

(d) The type of fracture that occurred (ductile or brittle)

(OR)

b) A cylindrical pressure vessel of internal diameter 1.5 m and wall thickness 20 mm is subjected to an internal pressure of 10 MPa. Determine the residual stress distribution in the vessel wall after the pressure is released, assuming a linear elastic behavior. (16)

15. a) Describe the apparatus and procedure used in the bar impact test, and explain the significance of the test in determining the impact properties of materials. (16)

(OR)

b) Define isochronous curve and explain its significance in Creep Analysis. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEH307 – Quality Control and Assurance in Construction

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List any two factors that influence construction quality.
2. Define quality management in construction.
3. Name any two ISO standards that are relevant to quality management in construction.
4. Define a Quality Management System (QMS).
5. What does ergonomics refer to in construction quality management?
6. What is Taguchi's concept of quality?
7. What is the difference between quality assurance and quality control?
8. What is meant by the "reliability coefficient" in construction?
9. What is the role of drawings and detailing in ensuring construction quality?
10. Define life cycle costing in construction.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What are the primary factors that influence construction quality? Discuss about them. (16)

(OR)

b) Define quality management in the context of construction and explain its objectives. (16)

12. a) Discuss the ISO 9000 family of standards. What are the key requirements for implementing these standards in a construction project? (16)

(OR)

b) What is the importance of third-party certification in the context of quality management in construction? (16)

13. a) Explain briefly about objectives and methods of quality policy in construction industry. (16)

(OR)

b) What are the key considerations when developing a total QA/QC program for a construction project? (16)

14. a) What are the objectives of quality assurance and quality control from the perspectives of the owner, design team, contractor, and regulatory agent? (16)

(OR)

b) Explain the concept of failure mode analysis and how it can help in preventing defects and failures in construction. (16)

15. a) How do environmental safety, social, and natural factors impact construction quality and the construction process? (16)

(OR)

b) Explain the concept of value engineering and how it can be applied in a construction project to improve quality and reduce costs. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEPE34 – Ground Improvement Techniques

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define expansive soil and give examples.
2. Represent the problem associated with loose sand deposits.
3. Indicate the working principle of vacuum dewatering.
4. Represent a partially penetrating slot in homogenous deposit with help of a drawing.
5. Indicate the scope of wick drains.
6. Define vibro compaction.
7. Indicate the principle requirements of a reinforcement material.
8. List any 2 applications of filtration function of geosynthetics.
9. Differentiate suspension & solution grout.
10. List the various classes of chemicals used in soil stabilization.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Analyze the potential geotechnical problems involved in the different types of soils. (10)

ii) Outline the role of ground improvement techniques in the field of foundation engineering. (6)

(OR)

b) i) Outline the ground improvement techniques based on the principle of application. (10)

ii) Outline the selection criteria of the ground improvement techniques with respect to the soil conditions and nature of the project. (6)

12. a) i) Explain the method of dewatering using sumps and ditches with a neat sketch. (8)

ii) Explain the seepage analysis for 2D flow of fully penetrating slot in homogeneous deposits. (8)

(OR)

b) i) Explain in detail about the lowering of water table using single and multiple well points dewatering system. (8)

ii) Explain briefly about the principle, equipment used, installation, operation and precaution adopted in electro-osmotic dewatering. (8)

13. a) i) Explain briefly about the installation and action of lime piles also indicate the limitations. (8)

ii) Illustrate with neat sketch the Preloading with Sand Drain Technique and indicate the principle and design aspects. (8)

(OR)

b) i) Illustrate the Dynamic Compaction Technique with neat sketch and indicate the design aspects and field execution procedures. (8)

ii) Explain briefly about the Vibro flotation Technique with its merits and limitations. (8)

14. a) i) Analyze external and internal stability of the geosynthetic reinforced earth wall with neat sketches. (10)

ii) Show the classifications of geosynthetic products with its specifications. (6)

(OR)

b) i) Differentiate Geosynthetics based on the filtration, drainage and separation functions. (10)

ii) Show the role of geosynthetics in protecting the soil from contaminations. (6)

15. a) i) Illustrate with neat sketches the Grout plant with necessary machineries and equipment. Indicate the functions and specifications. (10)

ii) Classify the types of grout and show the characteristics. (6)

(OR)

b) i) Outline the various grout injection and grout monitoring techniques. (10)

ii) Analyze cement stabilization in compare with lime stabilization. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE604 – Professional Practices, Ethics & Building by Laws

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the primary role of a standardization body BIS in the construction industry.
2. Differentiate between the roles of a consultant and a contractor in a construction project.
3. Compare between valid and voidable contracts.
4. Identify the purpose of a liquidated damages clause in a contract.
5. Comment on the concept of "UNCITRAL Model Law" in international commercial arbitration.
6. Differentiate between conciliation and negotiation.
7. Fix the term collective bargaining and its significance in labor relations.
8. Index about the concept of "minimum wages" under Indian labor laws.
9. Define intellectual property and list its main forms.
10. State the fundamental difference between copyright and patent protection.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Summarize the role of various stakeholders in professional practice. (8)

ii) Outline the role of a contractor governed by contracts and regulatory Acts and standards. (8)

(OR)

b) i) Discuss the professional ethics in detail and salient features pertaining to code of ethics. (8)

ii) Explain the protected disclosure mechanism and deficiencies in state of the art. (8)

12. a) i) Describe the principle of contract management and Indian Act, 1972. (8)

ii) Characterize the various types of contracts and their features. (8)

(OR)

	b)	i)	Elucidate about the process of preparing a tender document.	(8)
		ii)	Explain the role of prime contractor in subcontracting.	(8)
13.	a)	i)	Describe the regulation of an employment and condition of service under building and other Construction workers Act, 1996.	(8)
		ii)	Discuss the extent of judicial intervention in arbitration.	(8)
			(OR)	
	b)	i)	Compare and contrast the different types of ADR mechanisms available in India.	(8)
		ii)	Explain the role of dispute resolution boards.	(8)
14.	a)		Portray the regulation of employment and conditions of service under Building and other construction workers Act, 1996.	(16)
			(OR)	
	b)		Categorize the provisions of the Industrial Employment (Standing Orders) Act, 1946 and their relevance in contemporary workplaces.	(16)
15.	a)	i)	Explain the Patents Act, 1970 and discuss the patent protection for computer programmes.	(8)
		ii)	Discuss the historical evolution of copyright law in India, highlighting the key changes and developments.	(8)
			(OR)	
	b)	i)	Discuss the remedies available for copyright infringement in India.	(8)
		ii)	Catalogue the rights and obligations of a patentee under Indian patent law.	(8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEH101 – Bridge Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the drawback in skew alignment?
2. Give some IRC specifications for road bridges.
3. State the effects of temperature on bridges.
4. What are the components of bridge super structure?
5. List the different types of connectors used in the composite bridge.
6. Write the effect of secondary stresses in the steel bridges.
7. List the functions of end block in a prestressed girder.
8. List out the various losses of prestress in a post tensioning member.
9. Classify the various forces acting on bearings.
10. Examine which foundation is ideal for clay soil?why?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain briefly the various works involved in selecting a suitable site for a bridge. (16)

(OR)

b) Explain elaborately the various types of loadings on the Railway and Road bridges and also explain the design of bridges according to IRC Code. (16)

12. a) Explain about any two methods of bridge deck analysis. (16)

(OR)

b) Explain Elaborately the Effects of Differential Settlement of supports. (16)

13. a) Design a deck type welded plate girder bridge to suit the following data: (16)

Effective span of the girder = 30 m

Dead load (open floor) = 7.5 kN/m

Equivalent total live load for BM calculations/track = 2727 kN

Equivalent live load for shear calculations/track = 2927 kN

Top of rail level =108.00 m

Side slopes of embankment = 1.5:1

Foundation level=1000.00m and width of abutment = 4 m

Design the main plate girder with intermediate and bearing stiffeners. Adopt rolled steel sections and steel plate with yield stress of 236 N/mm^2 conforming to IS226 and IRC24.

(OR)

b) A railway bridge consists of welded plate girders of 30 m span. The equivalent live load on the girder is 75 kN/m uniformly distributed over the span. Evaluate the midspan section of the plate girder. Design also the end bearing stiffener. (16)

14. a) Design the deck slab of RCC "T" beam deck bridge to suit the following data: (16)

Spacing of the "T" beam = 2.5 mc/c

Span of the "T" beam = 25 m (length of the bridge)

Cross girders are provided at 5 m c/c

Loading IRC class 'AA' tracked vehicle

Materials: M 30 grade concrete and Fe 500 grade steel.

(OR)

b) Design a post tensioned prestressed concrete slab bridge deck for a national highway crossing to suit the following data: (16)

Clear span = 10 m

Width of bearing = 400 mm

Clear width of roadway =7.5 m

Foot path =1m on either side

Kerbs = 600 mm wide

Thickness of wearing coat =80 mm

Live load = IRC class AA tracked vehicle

Type of Structure = Class 1 type

Materials: M 40 grade concrete and 7mm diameter High tensile wires with an ultimate tensile strength of 1500 N/mm2 housed in cables with 12 wires and anchored by Freyssinet anchorages of 150 mm

diameter. For supplementary reinforcement, adopt Fe415 grade HYSD bars.

Compressive strength at transfer = $35N/mm^2$

Loss ratio = 0.8

15. a) Design a well foundation for the pier of a major highway bridge to suit the following data. Internal diameter of well = 2.5m, type of soil strata = clay, Depth of well = 25 m below the bed level. Materials = M 30 Concrete and Fe 415 Steel. (16)

(OR)

b) Evaluate and design an elastomeric unreinforced neoprene pad bearing to be placed beneath a girder of a bridge to suit the following data. (16)

Span of the girder = 16 m

Dimensions of the girder = 300 mm x 1600 mm

No. of girders = 3

Slab thickness = 300 mm

No. of lanes = 2

Live load = IRC Class AA

Horizontal force = 200 kN

Coefficient of friction = 0.4.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEH105 – Finite Element Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the basic principle of structural mechanics?
2. State the equations of equilibrium in 2D.
3. What is a Truss?
4. What is the difference between primary and secondary boundary conditions?
5. What is discretization in the context of FEA?
6. List the basic element shapes used in FEA.
7. What are subparametric, isoparametric, and superparametric elements?
8. Explain the concept of Gauss quadrature.
9. What is the Weighted Residual Method in FEA?
10. Describe the Collocation method in FEA.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Distinguish between plane stress and plane strain conditions with examples. (16)

(OR)

b) Explain the applications of minimum potential energy. (16)

12. a) Explain the steps involved in the direct method of FEA. (16)

(OR)

b) Discuss the importance of the element stiffness matrix and global stiffness matrix. (16)

13. a) Explain the process of Discretization. How does it affect the accuracy of the analysis? (16)

(OR)

b) Discuss the role of convergence requirements in FEA. How do they influence the reliability of the analysis results? (16)

14. a) Discuss the impact of choosing between subparametric, isoparametric, and superparametric elements on the accuracy and convergence of the FEA results. (16)

(OR)

b) i) Describe the role of Gauss quadrature. How does it enhance the accuracy and efficiency of numerical integration in element stiffness matrices? (8)

ii) What is static condensation? How does it simplify the solution process, particularly for large-scale structures? (8)

15. a) Describe briefly the Weighted Residual Methods in FEA. How do they differ in terms of error minimization and application scope? (16)

(OR)

b) i) Compare the Collocation method and the Galerkin method. Which method offers better accuracy and under what conditions? (8)

ii) Discuss the application and advantages of the Least Square method. How does it differ from other weighted residual methods? (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV & VI Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCEE20 – Repair and Rehabilitation of Structures

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define maintenance.
2. List out any four causes of deterioration of structures.
3. Distinguish between structural cracks and non-structural cracks with an example.
4. State the importance of cover thickness in concrete.
5. Differentiate filling ability and passing ability of self-compacting concrete.
6. Why steel fibre-reinforced concrete is used in tunnel linings?
7. Demonstrate crack repair by routing and sealing with the help of neat sketch.
8. List the methods adopted to overcome low member strength in concrete structures.
9. List the pre-planning activities to be done before demolition of a structure.
10. Name any four Engineered demolition techniques for RCC structures.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the steps involved in the assessment procedure for evaluating the damages and to carry out rehabilitation work. (16)

(OR)

b) Explain in detail about the various aspects of inspection. (16)

12. a) i) What do you understand by the term durability? Compared to the other considerations, how much importance should be given to durability in the design and construction of concrete structures? (8)

ii) How the properties of aggregate- both fine and coarse and cement affect the relationship of water demand on slump and the water-cement ratio and compressive strength? (8)

(OR)

b) List the various types of corrosion in concrete discussing its phenomena, causes and effects. Also suggest any one method of protection against each type of corrosion. (16)

13. a) i) Under what circumstances vacuum treatment is given to concrete? Explain with neat sketch the arrangement for vacuum treatment of concrete with its merits and applications in construction practicing. (8)

ii) Summarize the sequence of operation in preparation of polymer impregnated concrete elements. (8)

(OR)

b) Explain the manufacturing process, properties and uses of High-performance concrete. (16)

14. a) Write short note on mechanism of (16)

1) Epoxy injection
2) Underpinning.

(OR)

b) i) Discuss the following methods of crack repair (6)

1) Concrete replacement
2) Mortar replacement
3) Resin based repairs

ii) Illustrate the rehabilitation procedure of fire damaged following elements: (10)

1) Eccentrically loaded columns
2) RCC slabs and beams

15. a) Discuss the impulsion method of demolition of structures. (16)

(OR)

b) Illustrate the procedure for demolishing the main structural members like columns, beams and slabs of RCC structure without disturbing the nearby structures. The building was constructed win the year 1980 located in sea shore with car parking at basement. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERNIG

16PTCE404 – Design of Steel Structures (Limit State Design)

(Use of IS 800 – 2007 & Steel tables are permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define nominal diameter of the rivet.
2. List the types of failures in a rivetted joint.
3. Mention the components of self-supporting chimney with neat sketch.
4. Classify the types of chimneys.
5. Define Torsional buckling.
6. Mention the Interaction equation for capacity check.
7. List the classification in the stiffeners.
8. Enumerate various forces acting on Gantry girder.
9. State the purpose of providing purlin to the roof truss.
10. Mention the equation to calculate design wind pressure.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A tie member 75 mm x 8 mm connected to a 10 mm thick gusset plate is to transmit a load of 90 kN. Design the fillet weld and calculate the necessary overlap. Assume site welding. (16)

(OR)

b) Find the dimensions of a doubly bolted lap joint for plates 16 mm thick to carry its full load. Take permissible axial tension in plate 150 N/mm^2. (16)

12. a) Reproduce the design of a self-supporting steel chimney for a height of 40 m above foundation with diameter of cylindrical portion 2 m. Assume thickness of lining as 100 mm and wind pressure as 1.5 kN/m^2. (16)

(OR)

b) Distinguish between self-supporting type chimney and Guyed type chimney. (16)

13. a) Explain the behavior of beam-column in Elastic Torsional buckling. (16)

(OR)

b) Explain about the codal design procedure of beam-column. (16)

14. a) A plate girder of span 15m is made-up of web plates of 1600 mm x 8 mm flange angles 150 mm x 115 mm x10 mm and two flange plates 480 mm x 10 mm it carries a uniformly distributed load of 100 kN/m including its own weight. Design suitably and sketch the web splices at 5 m from one end. (16)

(OR)

b) Explain step by step procedure in the design of gantry girders. Also explain the loads that would be considered in the design. (16)

15. a) Design a purlin for a roof truss having the following data: (16)

Span of the truss : 6 m

Spacing of the truss : 3 m c/c

Inclination of the roof : 30 degree

Spacing of purlin : 2m c/c

Wind pressure : 1.5 kN/m^2

Roof coverage A.C sheeting weighing : 200 N/m^2

Provide a channel section purlin.

(OR)

b) List out various elements of the roof truss and give their design requirements. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE303 – Design of Reinforced Concrete Elements

(IS 456, & Charts and tables from SP16 may be permitted during the examination)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the advantages of Limit State Method?
2. What is Partial Safety Factor? Why is the partial safety factor for Concrete greater than that for Steel?
3. Distinguish between One Way Slab and Two Way Slab.
4. Under what circumstances are doubly reinforced beams used in practice?
5. State minimum requirement of shear reinforcement.
6. Distinguish between bond and anchorage.
7. What are the minimum numbers of longitudinal bars in rectangular and circular columns?
8. Distinguish between a tied column and a spirally reinforced column.
9. What is meant by a Dog-legged Staircase? Also draw a sketch of the staircase.
10. What are the situations in which Combined Footings are preferred to Isolated Footings?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the Limit State of Collapse and Serviceability. (8)

ii) Discuss in detail Characteristic Load and Characteristic Strength of material. (8)

(OR)

b) i) Describe in detail. (8)

1) Stress – Strain curve for concrete

2) Stress – Strain curve for steel.

ii) Explain working Stress Method, Limit State method and Ultimate Load method of design of R.C structures. (8)

12. a) Design a rectangular reinforced concrete beam simply supported on masonry walls 300 mm thick with an effective span of 5 m to support a service load of 8 kN/m and a dead load of 4 KN/m without its own weight. Adopt M 20 grade concrete and Fe 415 HYSD bars width of support of beam is 300 mm. (16)

(OR)

b) Design a one way reinforced concrete slab simply supported at the edges for a public building with a clear span of 4 m supported on 200 mm solid concrete masonry walls. Live load on slab is 5 kN/m^2. Adopt M 20 grade concrete and Fe 415 HYSD bars. (16)

13. a) A simply supported RC beam of size 300 x 500 mm effective is reinforced with 4 bars of 16mm diameter HYSD steel of grade Fe 415. Determine the anchorage length of the bars at the simply supported end if it is subjected to a factored fore of 350 kN at the Centre of 300 mm wide masonry supports. The concrete mix of grade M 20 is to be used. Draw the reinforcement details. (16)

(OR)

b) A rectangular beam of 300 mm wide is reinforced with four 25 mm dia bars at an effective depth of 600 mm the beam has to resistant of factored shear force of 400 kN at support section. Use M 20 concrete and Fe415 steel. Design the vertical stirrups. (16)

14. a) i) Discuss various assumptions used in the Limit State methods of design of compression members. (6)

ii) Determine the ultimate load carrying capacity of rectangular column section 400 x 600 mm reinforced with ten 25 mm dia bars. Use M 25 concrete and Fe 415 steel. (10)

(OR)

b) Design the reinforcement in a circular column of diameter 350 mm with helical reinforcement of 8 mm diameter to support a factored load of 1400 kN. The column has an unsupported length of 3.5 m and is braced against side sway. Adopt M 20 grade concrete and Fe 415 steel bars. (16)

15. a) i) Write down the different types of footings and their suitability. (8)

ii) Enumerate the procedure for the design of Combined Rectangular footing for two columns only. (8)

(OR)

b) Design one of the flight of a dog-legged stairs spanning between landing beams using following data (16)

Number of steps in a flight = 10

Tread = 300 mm

Rise = 150 mm

Width of landing beams = 300 mm

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE501 – Applied Hydraulics Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the properties of open channel?
2. Draw the specific energy curve.
3. What do you mean by surges in channel?
4. Draw drawdown and back water curves.
5. Write Impulse Momentum equation.
6. What is the efficiency of jet propulsion with inlet orifices at right angles to the direction of motion of the ships?
7. State the uses of draft tube.
8. Define governing of turbines.
9. What is specific speed of pump?
10. State the use of air vessels in pumps.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the classification of flow in open channel. (6)

ii) A trapezoidal channel has side slopes of 1 horizontal and 2 vertical and the slope of the bed is 1 in 1500. The area of the section is 40 m^2. Determine the dimensions of the section if it is most economical. Also, determine the discharge of the most economical section, if Chezy's constant C = 50. (10)

(OR)

b) i) Derive Chezy's formula. (6)

ii) A 3 m wide rectangular channel conveys 12 m^3/sec of water at a depth of 2 m. calculate the (i) specific energy and conjugate depth (ii) critical depth, critical velocity and the minimum specific energy. Also compute the Froude number. (10)

12. a) i) Derive the Dynamic equation for the Gradually Varied Flow. (8)

ii) In a horizontal rectangular channel has the velocity of flow is 12 m/s and depth of flow is 1 m before the jump. Determine the depth of flow after the jump and loss of energy due to the jump. (8)

(OR)

b) i) Describe the Standard step method of surface water profile determination. (8)

ii) Determine the slope of the free water surface in a rectangular channel of width 20 m, having depth of flow 5 m. The discharge through the channel is 50 m^3/sec. The bed of the channel is having a slope of 1 in 4000. Assume of Chezy's constant C = 60. (8)

13. a) A 75 mm diameter jet having a velocity of 30 m/sec strikes a flat plate, the normal of which is inclined at 45^0 to the axis of the jet. Define the normal pressure on the plate, (i) When the plate is stationary; (ii) When the plate is moving with a velocity of 15 m/sec in the direction of jet, away from the jet. Also determine the power and efficiency of the jet when the plate is moving. (16)

(OR)

b) A jet of water of 60 mm diameter strikes a curved vane at its centre with a velocity of 18m/sec. The curved vane is moving with a velocity of 6m/sec in the direction of the jet. The jet is deflected through an angle of 165^0, Assuming the plate to be smooth determine: (i) Thrust on the plate in the direction of jet,(ii) Power of the jet and (ii) Efficiency of the jet. (16)

14. a) A Pelton wheel is running under a head of 150 m at the speed of 300 rpm. The overall efficiency of the turbine is 85% and the ratio of jet to the wheel diameter is 1/10. Determine the diameter of the wheel, diameter of the jet, width of buckets, depth of buckets and number of buckets. Assume suitable data, if required. (16)

(OR)

b) The hub diameter of a Kaplan turbine, working under a head of 10 m is 0.4 times the diameter of the runner. The turbine is running at 150 rpm. If the vane angle of the extreme edge of the runner at outlet is 15^0 and the flow ratio is 0.5. Find diameter of the runner, diameter of the hub and the discharge through the runner. (16)

15. a) Explain the components and working principle of a Centrifugal Pump. (16)

(OR)

b) Explain the components and working principle of a Double Acting Reciprocating Pump with neat sketches. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CEH301 – Smart Materials and Smart Structures

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define smart materials and give two examples.
2. Differentiate between active and passive smart materials.
3. Define a strain rosette and its purpose.
4. What is the principle of operation of a pressure transducer?
5. Mention two advantages of using fibre optic sensors in structural assessment.
6. List two applications of bio-chemical sensing in engineering structures.
7. Write short note on shape memory alloys.
8. What are electro-rheological fluids, and where are they commonly used?
9. What is the role of signal processing in smart structures?
10. Define the term "geometrical processors" in the context of sensors.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the concept of smart materials and structures, discussing their significance in modern engineering. (16)

(OR)

b) Describe the different types of actuation systems and effectors used in smart structures with examples. (16)

12. a) Illustrate and explain the operation of a Wheatstone bridge in detail and its importance in strain gauge applications. (16)

(OR)

b) Explain the concept of strain rosettes, types of strain rosettes and how they are used to determine principal stresses. (16)

13. a) Describe in detail the working principle of piezoelectric sensors and their applications in structural health monitoring. (16)

(OR)

b) With relevant examples, describe how LVOT and fibre optic sensors are used for real-time monitoring of structural deformations. (16)

14. a) Write a detailed note on electromagnetic actuation, including its principle, advantages, limitations and real-world examples. (16)

(OR)

b) Describe the differences between magnetostrictive materials and shape memory alloys in terms of their properties and applications. (16)

15. a) Explain the different stages of data acquisition in smart structures. Provide examples of each stage. (16)

(OR)

b) Compare and contrast linear and non-linear control systems. Discuss their applications in smart structures. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CEH102 – Repair and Rehabilitation of Structures

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define repair and rehabilitation.
2. Indicate the facets of maintenance.
3. Enlist the important durability properties of concrete are to be satisfied for reinforced concrete structures.
4. Identify the main causes for cracks in buildings.
5. Specify the role of expansive cement as repair material.
6. Give examples for corrosion inhibitors.
7. Cite a suitable repair technique for fire affected buildings.
8. Specify the methods used for strengthening of axial members.
9. Name the explosives used for demolition.
10. List any four advanced demolition techniques.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Assess and evaluate the condition of damaged concrete structure. (8)

ii) Illustrate any two non-destructive testing techniques. (8)

(OR)

b) i) Summarize the types of maintenance with suitable examples. (8)

ii) Prepare the detailed checklist to review the various aspects of inspection. (8)

12. a) i) Describe how to ensure the quality assurance in concrete construction works. (8)

ii) Explain the factors affecting the permeability of concrete. (8)

(OR)

b) i) Discuss the effects of concrete due to climate and temperature. (8)

ii) Outline the details about the errors occurred during design as well as construction. (8)

13. a) Enumerate the method of preparation of polymer concrete and also mention its merits and applications. (16)

(OR)

b) i) Name the different fibres used to prepare fiber reinforced concrete and mention the important properties of fiber reinforced concrete. (10)

ii) Write the detailed notes on underpinning. (6)

14. a) Illustrate in detail about crack repair techniques with suitable applications. (16)

(OR)

b) Assume you are a Maintenance Engineer. Suggest appropriate retrofitting technique to overcome an excessive deflection in a damaged RCC beam element. (16)

15. a) i) Describe the sequence of steps involved in demolition techniques. (8)

ii) Discuss the various safety precautions to be followed during demolition and dismantling. (8)

(OR)

b) Illustrate with a case study for the demolition of multi-storey concrete building in dilapidated condition. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

STRUCTURAL ENGINEERING

22STE21 – Analytical and Numerical Methods for Structural Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the condition for Convergence of Iteration method.
2. Evaluate an iterative formula for 1/N, where N is a positive number by using Newton – Raphson method.
3. Write the nature of nth divided differences of a polynomial of degree n.
4. Write Newton's forward formula up to 4th finite differences.
5. Write the formula for $\frac{dy}{dx}$ at $x = x_n$ by Newton backward difference formula.
6. Write down the order of the errors of trapezoidal rule.
7. Estimate $y(0.2)$ given that y' = x + y, $y(0) = 1$, using Euler's method.
8. Explain one step methods and multi-step methods.
9. Obtain the finite difference scheme for the differential equation $2\frac{d^2y}{dx^2} + y = 5$.
10. What down the explicit formula Bender – Schmidt recurrence equation?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Evaluate the inverse of the matrix $\begin{pmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{pmatrix}$ using Gauss-Jordan method. (8)

ii) Find the dominant eigen value and vector of $\begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$ using Power method. (8)

(OR)

b) i) Find the positive real root of $x \tan x = -1 = 0$ using method of False position starting with $x_0 = 2.5$ and $x_1 = 3$ correct to 3 decimal accuracy. (8)

ii) Apply Gauss Seidel method to solve system of equations $3x - y + z = 1$; $3x + 6y + 7z = 0$; $3x + 3y + 7z = 4$ correct to 4 decimal accuracy. (8)

12. a) i) Write the polynomial y(x) and hence find y(2), using Lagrange's method, (8)

x:	0	1	3	4
y:	-12	0	6	12

ii) Using Newton's forward interpolation formula, find the value of y at x = 53 (8)

x :	45	50	55	60	65
y :	114.84	96.16	83.32	74.48	68.48

(OR)

b) i) Find the value of y at x = 5 by Newton's divided difference formula for the data: (8)

x :	0	2	3	4	7	8
y :	4	26	58	112	466	668

ii) Given (8)

(x) :	1	2	3	4	5	6	7	8
(y) :	1	8	27	64	125	216	343	512

Estimate y (7.5) using Newton's formula.

13. a) i) Find the value of f '(0) from the table given below (8)

x :	-1	1	2	3
f(x) :	-21	15	12	3

using suitable Newton's formula.

ii) Evaluate $\int_1^{1.4}\int_2^{2.4}\frac{dxdy}{xy}$, h = k = 0.1, using Simpson's rule and justify. (8)

(OR)

b) i) The population of a certain town is given in the following table: (8)

x :	1931	1941	1951	1961	1971
y :	40.62	60.80	79.95	103.56	132.62

Find the rate of growth of the population in 1931 and 1971

ii) Evaluate $\int_0^1 \frac{dx}{x^2+1}$ using Trapezoidal rule with h=1/6, hence obtain an approximate value of π. (8)

14. a) i) Using Taylor series method find correct to 4 decimal places the value of y(0.1) , given $\frac{dy}{dx} = x^2 + y^2$, y(0) =1. (8)

ii) By Adam's method, find y (1.4) given $\frac{dy}{dx} = x^2(1+y)$, y (1) = 1 using h = 0.1 if y(1.1) = 1.233, y(1.2) = 1.548 and y(1.3) = 1.979. (8)

(OR)

b) i) Apply modified Euler method to find y(0.1) & y(0.2) given $y' = x^2 + y^2, y(0) = 1$. (8)

ii) Evaluate $\frac{dy}{dx} = \frac{y^2-x^2}{y^2+x^2}$ given that y (0) = 1, find y at x = 0.2, using Runge-kutta method of 4 order. (taking h=0.2). (8)

15. a) i) Solve the boundary value problem, $y'' - y = 0$ with $y(0) = 0$ and $y(2) = 4$ by taking $h = 0.5$. (8)

ii) Solve the Poisson equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0, y = 0, x = 3, y = 3$ *and* $u = 0$ on the boundary. Assume mesh length $h = 1$ unit. (8)

(OR)

b) i) Solve $u_{xx} = 32u_t$, taking h=0.25 for $t \geq 0$, $0 \leq x \leq 1$ and u(x,0) = 0,u(0,t) = 0, u(1,t) = t (upto five time step). (8)

ii) Solve numerically $4u_{xx} = u_{tt}$ with the boundary conditions u(0,t) =0,u(4,t) = 0 and the initial condition $u_t(x, 0) = 0$ and u(x,0) = x(4-x) taking h=1 and upto t = 4. (8)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

STRUCTURAL ENGINEERING

22STE12 – Theory and Applications of Cement Composites

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define composite material? Why it is used instead of metals.
2. List the various type of laminated composite materials.
3. State any four applications of cement composites.
4. Write short notes on textile reinforcement.
5. Recall the mechanical properties of the Glass fibre reinforcements.
6. List the constituent materials used in the SIFCON.
7. Labs the relationship between elastic constants in composite materials.
8. Recall the various applications of Ferrocement.
9. State the reason for mining fibers in concrete mix.
10. Write short note on effective modulus of reinforcement.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Describe the various components of composite materials.	(16)
		(OR)	
	b)	Explain in detail about the classification of composite materials.	(16)
12.	a)	What are the various cement composite materials and Explain in detail about the fiber reinforced cement matrices?	(16)
		(OR)	
	b)	Elaborate in detail about the various interfaces in cement composites.	(16)
13.	a)	Explain in detail about the various types of reinforcement (fibres) in cement based composites.	(16)
		(OR)	
	b)	Write a detailed note on the construction techniques adopted for fabricating SIFCON.	(16)

14. a) State the summary on the behavior of Ferrocement in tension, compression, flexure and shear. (16)

(OR)

b) Discuss in detail about orthotropic and anisotropic behavior of composites material. (16)

15. a) Write the steps involved in the design of Ferrocement as a flexural members. (16)

(OR)

b) i) Compare the stress strain relationship of SIFCON flexure member with the conventional concrete flexure member. (8)

ii) Discuss the use of ferrocement in structural applications. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN/THERMAL ENGINEERING

22CDE11 – Advanced Mathematical Methods in Engineering

(Statistical Tables (t-test, F-test, φ^2 – test) to be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Determine whether the vectors $u = (1,1,2), v = (1,0,1) and\ w = (2,1,3)$ spans the vector space R^3.
2. If $V = R^3$ then verify whether $W = \{(a_1, a_2, a_3) : 2a_1 - 7a_2 + a_3 = 0\}$ is a subspace or not.
3. Classify the PDE: $u_{xx} + 2u_{xy} - u_{yy} + u_x - u_y = 0$.
4. Write all the possible solutions of one dimensional heat equation in Cartesian coordinates.
5. If $F\{f(x)\} = F(s)$, prove that $F\{f(x-a)\} = e^{ias}F(s)$.
6. Find $L(t^2e^{-3t})$.
7. State Central Limit theorem.
8. Write the applications of F-test.
9. What are the basic principles of design of experiments?
10. Why a 2X2 Latin square is not possible? Explain.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Determine whether the set of all 2 X 2 matrix of the form $\begin{pmatrix} a & a+b \\ a+b & b \end{pmatrix}, a, b \in R$ with respect to standard matrix addition and scalar multiplication is a vector space or not? If not, list all the axioms that fail to hold. (10)

ii) Prove that the intersection of two subspace is a subspace. (6)

(OR)

b) i) Let $T: R^3 \to R^2$ defined by $T(x,y,z) = (2x - y, 3z)$. Verify whether T is linear or not. Find $N(T)\ and\ R(T)$ and hence verify the dimension theorem. (10)

ii) Let $T: R^2 \to R^3$ defined by $T(x,y) = (x+3y,\ 0,\ 2x-4y)$. Find the matrix of the transformation with respect to standard basis of R^2 *and* R^3. (6)

12. a) Derive all the possible solutions of one dimensional diffusion equation in cylindrical coordinates by method of separation of variables. (16)

(OR)

b) Find the potential at all points of space inside and outside of a sphere of radius R = 1 which is maintained at a constant distribution of electrical potential $u(R,\theta) = f(\theta) = cos2\theta$. (16)

13. a) Solve IBVP described by the PDE: $u_t = ku_{xx}\,; 0 < x < \infty\,,\ t > 0$ subject to B.Cs: $(x,t) \to 0\ as\ x \to \infty\ ,\ u(0,t) = g(t)$I.Cs: $u(x,0) = 0$. (16)

(OR)

b) Obtain the solution of free vibrations of a semi-infinite string governed by PDE: $u_{tt} = c^2u_{xx}\,; 0 < x < \infty\,,\ t > 0$ subject to I.Cs: $u(x,0) = f(x), u_t(x,0) = g(x)$ (16)

14. a) i) Find the M.G.F, mean and variance of Binomial distribution. (8)

ii) An electrical firm manufactures light bulbs that have a life, before burns out that is normally distributed with mean equal to 800 hours and a S.D of 40 hours. Find the probability that
i) a bulb burns more than 834 hours
ii) a bulb burns between 778 and 834 hours. (8)

(OR)

b) i) Two independent samples from normal population with equal variance gave the following (8)

Sample	Size	Mean	S.D
1	16	23.4	2.5
2	12	24.9	2.8

Is the difference between the means significant?

ii) A sample analysis of examination results of 1000 Students were made and it was found that 260 failed, 110 first class, 420 second class and rest obtained third class. Do these data support the general examination results in the ratio 2:1:4:3? (8)

15. a) A farmer wishes to test the effects of four different fertilizers A, B, C and D on the yield of wheat. In order to eliminate sources of error due to variability in soil fertility he uses fertilizers in a Latin square design as indicated below, where the number indicate yields in kilograms per unit area. Perform an analysis of variance to determine if there is a significant difference between the fertilizers at 0.01 level of significance (16)

A 18	C21	D25	B11
D22	B12	A15	C19
B15	A20	C23	D24
C22	D21	B10	A17

(OR)

b) Table below shows the seeds of 4 different types of corns planted in 3 blocks. Test at 0.05 level of significance whether the yields in kilograms per unit area vary significantly with different type of corns. (16)

	Types of corns			
	I	II	III	IV
Blocks A	4.5	6.4	7.2	6.7
B	8.8	7.8	9.6	7.0
C	5.9	6.8	5.7	5.2

Civil

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2012 Regulations)

CIVIL ENGINEERING

12CEE23 – Prestressed Concrete Structures

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the difference between pre-tensioning and post-tensioning in prestressed concrete?
2. What is the primary difference between the behaviour of a prestressed concrete beam and a reinforced concrete beam under bending?
3. What is the primary cause of instantaneous loss in prestressed concrete members?
4. Which method is used to calculate the deflection of prestressed concrete flexural members?
5. According to IS Code provisions, what is the minimum percentage of prestressed reinforcement required for a simply supported rectangular section.
6. What is the purpose of the "bond" requirement in designing prestressed concrete members?
7. What is the primary purpose of an end block in a prestressed concrete member?
8. According to the Guyon and Magnell method, what is the shape of the stress distribution in the end block?
9. What is the purpose of using a "concordant cable profile" in the design of prestressed concrete structures?
10. State the difference between "full prestressing" and "partial prestressing" in the design of prestressed concrete structures?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A simply supported beam with a span of 10 m is prestressed with a force of 500 kN. The beam has a rectangular section with a width of 200 mm and a depth of 400 mm. Calculate the fibre stresses at the top and bottom fibres of the beam at the mid-span section due to the prestressing force. (16)

(OR)

b) Compare and contrast prestressed concrete with reinforced concrete in terms of their structural behavior, durability and construction costs. (16)

12. a) A pretensioned concrete beam has a rectangular cross-section with a width of 300 mm and a depth of 600 mm. The beam is prestressed with 12 wires, each with a diameter of 12.7 mm and a stress of 1200 MPa. Calculate the loss of prestress due to elastic shortening of the concrete. Assume a modulus of elasticity of concrete of 35 GPa and a modulus of elasticity of steel of 200 GPa. (16)

(OR)

b) Derive the expression for calculating the deflection of a prestressed concrete flexural member due to the prestressing force. (16)

13. a) Design a pre-tensioned simply supported rectangular section to carry a uniformly distributed load of 10 kN/m over a span of 10 m. The section is to be designed for flexure, bond, and shear using the stress method. Assume a concrete strength of M40 and a prestressing steel strength of 1860 MPa. (16)

(OR)

b) A post-tensioned simply supported I-section is to be designed to carry a uniformly distributed load of 15 kN/m over a span of 12 m. The section is to be designed for flexure, bond, and shear using the stress method. Assume a concrete strength of M50 and a prestressing steel strength of 2000 MPa. (16)

14. a) Explain the significance of the "anchorage zone" in the design of end blocks. How does the anchorage zone affect the stress distribution in the end block? (16)

(OR)

b) Design an end block for a prestressed concrete beam with a rectangular cross-section. The beam has a width of 300 mm, a depth of 600 mm, and a span of 10 m. The prestressing force is 500 kN, and the eccentricity is 200 mm. Use the Guyon and Magnell method to calculate the bursting force and design the end block reinforcement. (16)

15. a) Design a prestressed concrete pipe with an internal diameter of 1.5 m and a wall thickness of 150 mm. The pipe is subjected to an internal pressure of 1.0 MPa and an external load of 100 kN/m. Use the concordant cable profile method to design the prestressing tendons. (16)

(OR)

b) Explain the concept of "partial prestressing" and its advantages in the design of prestressed concrete structures. How does partial prestressing affect the flexural behavior of a simply supported beam? (16)

Register No :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

WELDING TECHNOLOGY

22WTE61 – Brazing, Soldering, Surfacing and Cutting

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between brazing and soldering.
2. How surface tension affects wettability?
3. List the role of fluxes in soldering.
4. What is the need of different atmospheres for brazing?
5. How is vacuum brazing done?
6. What is flame soldering?
7. Differentiate between welding and surfacing.
8. Compare plasma spraying and thermal spraying.
9. Which cutting process(es) is suitable for cutting austenitic stainless steel?
10. Mention the advantages of carbon arc cutting over oxy-fuel gas cutting.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the concepts of surface tension and contact angle in brazing and soldering with suitable examples. (16)

(OR)

b) Explain in detail wetting and spreading characteristics of soldering and brazing. (16)

12. a) Describe the important characteristics, major constituents and applications of different groups of fluxes. (16)

(OR)

b) Describe the various joint designs for brazing and soldering. Also explain the importance of fixturing and fixturing methods for brazing and soldering. (16)

13. a) Analyze the principle, process parameters, equipment and filler metals of Induction brazing and Dip brazing. (16)

(OR)

b) Analyze the flame soldering and hot gas blanket soldering processes with neat sketches. (16)

14. a) Describe the various thermal spray processes for surface hardfacing. (16)

(OR)

b) Describe the various types of PVD processes with neat sketches. (16)

15. a) Give a detailed account on principle, process considerations and applications of Oxy-fuel gas cutting process. (16)

(OR)

b) Give a detailed account on principle working and applications of laser beam cutting and water jet cutting. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MTH107 – Brazing, Soldering, Surfacing and Cutting

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are brazing and soldering?
2. What are capillary dams?
3. State the needs to use fluxes in brazing and soldering.
4. State the necessities to use fixtures for brazing.
5. List the applications of brazing and soldering.
6. What is resistance soldering?
7. List some examples for thermal spray surface modification processes.
8. What is ion implantation process?
9. What is water jet cutting and where is it used?
10. What is the principle of Laser beam cutting?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the mechanism, process steps, advantageous and limitations of brazing in detail. (16)

(OR)

b) Explain the terms capillary action, wetting and surface tension and contact angles when a liquid is spread over a solid surface? (16)

12. a) Elaborate the grouping and applications of fluxes and atmospheres in brazing and soldering. (16)

(OR)

b) Write short notes on (16)

1) Filler materials
2) Joint design and
3) Fixtures pertaining to brazing

13. a) Explain the process, equipments, advantages, limitations and applications of resistance brazing process in detail. (16)

(OR)

b) Explain the dip soldering process in detail with respect to process, equipment, advantages, limitations and applications. (16)

14. a) Give a detailed account on LASER surface modification and alloying on metal substrates. (16)

(OR)

b) Discuss in detail the principle and steps involved in physical vapour deposition (PVD). (16)

15. a) Explain the oxy acetylene gas cutting process in detail with respect to process, equipment, advantages, limitations and applications. (16)

(OR)

b) Discuss in detail the plasma arc cutting process in detail with respect to process, equipment, consumables, advantages, limitations and applications. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MTE31 – Non Metallic Materials

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. How are the polymers classified based on their structure?
2. What is Degree of Polymerization?
3. Compare and contrast Elastomers with polymers.
4. State the significance of Crazing in polymers.
5. What are Ceramics? Name few conventional ceramics and advanced ceramics.
6. Name the different types of glasses and state their applications.
7. What are Composite materials? Evaluate the need for composites in daily scenario.
8. Analyze the need for prepregs in composite production.
9. List the name of few dispersoids and mention their functions.
10. What are hybrid composites? State few applications of hybrid composites.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss about the structure, properties and applications of the following polymers: PE, PS, PMMA and Nylon. (8)

ii) What is Glass Transition temperature? Analyze its significance in polymers. (8)

(OR)

b) i) What is Polymerisation? Explain the types of polymerisation and its mechanisms with suitable examples. (8)

ii) What are the various polymer additives used in processing of polymers? List their properties and give few examples for each additive. (8)

12. a) i) Name the various polymer processing methods and explain any two methods with suitable diagrams. (8)

ii) Classify the elastomers and briefly explain any two elastomers with their properties and applications. (8)

(OR)

b) i) How does yielding and fracture occur in polymers? Explain in detail. (8)

ii) What are Viscoelastic polymers? State the two important properties of viscoelastic polymers and briefly explain them. (8)

13. a) Discuss in detail about the production, properties and applications of Silicon carbide and Boron nitride. (16)

(OR)

b) Explain the various glass manufacturing methods with required sketches. (16)

14. a) What are the different types of fibers used in composites? Name the fiber widely used in composites and explain the processing of same with a required flowchart. (16)

(OR)

b) Explain Filament winding and Lay up method employed in the production of fiber composites with suitable diagrams. (16)

15. a) What are the different types of Laminar composites? Briefly explain them with suitable diagrams. (16)

(OR)

b) What are Hybrid composites? State its significance. Also, explain the same with a suitable diagram. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT401 – Mechanical Behaviour and Testing of Materials

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is "Plastic instability" of materials? List the conditions favouring plastic instability.
2. What is the significance of Hollomon-Ludwig equation in tensile behaviour of materials?
3. Calculate the Brinell hardness if the diameter of indentation is 2 mm when tested with 5 mm ball at 750 kg load.
4. What is the use of Instrumented Charpy test?
5. DBTT is not observed in FCC materials. Analyze.
6. What is the significance of "J Integral" in fracture mechanics?
7. List the various factors affecting fatigue.
8. How are fatigue testing machines classified?
9. Differentiate Creep test from Stress rupture test.
10. Name any two high temperature alloys with their chemical composition.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw the schematic True stress strain curve and explain how it is used to find out the strain hardening exponent of a material. (8)

ii) Justify the need for ASTM testing standards. Also, specify the ASTM standards for various testing procedures. (8)

(OR)

b) i) Recall Notch sensitivity and describe the Notch tensile testing with sketch. (8)

ii) Explain the procedure, purpose, importance and application of torsion test. (8)

12. a) i) Explain the determination of hardness by Rockwell hardness test. Indicate the salient features of Rockwell test. (8)

ii) List the various Microhardness tests and explain any one microhardness test stating their advantages and disadvantages. (8)

(OR)

b) i) Differentiate Izod and Charpy impact tests with suitable diagrams. (8)

ii) Compare the Explosion-crack-starter test and Drop weight test with suitable sketches. (8)

13. a) i) What is the significance of Transition Temperature curve and give a detailed account of various factors affecting DBTT. (8)

ii) Derive the Griffith's equation for the crack propagation in brittle materials. Also, discuss about Orowan's modification. (8)

(OR)

b) i) Explain the procedure for determining K_{IC} value by plane strain toughness testing with dimensional details of different types of specimens. (8)

ii) Briefly explain the concept of Crack Opening Displacement with required sketches. (8)

14. a) i) Analyze the reason for most of the non ferrous metals not having a true fatigue limit and explain the procedure for determining SN curve. (8)

ii) Briefly explain the effect of mean stress on fatigue using Goodman diagram and Haig-Soderberg diagrams. (8)

(OR)

b) i) Briefly explain the structural features accompanying by fatigue. (8)

ii) Explain the fatigue crack propagation rate and derive an expression for fatigue crack growth life. (8)

15. a) i) With help of an ideal creep curve explain the different stages of creep and a method to develop creep curve. (8)

ii) Explain the structural changes that occur during creep deformation with required sketches. (8)

(OR)

b) i) Explain in detail the various factors affecting creep and mechanisms of creep. (8)

ii) Analyze the significance of creep - fatigue interaction in detail. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT402 – Advanced Physical Metallurgy

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the driving force for solidification?
2. What are the reasons for dendritic solidification during casting process?
3. Why does heterogeneous nucleation occur more readily than homogeneous nucleation?
4. What is the influence of wetting angle during nucleation process?
5. What is the first phase that nucleates during pearlitic and bainitic phase transformations?
6. What is uphill diffusion?
7. What are the factors that lead to particle coarsening during precipitation hardening?
8. What are the advantages of warm working?
9. What are the modes by which martensitic transformations occur?
10. Give any two applications of shape memory alloys.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the mechanism of solidification in eutectic alloys with an example. (16)

(OR)

b) Compare and contrast the phase transformations that occur during solidification in pure metals and alloy systems. (16)

12. a) Explain the two types of nucleation and derive the expressions for overall phase transformation kinetics for any one of the above type. (16)

(OR)

b) Explain the differences between interface-controlled growth and diffusion-controlled growth. (16)

13. a) Explain the mechanism of nucleation and growth during pearlitic transformations. (16)

(OR)

b) Explain the process of order-disorder phase transformations in certain alloys with examples. (16)

14. a) Explain the criteria for recovery, recrystallization and grain growth and the property changes that occur during above processes. (16)

(OR)

b) Compare the microstructural and property changes that occur during cold working and hot working. (16)

15. a) With sketches, explain the crystallography and characteristic features of martensitic transformations? (16)

(OR)

b) Discuss the crystallographic changes that occur during shape memory effect in certain alloy systems with examples. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MTE21 - Ferrous and Nonferrous Alloys

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is micro alloyed steel?
2. Give the properties and applications of high carbon steel.
3. What is sensitization? Give the remedial action.
4. List the applications martensitic stainless steel.
5. What are the influence of alloying elements on copper?
6. List the applications of OFHC Copper.
7. What are the alpha stabilizers and Beta stabilizers in Titanium alloys?
8. What is superplastic forming in Aluminium alloys?
9. What are the major characteristics and applications of Lead alloys?
10. What are Nickel base super alloys?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the composition, properties and applications of Maraging steel, CRGO and High manganese steels. (16)

(OR)

b) Describe the composition, properties and applications of Armour steel, Ultrahigh strength steel and creep resistant steels. (16)

12. a) Discuss the composition, properties and applications of Austenitic and Duplex stainless steels. (16)

(OR)

b) Discuss the composition, properties and applications of precipitation hardening, High Nitrogen Stainless steels. (16)

13. a) Give the composition, properties and applications of Alpha brass, Beta brass and Aluminium bronze. (16)

(OR)

b) Explain the strengthening mechanism of copper alloys by mechanical alloying. Also explain the properties and uses of Cu-Ni alloys. (16)

14. a) Explain the various (any one) heat treatable and non-heat treatable Aluminium alloys. (16)

(OR)

b) Explain the Thermo mechanical processing and Super plastic forming of Titanium alloys. (16)

15. a) Explain the heat treatment, properties and applications of Nickel base DS alloys and Nickel-Iron base alloys. (16)

(OR)

b) Explain the composition, properties and uses of any two Zinc and Tin alloys. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT401 – Mechanical Behaviour of Materials

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Burger's vector?
2. Compare Slip and Twinning.
3. What is Bauschinger effect?
4. Recall the term : Yield point phenomena.
5. List the factors affecting DBTT.
6. What is Hydrogen Embrittlement?
7. What is Coffin-Manson relationship in low cycle fatigue?
8. Recall the terms: Alternating stress and Range of stress.
9. What is stress rupture test?
10. What is Creep-Fatigue interaction?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the edge and screw dislocations with neat sketches. (8)

ii) Discuss the dislocations in BCC and FCC systems. (8)

(OR)

b) i) Discuss the Deformation bands and Kink bands. (8)

ii) Discuss the determination of Critical resolved shear stress. (8)

12. a) i) Explain the solid solution strengthening in metals and alloys. (8)

ii) Explain the Age hardening of Al-Cu alloy. (8)

(OR)

b) i) Explain the Martensite strengthening in ferrous system. (8)

ii) Explain the severe plastic deformation in metals and alloys. (8)

13. a) i) Explain the Theoretical Cohesive strength in metals. (8)

ii) Explain the Griffith's theory of brittle fracture in metals. (8)

(OR)

b) i) Explain the stress intensity factor and strain energy release rate in fracture mechanics. (8)

ii) Explain the determination of K_{IC} in metals. (8)

14. a) Draw the S-N curve and factors affecting the fatigue failure in metals. (16)

(OR)

b) Explain the structural changes accompanying fatigue and application of fracture mechanics to fatigue crack propagation. (16)

15. a) Draw a typical creep curve and analyze the various stages in the creep curve. (16)

(OR)

b) Analyze the creep mechanism map and metallurgical factors affecting the creep. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT402 – Phase Transformation

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State the role of constitutional super cooling during solidification of alloys.
2. Analyze the significance of Arrhenius equation in solidification.
3. Analyze the role of temperature in determining the nucleation rate for both homogeneous and heterogeneous nucleation.
4. What is the role of Interface controlled growth in transformation kinetics?
5. Mention the importance of pearlitic transformation.
6. What is Spinodal decomposition? Give an example.
7. What is the importance of recrystallization?
8. Define Recovery. What is the effect of recovery on the metal microstructure?
9. Differentiate between lath and plate martensite.
10. What is the significance of thermoelastic martensite in material transformations?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the driving force for solidification and discuss how it governs the formation of different microstructure during cooling. (8)

ii) Discuss the formation of cellular and dendritic structures during the solidification of alloys. What are the factors that influence the transition between these two types of solidification? (8)

(OR)

b) i) What is eutectic solidification? Discuss the phase diagram of a binary eutectic system and explain how the eutectic compositions solidify. (8)

ii) Explain the concept of Activation energy with a simple sketch. Calculate the activation energy for diffusivity of copper in aluminium from the following data: Diffusivity of copper in aluminium at $400^0C = 2.49 \times 10^{-15}$ m^2/s and at 600^0C 4.33×10^{-13} m^2/s. (8)

12. a) i) Derive the expression for the rate of homogeneous nucleation. (8)

ii) Apply the principles of transformation kinetics to a specific material undergoing a phase change. Using empirical equations, analyze the kinetics of a given phase transformation in a material. (8)

(OR)

b) i) Discuss the types of Nucleation and explain the differences in critical free energy change between homogeneous and heterogeneous nucleation. (8)

ii) Derive an expression for critical radius and critical free energy when a spherical particle nucleates homogeneously from the melt. During an experiment on the homogeneous nucleation, the following data were obtained: surface energy (σ) = 2.55×10^{-5} J/m^2, m.p. of the metal = 1453^{0}C, ΔHm = 2.756×10^3 J/cc. Estimate the critical radius during homogeneous nucleation. (8)

13. a) i) Apply the concepts of interface controlled growth and diffusion controlled growth to analyze the phase transformation kinetics in a given material system. (8)

ii) Explain the process of eutectoid transformation, including nucleation and growth of pearlite. (8)

(OR)

b) i) Relate the concept of cooling rate to predict its effect on the interlamellar spacing of pearlite. Explain how varying cooling rates would influence the spacing and the resulting material properties. (8)

ii) Describe the order-disorder transformation in materials and its influence on microstructure. (8)

14. a) i) Interpret how the rate of particle coarsening varies with temperature according to Greenwood's model. (8)

ii) Explain the recrystallization process, including the factors affecting it and its effect on the grain structure. (8)

(OR)

b) i) Explain the structure and properties of cold-worked metals, and the effect of cold working on mechanical properties. (8)

ii) Compare the hot working and cold working processes. (8)

15. a) i) Apply your concept of massive transformation to a specific metallic system. Given an alloy undergoing a massive transformation, analyse the effect of transformation and predict its performance in an engineering application. (8)

ii) Explain the kinetics of martensite transformation in steels, and discuss its temperature dependence. (8)

(OR)

b) i) Evaluate the significance and limitations of the shape memory effect in alloys. How do the properties of shape memory alloys make them suitable for specific practical applications? Provide examples where these alloys offer distinct advantages or face challenges. (8)

ii) Compare the properties and applications of martensite in ferrous and non ferrous systems. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT501 – Heat Treatment and Surface Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Calculate the percentage of ferrite and cementite in fully pearlitic steel.
2. Mention the purposes of a heat treatment process.
3. Compare Annealing and Normalizing processes.
4. What is Subzero treatment?
5. Mention the various types of tool steels.
6. What is Malleabilizing?
7. What is Boriding? Give its types.
8. Recall the term Case Depth. Also list the various methods used in measurement of case depth.
9. What is Reactive sputtering?
10. Recall the term : Tribology

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw an Iron-Carbon phase diagram and analyze three important invariant reactions. (10)

ii) Discuss the effect of alloying elements on Iron-Carbon phase diagram. (6)

(OR)

b) i) Draw the TTT diagrams of 0.3 % C, 0.8 % C and 1.3 % C steels and analyze it. (10)

ii) Discuss the various process variables in heat treatment. (6)

12. a) i) Explain the types of Annealing processes. (10)

ii) Discuss about Hardening of 0.4 % C, 0.8 % C and 1.2 % C Steels (6)

(OR)

b) i) Explain the two experimental methods of hardenability determination. (10)

ii) Discuss about Austempering process of steels. (6)

13. a) Analyze the heat treatment procedure of High Speed Steel, SG Iron and Al - 4.5 % Cu alloy. (16)

(OR)

b) Analyze the causes and remedies of various possible defects in heat treated steels. (16)

14. a) Describe the types of Carburizing and Nitriding process. (16)

(OR)

b) Describe the Flame hardening, Induction hardening and Electron beam hardening processes. (16)

15. a) Discuss in brief the following Physical Vapour Deposition (PVD) processes: i) Thermal Evaporation ii) Sputter Coating iii) Ion plating. (16)

(OR)

b) Discuss about the following coating methods: TiC, TiN, Alumina, and CBN coatings. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MTE11 – Transport Phenomena

(Use of HMT handbook is permitted)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the differences between Newtonian and non-Newtonian fluids?
2. Define Newton's law of viscosity and mention its significance in fluid mechanics.
3. State Bernoulli's equation and mention one practical application.
4. How does a Pitot tube work in measuring fluid velocity?
5. State Fourier's law of heat conduction and its significance.
6. What is the thermal conductivity of a material? How does it vary for solids and fluids?
7. Define the overall heat transfer coefficient and its significance in heat transfer calculations.
8. Explain Kirchhoff's law of radiation.
9. What is mass diffusion and what are the factors affecting diffusivity in solids, liquids and gases?
10. What is the difference between steady-state and unsteady-state diffusion?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the Navier-Stokes equation for steady-state fluid flow and explain its physical significance in conservation of momentum. (16)

(OR)

b) Describe the conservation of momentum in fluid flow and derive the equation of continuity for incompressible fluids. (16)

12. a) Discuss the concept of the velocity boundary layer for flow over a flat plate and describe how it affects drag and friction. (16)

(OR)

b) Describe the mechanics of flow through packed beds and fluidized beds, emphasizing their applications in industrial processes. (16)

13. a) A composite wall consists of two layers: The thickness of layer 1 is 0.05 m and its thermal conductivity is 0.8 W/mK. The thickness of layer 2 is 0.1 m and its thermal conductivity is 0.2 W/mK. The temperatures on the two outer surfaces of the wall are 150°C and 50°C. Calculate the heat transfer rate per unit area through the wall under steady-state conditions. (Assume the missing values suitably) (16)

(OR)

b) Water is flowing through a horizontal pipe of diameter 0.05 m at a velocity of 1 m/s. The temperature of the pipe surface is 80°C and the bulk temperature of the water is 25°C. Calculate the heat transfer rate per unit length of the pipe. Assume the thermal conductivity of water is 0.6 W/m·K and the kinematic viscosity of water is 1×10^{-6} m^2/s. Use the Dittus-Boelter equation to find the heat transfer rate. (Assume the missing values suitably) (16)

14. a) Discuss the heat transfer by natural convection from a vertical plate and explain the factors that affect the rate of heat transfer. (16)

(OR)

b) Consider two large parallel black surfaces. Surface 1 has a temperature of 600 K and Surface 2 has a temperature of 300 K. The emissivity of both surfaces is 1 (perfect black bodies). Calculate the net radiative heat exchange between the two surfaces (Assume the missing values suitably). (16)

15. a) Derive Fick's first law of diffusion and discuss its application in the diffusion of gases through a stagnant fluid. (16)

(OR)

b) Discuss mass transfer by forced and free convection in laminar flow, including the concept of mass transfer coefficients. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT501 - Nonferrous Extractive Metallurgy

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is calcination?
2. Write usage oxygen scale in Ellingham diagram.
3. What is leach liquor?
4. What are the steps involved in hydrometallurgy?
5. State Henry's Law.
6. Define activation polarization.
7. List the sources of Magnesium.
8. Which is the most popular method to roasting the lead ores?
9. Write notes on chemical precipitation of Uranium form its ore.
10. Give the names of different methods of extraction of silver from its ore.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What is smelting? List the functions of fluxes and explain any two smelting furnaces in detail. (16)

(OR)

b) With neat sketch explain salient features of Ellingham diagram. Write its advantages and disadvantage. (16)

12. a) What is Bioleaching/Microbial leaching? Explain. Mention factors affecting Bioleaching/Microbial leaching. (16)

(OR)

b) Discuss the methods of Recovery of metal from leach liquor with an example. (16)

13. a) State and explain Faraday's law of electrolysis with an example. (16)

(OR)

b) Discuss the principle and working of zone refining and mention its advantages and disadvantages. (16)

14. a) What is the main function of smelting and what is the product of smelting? Elaborate fire refining of copper. (16)

(OR)

b) Explain the direct Carbo-thermic Reduction of Aluminium Oxide ore and mention the advantages over the Hall-Heroult process. (16)

15. a) List the processes of extraction of gold and explain any two in detail. (16)

(OR)

b) Explain the metallo-thermic route or through electrolysis extraction process of Titanium from its halide ore. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT603 – Foundry Processes and Metallurgy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the ingredients of moulding sand.
2. What is Core in foundry?
3. Recall Rheocasting.
4. What is centrifugal casting?
5. List the types of gating system used in moulding process.
6. Write down Chvorinov's rule.
7. What is sand reclamation? Give its types.
8. Why the gas cutting is not suitable for removal of riser and gates in stainless steel castings?
9. What is modification treatment in Al-Si alloys?
10. What is inoculation in cast irons?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the types of patterns, pattern materials and various pattern allowances with neat sketches. (16)

(OR)

b) Discuss the following sand testing methods (16)
   i) Permeability test
   ii) Total Clay test
   iii) AFS grain fineness number test.

12. a) Explain the Shell moulding, CO_2 moulding and Investment casting processes. (16)

(OR)

b) Explain the Full mould process, Die casting and Squeeze casting processes. (16)

13. a) Design a riser for i) a rectangular casting dimensions of L = 125 cm, W = 90 cm and T = 50 cm using insulating sleeves ii) a cylindrical casting dimensions of D = 63 cm and H =137 cm using exothermic sleeves. (16)

(OR)

b) Design a gating dimensions of hollow cylindrical SG iron castings with inner diameter = 50 cm, outer diameter = 80 cm and length = 300 cm. Distance between ingates are 30 cm. (16)

14. a) Describe the Cleaning of castings, Heat treatment of castings and Inspection of castings. (16)

(OR)

b) Analyze the causes and remedies of various possible defects in cast components. (16)

15. a) Discuss about the melting practice of SG iron, Stainless steel and Al-Si alloys. (16)

(OR)

b) Discuss about the factors affecting fluidity and various methods of measurement of fluidity. Also discuss about various degassing techniques. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT604 – Welding Processes and Metallurgy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How to calculate the duty cycle of a welding power source?
2. Write the differences between GMAW and GTAW processes.
3. Define solid state welding processes.
4. What is explosive welding?
5. State the basic differences between welding and brazing.
6. What are hard-facing processes?
7. How to calculate the heat input of a welding process?
8. What is meant by weldability of alloys?
9. Name the electrodes usually recommended for welding cast irons.
10. What is meant by dissimilar welding?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the principle and various modes of metal transfer mechanisms of GMAW process. (16)

(OR)

b) Write a short note on various resistance welding processes. (16)

12. a) Explain the principle and procedure of friction stir welding process in detail. (16)

(OR)

b) Discuss the principle, procedure and applications of electron beam welding in detail. (16)

13. a) Discuss the mechanisms and types of brazing and soldering processes. (16)

(OR)

b) Write a short note on various metal cutting processes. (16)

14. a) Explain the microstructural changes take place in WM and HAZ while welding a low steel plate with another low carbon steel plate by SMAW using carbon steel electrodes with neat diagrams. (16)

(OR)

b) Discuss the different methods of evaluating the weldability of metals or alloys. (16)

15. a) Explain the difficulties experienced in the welding of wrought aluminium alloys by arc welding process. (16)

(OR)

b) What are welding defects? Also explain the causes of various welding defects and discuss the remedial actions for the same. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MTE55 – Additive Manufacturing

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the significance of Additive Manufacturing (AM)?
2. What is reverse engineering?
3. What is the principle of Laminated Object Manufacturing?
4. What are the advantages of 3D printing?
5. What is photo polymerization?
6. Name any four common AM methods used for metal products.
7. Give any two examples of prosthesis produced by additive manufacturing.
8. What are the applications of AM in tissue engineering?
9. Name any two automotive components that are manufactured using AM technique.
10. What are the limitations of additive manufacturing?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the need for additive manufacturing process in the current scenario. (16)

(OR)

b) Compare the production cost of complex shapes using conventional casting route and additive manufacturing route with examples. (16)

12. a) Explain the principle, construction and working of fused deposition modeling process in detail. (16)

(OR)

b) Explain the principle, procedure and advantages of Selective Laser Sintering (SLS) method in detail. (16)

13. a) Explain the process of Laser Chemical Vapor Deposition (LCVD) for making a component with the process advantages and applications. (16)

(OR)

b) Explain the effect of rapid solidification on the final property of components made by SLS and LCVD processes. (16)

14. a) Explain the procedure to design and produce a customized baby skull implant using additive manufacturing technique. (16)

(OR)

b) Discuss the significance of Computer Aided Tissue Engineering (CATE) in making scaffolds to interact with the cells. (16)

15. a) Suggest a suitable AM technique and explain its procedure to manufacture wear and corrosion resistant metallic component with an example. (16)

(OR)

b) Explain the procedure for making a 3D printed component for oil and gas industries with an example. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22MT310 – Materials Engineering

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term " Eutectic reaction and Eutectoid reaction"
2. Name any four austenitic stabilizers in steels.
3. What is process annealing? Give its applications.
4. What are the advantages of nitriding process?
5. Write name of any two steels that can be used in Desalination Plant applications.
6. What is Babbitt alloy" Write its applications.
7. Differentiate between slip and twin.
8. An indentation of diameter 3.04 mm was produced in steel in a Brinell hardness tester with 10 mm carbide ball and 3000 kg load. Calculate the Brinell Hardness Number (BHN) for the steel.
9. What is the principle of ultrasonic test?
10. What is meant by thin film coating? Give its advantages.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the conditions required for solid solution phases in the alloy systems. (8)

ii) Draw the Fe-Fe3C phase diagram and discuss the importance of phases and invariant reactions. (8)

(OR)

b) i) Explain the effect of alloying elements 1) Phase stability 2) Eutectoid carbon content 3) eutectoid temperature and 4) critical cooling curve. (8)

ii) Draw the TTT diagram of 0.8 % carbon steel and the importance of different phase transformation. (8)

12. a) Discuss in detail about the different annealing processes and superimpose temperature of these annealing processes on the Fe-C phase diagram. Highlight the objectives and applications of each annealing process. (16)

(OR)

b) Discuss the methods to determine the hardenability of steels with suitable diagram. Explain the factors affecting the hardenability of steels. (16)

13. a) Give a detailed account of metallurgy of the following steels: (16)
i) HSLA steels ii)Stainless steels

(OR)

b) Discuss in detail about the chemical composition, microstructure, properties and applications of Brasses and Bronzes. (16)

14. a) i) Briefly explain the strengthening mechanisms involved in the use of cold rolled brass. (8)

ii) Distinguish between hot working and cold working methods in terms of 1) Cost 2) Strength 3) Dimensional accuracy 4) Machinability (8)

(OR)

b) Tensile tests on mild steels of different grain sizes gave the following results for lower yield point. (16)

σ_y	d(mm)
29.6	0.0129
18.9	0.0550

1) Evaluate the constants in the Hall-Petch relation

$\sigma_y = \sigma_o + Kd^{-1/2}$

2) Calculate the lower yield stress for mild steel with average grain size of 0.08 mm

15. a) Discuss the working principle and construction of the following NDT methods. (16)

1) Radiography test

2) Magnetic Particle Inspection

(OR)

b) Discuss in detail about the working principle and operation sequence of the following coating methods: (16)

1) Thermal evaporation and 2) Sputtering

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEH102 – Thermal Management of Electric Vehicle Battery Systems

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is thermal runaway?
2. Which is the active material present on the negative plate in a lead-acid battery?
3. Does gravity play any part in a substances ability to undergo a phase change? If so, how?
4. Classify the types of PCMs.
5. Define the term TMS.
6. Summarize about cells and sub modules in battery system.
7. Differentiate between the energy and exergy of the battery.
8. Illustrate the major components of TMS.
9. Compare the prismatic Lithium and Ion battery.
10. Illustrate about the thermal management in electric vehicle.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the process of electron transfer using Reduction-Oxidation Reaction in case of Li battery. (8)

    ii) Distinguish between cyclic aging and calendar aging in a battery. (8)

    (OR)

    b) i) Explain role of multiplexer for voltage sensing unit in Battery Management System. (8)

    ii) Classify different functionalities of battery. (8)

12. a) i) Explain briefly about the basic properties and types of Phase Change Materials. (8)

    ii) Compare the organic and inorganic Phase Change Materials with suitable examples. (8)

    (OR)

b) i) Discuss briefly about the measurement of thermal properties of Phase Change Materials. (8)

ii) Analyze the cost and environmental impact of Phase Change Materials in detail. (8)

13. a) i) Develop the numerical model for cell and sub modules for Phase Change Material applications in battery system. (8)

ii) Describe the fundamentals of battery module and pack test in brief. (8)

(OR)

b) i) Explain the simulation and experimental procedure of liquid battery thermal management system using Phase Change Materials. (8)

ii) List the stages of battery testing in design and manufacturing and Explain in detail. (8)

14. a) i) Examine the energy and exergy analyses of battery thermal management system. (8)

ii) Describe the comparison of thermal management of battery system. (8)

(OR)

b) i) What are the major components of the thermal management system and explain briefly. (8)

ii) Elaborate the procedure of thermal management in the liquid battery system. (8)

15. a) Lithium-Ion Battery Management System for Electric Vehicles: Constraints, Challenges, and Recommendations. Submit your detailed survey on the above problem statement. (16)

(OR)

b) A quick adoption of electric vehicles is slowed down by their limited range compared to combustion engine cars. The range of electric vehicles depends on the capacity of the battery obtained after charging and the proposed strategy of extracting the energy. The battery management system is responsible for both cases. Give the reason and detailed solution for the above problem. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE12 – Design of Transmission System

(Approved PSG Design Data Book is permitted during the examination)

Time : 3 Hours Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Specify the purpose of crowning of belts.
2. The driver shaft rotates at a speed of 1400 rpm and a speed ratio of 2.5. Estimate the driven shaft speed.
3. List the materials generally used for fabrication of Gears.
4. If the PCD of a gear is 200 mm and the number of teeth on the gear is 40. Estimate the Module of the gear.
5. Define the term Crown gear.
6. A pair of worm gears is designated as 2/54/10/5. Find the gear ratio.
7. List six standard speeds starting from 18 rpm with a step ratio 1.4.
8. Mention the functions of Torque Convertor.
9. Give the reason for left and right shoes of internal expansion brakes that having different actuating forces.
10. Define pressure angle with respect to cams.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Design a V-belt drive for grinding machine to the following specifications: (16)

Power to be transmitted : 75 kW
Speed of the driving Wheel : 1440 rpm
Speed of driven Wheel : 400 rpm
Diameter of driving Wheel : 300 mm
Centre distance : 2500 mm
Service : 16 hours/day

(OR)

b) Design a chain drive to actuate a compressor from15 kW electric motor running at 1000 rpm, the compressor speed being 350 rpm. The minimum center distance is 500 mm. The compressor operates 15 hours per day. The chain tension may be adjusted by shifting the motor. (16)

12. a) A motor shaft rotating at 1440 rpm has to transmit 15 kW power to a low speed shaft at 500 rpm. A 20° pressure angle involute tooth gear pinion is used. The pinion has 25 teeth. Both gear and pinion are made of cast iron. Design a suitable spur gear drive. (16)

(OR)

b) Design a pair of helical gears for crushing machine based on the following data (16)

Power = 7.5 kW
Speed of pinion = 1400 rpm
Speed reduction = 3
Pressure angle = 20°
Helix angle = 10°
Select the suitable materials for the gears.

13. a) Design a pair of bevel gears for two shafts whose axes are at right angles to transmit 20 kW at 1000 rpm. The speed of gear is 250 rpm. Life required is 10,000 Hrs. (16)

(OR)

b) Design a worm gear drive to transmit a power of 22.5 kW. The worm speed is 1440 rpm and the speed of the wheel is 60 rpm. The drive should have a minimum efficiency of 80 % and above. Select suitable materials for the worm and the wheel and decide upon the dimensions of the drive. (16)

14. a) Design a 9-speed gear box for the following data. Minimum speed: 100 rpm, step ratio:1.25. The input is from a 4 kW, 1440 rpm motor. Draw the speed diagram, kinematic diagram and indicate the number of teeth on each gear. (16)

(OR)

b) Design the layout of a 12-speed gear box for a milling machine having an output of speeds ranging from 180 to 2000 rpm. Power is applied to the gear box from a 6 kW induction motor at 1440 rpm. Choose standard step ratio and construct the speed diagram. Decide upon the various reduction ratios and number of teeth on each gear wheel. Sketch the arrangement of the gear box. (16)

15. a) A power of 20 kW is to be transmitted through a cone clutch at 500 rpm. For uniform wear condition, find the main dimensions of the clutch and shaft. Also determine the axial force required to engage the clutch. Assume the coefficient of friction as 0.25, the maximum normal pressure on the friction surface is not to exceed 0.08 MPa and take the design stress for the shaft material as 40 MPa. (16)

(OR)

b) An internal expanding shoe brake has the following dimensions: Diameter of the drum = 300 mm, distance between the fulcrum centers are 80 mm, distance of fulcrum centers and that of cam axis, both from the drum center = 100 mm, distance of the line of action of braking force from the cam axis = 90 mm, distance between the points where the cam acts on the two brake shoes = 30 mm. Each shoe subtends an angle of 90° at the drum Centre. If the braking force is 750 N and the coefficient of friction is 0.3, Find the braking torque on the drum. Assume the reaction between the brake shoes and the drum passes through the point bisects the contact angle. Also assume that forces exerted by the cam ends on the two shoes are equal. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MTH101 – Welding Equipments and Consumables

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the different colour hoses used for different gas flow in the welding process?
2. Recall the types of welding torches used for GMAW process.
3. What is the function of cathode in EBW process?
4. List down the types of seam tracking devices used in electron beam welding process.
5. What type of input and output current are used in the welding transformer?
6. What is DC rectified welding power source?
7. Show the types of welding sequence in fusion welding processes.
8. Compare the automation in welding with that of manual mode of welding
9. Identify the welding position in the given electrode E 7028.
10. Name the gases used as shielding gas for welding.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Outline the equipment and accessories used for SMAW process. (8)

ii) Exemplify the power source, torch, filler wire and wire feed mechanism of GTAW process. (8)

(OR)

b) i) Demonstrate the power source, gun, wire feed system and water cooling system involved in GMAW equipment. (8)

ii) Explain the equipment and accessories involved in the SAW process. (8)

12. a) i) Organize the principle, mechanism and equipment setup of ruby laser welding process. (8)

ii) Develop the thermit welding - Equipment setup, accessories and their operations. (8)

(OR)

b) i) Classify the friction welding process and elaborate any one Friction welding machine setup with neat sketch. (8)

ii) Compare and contrast the press type and rocker arm type machines in the resistance welding. (8)

13. a) i) Organize the operating principle and requirements of welding transformer for A.C power source. (8)

ii) Construct the output Volt–Ampere characteristic of welding generator. (8)

(OR)

b) i) Organize the general theory involved in rectifier design of welding power sources. (8)

ii) Differentiate between Pulsed arc welding power sources and Transistor welding power sources. (8)

14. a) i) Distinguish between the semi-automatic welding and manual welding in terms of operation, equipment setup and productivity. (8)

ii) Compare and Contrast the Automatic welding and Automated welding. (8)

(OR)

b) i) Analyze the robotic welding equipment setup and their operations. (8)

ii) Examine the criteria for selecting welding system for automations. (8)

15. a) i) Analyze the types of coated electrode and the chemical ingredients involved in them. (8)

ii) Classify the electrodes of SMAW/MMAW for medium alloy steels as specified in the Code. (8)

(OR)

b) i) Examine the specification for welding wire, rods and tubular electrodes for welding. (8)

ii) Analyze the chemical classification of fluxes and the chemical ingredients used in SAW process. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MTOE01 – Foundry and Welding Technology

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the functions of a pattern?
2. What is the purpose of using cores in casting process?
3. What is skin dried sand moulding process?
4. Define Thixocasting process.
5. What are the difficulties in casting aluminium alloys?
6. How to repair the castings with some defects?
7. What is the major difference between soldering and brazing?
8. What are the advantages and limitations of oxy-acetylene gas cutting process?
9. What is the principle and average temperature of plasma arc in plasma arc welding process?
10. What is the difference between conventional welding and diffusion welding processes?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the various steps involved in a casting process from 'preparing a pattern' to 'acceptance of final casting' for delivery. (16)

(OR)

b) Discuss the different types of patterns and various allowances given in the patterns to get required casting dimensions. (16)

12. a) Compare and contrast the green sand moulding and shell moulding process with respect to their composition, applications, advantages and limitations. (16)

(OR)

b) Explain the principle, materials that can be cast, parameters involved and applications of a centrifugal casting process. (16)

13. a) Discuss the melting practice and special precautions taken while casting stainless steel products. (16)

(OR)

b) With images, explain the causes and remedies to control any five casting defects. (16)

14. a) Explain the procedure for submerged arc welding process with its advantages and applications. (16)

(OR)

b) Differentiate between electro slag and electro gas welding processes. (16)

15. a) Explain the principle, construction and procedure for electron beam welding process. (16)

(OR)

b) Explain the process variables and procedure for friction stir welding process with their merits and limitations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MTH107 - Failure Analysis in Weldments

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Classify the types of fracture.
2. What is fractography?
3. How the wear rate is calculated?
4. List the types of corrosion failures.
5. Give the general characteristics of the fatigue failure.
6. What is SN curve?
7. Distinguish creep and stress rupture test.
8. What is dislocation glide?
9. Give the causes for pipe defect in casting.
10. Give the remedial acation for under cut in weldment.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the failure analysis procedure in detail. How will you analyze and find out the sources of failure. (16)

(OR)

b) State and explain Griffith's theory on brittle materials. (16)

12. a) Analyze the wear failure of weldment with suitable example. (16)

(OR)

b) Explain the sources and mechanism of stress corrosion cracking. List the characteristics of SCC. (16)

13. a) What is stress cycle? List and explain the parameters of fatigue with neat sketch. (16)

(OR)

b) Analyze the environmental induced failure with suitable case study. (16)

14. a) What is creep failure? Explain its mechanism and stages of creep failure. (16)

(OR)

b) Discuss the development of creep resisting materials with suitable example. (16)

15. a) Demonstrate the causes of failure in forge weldments with neat sketch. Write the effects on residual stresses in forging. (16)

(OR)

b) Illustrate the in-service condition weldments failure with suitable cases. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

WELDING TECHNOLOGY

22WTE21- Physical Metallurgy and Heat Treatment

Time : 3 Hours

Maximum Marks : 100

Part A

Answer ALL Questions

(10 x 2 = 20 Marks)

1. Recall Gibb's phase rule in metallurgical system.
2. What is Isomorphous system? Give an one example.
3. List the types of plain carbon steel with composition.
4. Mention the composition of Grey cast iron and White cast iron.
5. List the various types Magnesium alloys.
6. What is IADS?
7. What is malleabilising?
8. Compare annealing and normalizing processes.
9. What is Fick's first law of diffusion?
10. What is post carburizing technique?

Part B

Answer ALL Questions

(5 x 16 = 80 Marks)

11. a) Analyze the three invariant reactions and microstructural changes from liquid temp to room temperature of 0.16 %C steel in Iron-Carbon phase diagram. (16)

(OR)

b) Explain in detail the various types of solid solutions with Hume-Rothery rules. Also draw the TTT diagrams of 0.4 %C and 0.8 %C steels. (16)

12. a) Describe the processing, properties and applications of UHS steel, Maraging steel, HSLA steel and Q & T Steel. (16)

(OR)

b) Describe the composition, properties and applications of Ferritic, Austentic, Martensitic and Duplex stainless steel. (16)

13. a) Analyze the physical metallurgy, composition, properties and applications of Tin Bronze and Al-Si alloys. (16)

(OR)

b) Analyze the physical metallurgy, composition, properties and applications of Ti-6Al-4V alloy and Monel alloy. (16)

14. a) Describe the various types of annealing processes. Also discuss the Jominy end quench method of hardenability test. (16)

(OR)

b) Describe the heat treatment procedure for SG Iron, Al-4.5 % Cu alloy and alpha Brass. (16)

15. a) Give a detailed account on types of Carburizing, Cyaniding, Carbo nitriding and Nitriding processes. (16)

(OR)

b) Discuss in detail the various case depth measurements. Also explain the Flame and Induction hardening processes. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

WELDING TECHNOLOGY

22WTE11 – Electrical Aspects of Welding

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the potential distribution curve of a welding arc and identify the different potential components of the welding arc.
2. Distinguish between an immobile arc and a mobile arc.
3. List the key requirements of a welding transformer.
4. Find the duty cycle at which a welding power source rated at 700 A @ 75 % be operated to get a welding current of a) 200 A and b) 400 A.
5. List the techniques used to reduce lower order harmonics from the output voltage of an inverter.
6. Draw the circuit diagram of SCR Phase control and mention its significance.
7. List the various types of monitoring and control mechanisms used in arc welding.
8. List the different types of welding robots commonly used in industries.
9. State the importance of LASER detectors in welding processes.
10. Inscribe the significance of digital storage oscilloscope in welding applications.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw and explain static and dynamic electrical characteristics of welding arc. (8)

ii) Explain briefly the phenomena of arc blow due to magnetic field and the effect of ground location on magnetic arc blow. (8)

(OR)

b) i) Illustrate and explain the various arc forces in welding. Discuss their significance and impact on the welding process. (8)

ii) Explain the static V-I characteristics for different types of power sources used in arc welding. Support your explanation with suitable wave forms. (8)

12. a) i) Describe the construction and operational characteristics of an Integral type welding transformer. (8)

ii) Explain in detail how to adjust the output Volt-ampere characteristics of a saturable reactor type welding transformer, ranging from minimum to maximum. (8)

(OR)

b) i) Describe the construction and operating principles of a separately excited opposition series generator and a self excited opposition series generator. (8)

ii) With a suitable sketch, explain the working principle and operation of a split-pole D.C. welding generator. (8)

13. a) i) Explain the principle of uncontrolled and controlled rectifiers, providing suitable circuit diagrams and waveforms to illustrate their operation. (8)

ii) Describe the solid state power regulation system used in the welding process, explaining its components and functionality. (8)

(OR)

b) i) Describe briefly sinusoidal PWM technique for voltage control of 3-phase inverters. (8)

ii) Explain the working principle of Transistor series regulator. (8)

14. a) i) Discuss the open loop and closed loop control techniques for welding process and list the differences between them. (8)

ii) Describe the principle of Resistance spot welding control technique. (8)

(OR)

b) i) Explain the principle of Robotic arc welding system, highlighting the role of various sensors used in this system and their applications. (8)

ii) Discuss the concept of adaptive control in automated welding system. Explain its functionality and benefits. (8)

15. a) i) Explain the role of Hall effect current sensors in the welding process. Discuss in detail their working principle, applications and how they enhance welding operations in terms of accuracy, safety and performance. (10)

ii) What is LVDT? Explain its application in measuring displacement during the welding process. (6)

(OR)

b) i) Evaluate the concept, features, advantages and applications of Synergetic welding power sources. Discuss their effectiveness in improving weld quality, productivity and energy efficiency in various industries. (10)

ii) Explain the construction, working principle and applications of pulsed arc welding power sources. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MTOE02 – Surface Engineering

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Tribology?
2. What is hard anodizing?
3. List the advantages of Furnace Fusing.
4. What is hard facing?
5. What is the principle of diffusion process?
6. How will you measure the hardness of diffused layer?
7. What is reactive sputtering?
8. What is CBN? List the applications of CBN.
9. List out the high energy beam modification processes.
10. What are wear sleeves?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the different types of wear with neat sketches. (16)

(OR)

b) Explain the electroplating, electro less plating, electrochemical conversion coating with suitable sketch. (16)

12. a) Explain the hard facing processes using SMAW and SAW with neat sketches. (16)

(OR)

b) Explain the Detonation gun and Jet Kote processes with neat sketches. (16)

13. a) Illustrate the different types of Boriding and Aluminising processes. (16)

(OR)

b) Illustrate the characteristic features of diffused layer, micro structure properties and applications of diffusion process. (16)

14. a) Discuss the Thermal evaporation, Sputter coating and Ion plating processes with neat sketches. (16)

(OR)

b) Discuss the TiC, Diamond and DLC coatings with their properties and applications. (16)

15. a) Explain the glazing and ion implantation processes with suitable example. (16)

(OR)

b) Explain the Electrospark deposition and centrifugal cast wear coating processes. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MTH101 – Advanced Metal Joining Processes

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the differences between high vacuum and low vacuum environment in electron beam welding?
2. What is meant by hybrid welding? List any two advantages of hybrid welding process in manufacturing.
3. Why clean weld metal is formed in electro slag welding? Justify.
4. List the significance of controlling electrical current and time in resistance welding.
5. Give the advantages of solid state welding processes over conventional welding processes.
6. What is the principle of ultrasonic welding process?
7. List the important variables in Friction welding.
8. List the advantages of Friction Stir Welding over Friction Welding.
9. List the needs of welding of plastics in engineering applications.
10. What is meant by brazing? Give any one advantages of brazing over welding process.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the mechanism of heat generation in electron beam welding process. (6)

ii) Explain the equipment setup of Electron Beam Welding in detail. Also lost their advantages, disadvantages and applications. (10)

(OR)

b) i) Explain the principle and applications of LASER beam welding process. (10)

ii) List the limitations for the following welding processes (6)

1) LASER welding ,
2) Hybrid welding ,

12. a) i) Discuss the principle of operations, importance of fluxes and applications of Electro slag welding process. (8)

ii) Explain the variants of elctroslag welding process with a neat sketch. (8)

(OR)

b) Explain the principles, advantages and applications of (16)

1) Resistance spot welding and,
2) Projection welding,
3) Flash Welding

13. a) i) Differentiate the high temperature and low temperature solid state welding processes. (8)

ii) Discuss the classifications of solid state welding process and mention their applications. (8)

(OR)

b) Discuss the advantages, limitations and applications of (16)

1) Forge welding,
2) Cold pressure welding,
3) Explosive welding

14. a) Explain the process setup, procedures and applications of Friction Welding process. (16)

(OR)

b) With a neat sketch, explain the Friction Stir Welding (FSW) process and list the applications. (16)

15. a) Explain the procedure of adhesive bonding and also discuss any one testing method used to evaluate the adhesive bonded joints with neat sketch. (16)

(OR)

b) Explain the principle, applications and advantages of Thermit welding process. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

WELDING TECHNOLOGY

22WTC12 – Welding Processes - I

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare welding process of joining with other methods of joining.
2. List the three types of flames in gas welding process.
3. List the various functions of flux coatings in SMAW electrodes.
4. What is meant by the electrode designation E7018?
5. State the importance of polarity in GTAW.
6. State the differences between transferred arc and non-transferred arc in PAW.
7. Differentiate between GMAW and GTAW.
8. Differentiate between SMAW and FCAW.
9. What is the importance of basicity index of slag in submerged arc welding?
10. What are ferrules in stud arc welding?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the importance of the following: (16)
    1) Gases used as heat sources and for shielding in welding.
    2) Consumables for arc welding processes.

(OR)

b) Explain the joining of materials by oxy-acetylene gas welding process with required sketches. (16)

12. a) Explain the types, characteristics and applications of various power sources used for SMAW process with neat sketches. (16)

(OR)

b) Explain the working principle, applications, merits and limitations of SMAW process with a neat weld circuit diagram. (16)

13. a) Two 3 mm thick plates of aluminium alloys have to be joined by GTAW process. Explain the selection of power source, polarity, joint design, filler material and shielding gases for this process. (16)

(OR)

b) Explain the two modes of operation of plasma arc welding process with required sketches. (16)

14. a) Explain the four types of metal transfer mechanisms possible in GMAW process with neat sketches. (16)

(OR)

b) Explain the working principle, applications, merits and limitations of FCAW process with neat diagrams. (16)

15. a) With neat sketches, explain the instrumentation and process of submerged arc welding process in detail. (16)

(OR)

b) Explain the principle, equipment and operation of stud arc welding process in detail. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

WELDING TECHNOLOGY

22WTC11 – Advanced Mathematics and Statistics

(Statistical tables t – test, F – test of chi -square test permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Fit a straight line to the data given below.

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

2. Solve by Gauss -Elimination method: $2x + y = 3; 7x - 3y = 4$

3. Prove that $L[e^{-at}f(t)] = F(s + a)$.

4. Find the value of $L\left[\frac{\partial^2 u}{\partial t^2}; s\right]$.

5. Find the Fourier sine transform of $f(x), if\ f(x) = \begin{cases} 0 & 0 < x < a \\ x & a \leq x \leq b \\ 0 & x > b \end{cases}$

6. Find the Fourier transform of $f(x) = e^{-a|x|}, -\infty < x < \infty$

7. If X is a Poisson variate such that $P(X = 2) = 9P(X = 4) + 90P(X = 6)$. Find the variance.

8. State the important properties of $'F'$ distribution.

9. What is $ANOVA$?

10. What are the advantages of a completely Randomized Experimental design?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Fit a parabola, by the method of least squares, to the following data: (8)

x	1	2	3	4	5
y	5	12	26	60	97

ii) Find the real positive root of $3x - cos\, x - 1 = 0$ by Newton- Raphson method correct to six decimal places. (8)

(OR)

b) i) Solve the equations by Gaussian Elimination method: (8)
$10x + y + z = 12, 2x + 10y + z = 13, 2x + 2y + 10z = 14.$

ii) Solve the system of equations by Gauss- Seidel method (correct to 3 decimal places): (8)

$$8x - 3y + 2z = 20, 4x + 11y - z = 33, 6x + 3y + 12z = 35.$$

12. a) Find the solution of the BVP given by (16)

PDE: $\frac{\partial^2 u}{\partial x^2} = \frac{1}{k}\frac{\partial u}{\partial t}, \ 0 \le x \le a, t > 0$

BCs: $u(0,t) = f(t), u(a,t) = 0$

ICs: $u(x,0) = 0$

Using the Laplace transform method.

(OR)

b) An infinitely long string having one end at $x = 0$ is initially at rest on the $x-axis$. The end $x = 0$ undergoes a periodic transverse displacement described by $A_0 \sin \omega t, t > 0 (A_0 = costant)$. Find the displacement of any point on the string at any time t. (16)

13. a) Solve the heat conduction problem described by (16)

PDE: $k\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}, 0 < x < \infty, t > 0$

BC: $u(0,t) = u_0, t \ge 0$

IC: $u(x,0) = 0, 0 < x < \infty$

u and $\partial u/\partial x$ both tend to zero as $x \to \infty$

(OR)

b) Obtain the solution of free vibrations of a semi-infinite string governed by (16)

$$PDE: u_{tt} = c^2 u_{xx}, 0 < x < \infty, t > 0$$
$$ICs: u(x,0) = f(x)$$
$$u_t(x,0) = g(x)$$

14. a) It is known that the probability of an item produced by a certain machine will be defective is 0.05. If the produced items are sent to the market in packets of 20, find the no. of packets containing at least, exactly and atmost 2 defective items in a consignment of 1000 packets using i) Binomial distribution ii) Poisson approximate to binomial distributions. (16)

(OR)

b) Out of 800 families with 4 children each, how many families would be expected to have i) 2 boys and 2 girls ii) atleat 1 boy iii) at most 2 girls and iv) children of both genders. Assume equal probabilities for boys and girls. (16)

15. a) An experiment was designed to study the performance of 4 Different detergents for cleaning fuel injectors. The following "cleanness" readings were obtained with specific designed equipment for 12 tanks of gas distributed over 3 different model of engines: (16)

	Engine 1	Engine 2	Engine 3	Total
Detergent A	45	43	51	139
Detergent B	47	46	52	145
Detergent C	48	50	55	153
Detergent D	42	37	49	128
Total	182	176	207	565

Perform the ANOVA and test at 0.01 level of significance whether there are differences in the detergents or in the engines.

(OR)

b) Illustration: Analyze the following of Latin square experiment. (16)

Columns / Row	1	2	3	4
1	$A(12)$	$D(20)$	$C(16)$	$B(10)$
2	$D(18)$	$A(14)$	$B(11)$	$C(14)$
3	$B(12)$	$C(15)$	$D(19)$	$A(13)$
4	$C(16)$	$B(11)$	$A(15)$	$D(20)$

The letters A, BC, D denote the treatments and the figures in brackets denote the observations.

Register Number :

CSE

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS301 – Computer Organization and Architecture

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Bus? Draw the single bus structure.
2. Classify the instructions based on the operations they perform and give one example to each category.
3. Analyze overflow conditions for addition and subtraction.
4. Give the representation of double precision floating point number.
5. State different types of hazards that can occur in pipeline.
6. What are the steps required for a pipelined processor to process the instruction?
7. Compare and contrast SRAM and DRAM.
8. An Address space is specified by 24 bits and corresponding memory space by 16 bits. How many words are there in 1) virtual memory 2) Main memory?
9. How the interrupt is handled during exception?
10. Why IO devices cannot be directly be connected to the system bus?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) List the various components of computer system and explain with neat diagram. (8)

ii) Analyze the bus structure in computer system and explain it. (8)

(OR)

b) i) Discuss about different types of addressing modes. (8)

ii) Describe the operational concepts between the processor and memory. (8)

12. a) i) Describe the algorithm for integer division with suitable examples. (8)

ii) Assess the result of the numbers $(0.5)_{10}$ and $(0.4375)_{10}$ using binary Floating point Addition algorithm. (8)

(OR)

b) i) Tabulate the IEEE 752 binary representation of the number - 0.7510 to Single precision and Double precision. (8)

ii) Draw the flowchart and explain about booths algorithm. (8)

13. a) i) Discuss in detail about hardwired control unit, with a neat sketch. (8)

ii) Distinguish the data and control path methods in pipelining. (8)

(OR)

b) i) Analyze the hazards caused by unconditional branching statements. (8)

ii) State and draw a simple MIPS data path with control unit and explain the execution of ALU instruction. (8)

14. a) i) Explain in detail about secondary storage device. (10)

ii) Draw the neat sketch of memory hierarchy and explain the need of cache memory? (6)

(OR)

b) i) Discuss virtual memory address translation in detail with necessary diagram. (10)

ii) Write a detailed notes on improving cache performance. (6)

15. a) i) What is IO Interface? Discuss the differences that exist between central computer and Peripherals. (8)

ii) Draw and discuss the block diagram of DMA controller. (8)

(OR)

b) i) Describe the basic concepts of SCSI and USB. (8)

ii) How data transfers can be controlled using handshaking technique? Discuss in detail. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS302 – Software Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are umbrella activities for a software development process?
2. Write any four agility principles.
3. State the need of quality function deployment.
4. Define data object. Also give the tabular representation of the data object Car.
5. Expand the term FURPS. Define each term in short.
6. What are archetypes? List out the archetypes of SafeHome security system.
7. Define regression testing.
8. State the process of debugging.
9. Mention the use of WHH principle.
10. Identify defect removal efficiency and how it will be calculated?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain various prescriptive process models with neat diagram. (10)

ii) Write about the unified process with neat sketch. (6)

(OR)

b) i) Draw the diagram for extreme programming process and explain each activity in detail. (10)

ii) Explain Adaptive Software Development process with neat diagram. (6)

12. a) How the use cases are developed? Explain the process of developing use cases for the Library management system. Also draw the UML use case diagram for the same. (16)

(OR)

b) What are activity and swimlane diagram? Develop activity and swinlane diagram for accessing the camera surveillance system using internet. (16)

13. a) Draw the dimensions of data model and explain the major elements of data model in detail. (16)

(OR)

b) Explain different types of architectural styles with neat diagram. (16)

14. a) Mention the types of control structure testing? Explain with neat example. (16)

(OR)

b) Explain various object-oriented testing methods in detail. (16)

15. a) Explain various metrics used for software quality and discuss how it will be integrated within the software process? (16)

(OR)

b) Explain LOC based estimation and FP based software estimation with clear example. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS303 – Data Structures and Algorithms

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Give the properties of an Abstract Data Types (ADT).
2. How doubly linked list can be altered as circular linked list?
3. Given is the prefix for an expression. Write its postfix -*-+abc/ef-g/hi.
4. Analyze when overflow and underflow conditions occurs in a queue.
5. If the depth of the binary tree is k, the maximum number of nodes in the binary tree is 2^k-1. Justify.
6. Define and outline the properties of a heap.
7. In a complete graph with n vertices, show the number of spanning trees is atleast $2^{n-1}-1$.
8. How to find all articulation points in a given graph?
9. Compare linear search and binary search.
10. Define Extendible hashing.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) State the polynomial representation for $6x^3 + 9x^2 + 7x + 1$ using linked list. Write and explain the procedure to add and multiply two polynomials and explain with suitable examples. (8)

ii) Write a procedure to delete the last node in a circular link list along with the code to return the number of elements in it after deletion. (8)

(OR)

b) i) Describe how a node can be inserted at a user specified position in a doubly link list with an illustration. (8)

ii) Given a singly link list containing any type of data, suppose X and Y are two nodes in the list. Add all the nodes between X and Y so that X is the first node and Y is the last node in the resulting list. (8)

12. a) Write the procedure to convert the infix expression to postfix expression and steps involved in evaluating the postfix expression. Convert the expression A-(B/C+(D%E*F)/G)*H to postfix form. Evaluate the given postfix form 9 3 4 * 8 + 4 / - (16)

(OR)

b) A Circular queue is maintained in an array, and F and R are the front location and rear location of the queue respectively. (16)

1) Obtain the formula for N, the number of elements in the queue in terms of F and R

2) Write an algorithm to delete the i^{th} element in the queue

3) Write an algorithm to insert an item X just after the i^{th} element in the queue.

13. a) i) Create a B tree of order 5 by inserting the following elements 3, 14, 7, 1, 8, 5, 11, 17, 13, 6, 23, 12, 20, 26, 4, 16, 18, 24, 25, 19 (10)

ii) Give the routine to implement Find_min and Find_max operation in a Binary Search Tree. (6)

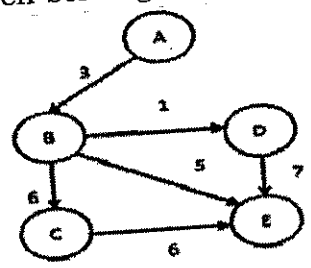
(OR)

b) i) Write a routine for AVL tree insertion. Insert the following elements in the empty tree and how do you balance the tree after each insertion. (10)

2, 5, 4, 6, 7 ,9, 8, 3, 1, 10

ii) Discuss the applications of Heap. (6)

14. a) i) Apply Prim's algorithm to find the shortest path from node A to all other nodes for the given below graph. (10)



ii) Give the procedure for Depth First Traversal of a graph. (6)

(OR)

b) i) Demonstrate how minimum cost spanning tree can be obtained by Kruskal algorithm with an example. (10)

ii) Discuss the applications of Graph. (6)

15. a) Write the algorithm and sort the sequence 4, 6, 8, 2, 9, 5, 1, 7 and 3 using the following (16)

1) Merge Sort

2) Quick Sort (Take First element as pivot)

(OR)

b) Consider a hash table with 9 slots. The hash function h(k)=k mod 9. The following keys are inserted in the order 5, 28, 19, 15, 20, 33, 12, 17, 10. Draw the contents of the hash table when the collisions are resolved by (16)

1) Chaining
2) Open addressing
3) Double hashing(the second hash function h2(x)=7-(x mod 7)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS304 – Operating Systems

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Is OS a resource Manager? If so, justify your answer.
2. What is dual mode operation and what is the need of it?
3. Compare user level threads and kernel level threads.
4. Define context switching with an example scenario.
5. How monitors help in process synchronization?
6. Define Starvation in deadlock.
7. What you mean by compaction? In which situation is it applied.
8. Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames.
   i) How many bits are there in the logical address?
   ii) How many bits are there in the physical address?
9. What are the structures used in file-system implementation?
10. List different types of directory structure.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Enumerate the different operating system structure and explain with neat sketch. (10)

    ii) Draw the storage device hierarchy. (6)

    (OR)

    b) i) Write and explain the sequence of system calls for copying a file to another (new) file. (10)

    ii) Narrate on operating system services. (6)

12. a) i) Sketch the components of process control block and explain in detail. (6)

    ii) Explain various states of a process with the help of a process state transition diagram. (10)

(OR)

b) i) Consider the following set of processes with the length of the CPU – burst time and the arrival time given in milliseconds. (10)

Process Id	**Burst Time**	**Arrival Time**	**Priority**
P1	8	0	0
P2	12	8	4
P3	10	8	3
P4	8	8	1
P5	5	8	2

Draw a Gantt chart illustrating the execution of these processes. Calculate turnaround time, waiting time and response time for each process and average waiting time for the following algorithms FCFS, SRTF and Preemptive priority scheduling.

ii) Compare multilevel queue and multilevel feedback CPU scheduling algorithm with neat diagram. (6)

13. a) i) Explain critical section problem in brief. (8)

ii) Outline a solution using semaphores to solve dinning philosopher problem. (8)

(OR)

b) i) Apply the deadlock detection algorithm for the following system and find whether the system is in deadlock state or not. (8)

Processes	Request			
P0	2	0	0	1
P1	1	0	1	0
P2	1	1	0	0

Processes	Allocation			
P0	0	0	1	0
P1	2	0	0	1
P2	0	1	2	0

Available

(2,1,0,0,)

ii) Write the bankers algorithm for deadlock avoidance. (8)

14. a) i) With a diagram discuss the steps involved in handling a page fault. (8)

ii) Compare Internal and External Fragmentation. (8)

(OR)

b) i) Consider the following page reference string: 1,2,3,2,5,6,3,4,6,3,7,3,1,5,3,6,3,4,2,4,3,4,5,1 Indicate page faults and calculate total number of page faults and successful ratio for FIFO, optimal and LRU algorithms. Assume there are four frames and initially all the frames are empty. (8)

ii) Explain with the help of supporting diagram how TLB improves the performance of a demand paging system. (8)

15. a) i) Explain free space management with neat example. (6)

ii) Explain in detail the various file allocation methods with their pros and cons. (10)

(OR)

b) i) On a disk with 1000 cylinders, numbered from 0 to 999, compute the number of tracks the disk arm must move to satisfy all the request in the disk queue, Assume the last request received was at track 345 and the head is moving towards track 0. The queue contains requests for the following tracks 123, 874, 692, 475, 105 and 376. Perform the computation for the FIFO, SSTF, SCAN and C-SCAN scheduling algorithms. (10)

ii) Identify the two important function of virtual File system (VFS) layer in the concept of file system implementation. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18CSOE02 – Operating Systems

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between tightly coupled and loosely coupled systems.
2. Identify the purposes of fork and exec system calls.
3. Differentiate preemptive and non-preemptive scheduling.
4. Mention the fundamental models of Interprocess communication with example.
5. Define Resource Allocation Graph. Give example for request and assignment edges.
6. List out the methods for handling deadlock.
7. What is meant by Compaction? Give example.
8. Differentiate internal and external fragmentation.
9. Compare the various file access methods.
10. Define RAID and list out its levels.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain about the features of Multi-processor systems and Clustered systems. (12)

    ii) Write short notes about the services of operating system. (4)

    (OR)

    b) Explain the various types of system calls with example. Describe the three general methods for passing parameters to the operating system. (16)

12. a) Illustrate with an example about the co-operating processes in detail. (16)

    (OR)

b) Assume some operating system needs to schedule four processes using scheduling algorithms. For each process, the following information shows its burst time, priority (the lower number as higher priority) and arrival time. (16)

Processes	Burst Time	Priority	Arrival Time
P1	12	3	0
P2	6	4	2
P3	4	1	4
P4	18	2	6

Calculate the average waiting time and turnaround time of those processes for Preemptive Priority scheduling and Round-Robin scheduling (Time Quantum= 5 ms).

13. a) Illustrate two-process solutions in critical section problem for process synchronization with example. (16)

(OR)

b) Consider the following system snapshot using data structures in the Banker's algorithm with resources A,B,C,D and processes P0 to P4: (16)

Available : A = 3, B = 2, C = 1, D = 1

Processes	Max				Allocation			
	A	B	C	D	A	B	C	D
P0	6	0	1	2	4	0	0	1
P1	1	7	5	0	1	1	0	0
P2	2	3	5	6	1	2	5	4
P3	1	6	5	3	0	6	3	3
P4	1	6	5	6	0	2	1	2

Using Banker's algorithm answer the following:

i) What are the contents of the Need matrix?

ii) Identify the safe sequence in which the processes may complete using safety algorithm.

iii) If a request from a process P4 arrives for additional resources of (1, 2, 0, 0) can the banker's algorithm grant the request immediately? Show the new system state and other criteria.

14. a) Explain in detail about paging and its architecture. (16)

(OR)

b) Consider the reference string : (16)

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6

Assume five page frames and calculate the page hit and fault ratio occur for the Optimal and LRU replacement algorithms.

15. a) Explain in detail about the various file allocation methods with example. (16)

(OR)

b) Consider the disk queue with request for I/O to blocks on cylinders and are numbered from 0 to 199. (16)

98, 183, 37, 122, 14, 124, 65, 67

If the disk head is start at 53, then find out the total head movement with respect to FCFS, SSTF, SCAN and C-SCAN scheduling.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS501 – Database Management Systems

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Schema.
2. Give 5 SQL Aggregate function.
3. Distinguish between entity and attribute.
4. Why BCNF preferred over 3NF?
5. State ACID properties.
6. What is the maximum number of superkeys for the relation schema R(E,F,G,H) with E as the key attribute? Write all such possible superkeys.
7. What is cascading update?
8. What is hash based indexing?
9. Outline the motivation of Replication in a distributed database environment.
10. What is meant by DTD?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Why would you choose a database system instead of simply storing data in operating system files? When would it make sense not to use a database system? (8)

ii) Explain the difference between logical and physical data independence. (8)

(OR)

b) i) Define relational algebra. Explain the basic operations in relational algebra. (10)

ii) Explain the structure and features of a relational database. (6)

12. a) i) Consider the following relation: R (U, V, W, X, Y, Z) All the attributes of relation R are atomic. The primary key of relation R is combination of U and V. The following functional dependencies hold: (10)

$UV \rightarrow W$

$U \rightarrow X$

$V \rightarrow Y$

$Y \rightarrow Z$

Is relation R normalized? If yes, justify the relation is normalized. If no, state reasons and normalize the same.

ii) Explain Multivalued dependencies and Join dependencies with suitable example. (6)

(OR)

b) i) A university registrar's office maintains data about the following entities: (10)

(1) courses, including number, title, credits, syllabus, and prerequisites;

(2) course offerings, including course number, year, semester, section number, instructor, timings, and classroom;

(3) students, including student-id, name, and program; and

(4) instructors, including identification number, name, department, and title.

Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. Model an entity relationship diagram for the registrar's office.

ii) Model an E-R diagram for a car-insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents. State any assumptions you make. (6)

13. a) Explain the two phase locking protocols for concurrency control. (16)

(OR)

b) Define Transaction. Represent the transaction states and explain the various desirable properties of a transaction. (16)

14. a) Explain the RAID levels with the nature of applications supported by each level. Also, Illustrate how the B+ tree structures are used for indexing files. (16)

(OR)

b) What is query processing? Outline the steps involved in processing a query with a diagram. (16)

15. a) Outline the two basic types of fragmentation in a distributed database environment with an example. Also, Compare the features of Object based and Object-relational databases. (16)

(OR)

b) Present an outline of Document Type Declaration, XML schema, path expressions and XQuery language. (16)

Register Number :

Government College of Engineering :: Salem
(An Autonomous Institution Affiliated to Anna University, Chennai)
B.E. Degree Examinations – Nov/Dec 2024
V Semester (Full Time)
(2018 Regulations)
COMPUTER SCIENCE AND ENGINEERING
18CS501 – Database Management Systems

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Investigate the importance of super key.
2. Examine the difference between Dynamic SQL and Static SQL.
3. Assess the significance of cardinality ratio.
4. What is the output of following statement?
   $\sigma_{subject = "database"}(Books)$
5. Generalize the type of locking needed for insert and delete operations.
6. Give the reasons for allowing concurrency.
7. Write about B+ tree index file.
8. Examine about query evaluation plan.
9. Write the representation of multidimensional data.
10. Given that LDAP functionality can be implemented on the top of a database system, what is the need for the LDAP standard?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Consider the following relations for a database that keeps track of business trips of salespersons in a sales office: (16)

SALESPERSON (SSN, Name, start_year, Dept_no) TRIP (SSN, From_city, To_city, Departure_Date, Return_Date, Trip_ID) EXPENSE (Trip_id, Account#, Amount)

Specify the following queries in SQL on the above database schema,

(i) Give the details (all attributes of TRIP) for trips that exceeded $2000 inexpenses.

(ii) Print the SSN of salesman who took trips to 'Honolulu'

(iii) Print the trip expenses incurred by the salesman with SSN = '234-56-7890'.

(iv) Write a program in embedded SQL to retrieve the total trip

expenses of the salesman named 'Bill' for the above relations and explains it.

(OR)

b) i) Explain why would you choose a database system instead of simply storing data in operating system files? When would it make sense not to use a database system? (16)

ii) Explain the difference between logical and physical data independence.

12. a) A car-rental company maintains a database for all vehicles in its current fleet. For all vehicles, it includes the vehicle identification number, license number, manufacturer, model, date of purchase, and colour. Special data are included for certain types of vehicles: (16)

1) Trucks: cargo capacity.

2) Sports cars: horsepower, renter age requirement.

3) Vans: number of passengers.

Off-road vehicles: ground clearance, drive train (four- or two-wheel drive). Construct an E- R model for all operations.

(OR)

b) Consider the following database relations containing the attributes; Book_id, Subject_Category_of_book, Name_of_Author, Nationality_of_Author with book_id as the primary key. (16)

a) What is the highest normal form satisfied by this relation? Explain in detail.

b) Suppose the attributes Book_title and Author_address are added to the relation, and the primary key is changed to {Name_of_Author, Book_title}, what will be the highest normal form satisfied by the relation?

13. a) Consider the following two transactions: (16)

T1: read(A);

read(B);

if A = 0, then B := B + 1; write(B).

T2: read(B);

read(A);

If B = 0, then A: = A +1; write (A).

Add lock and unlock instructions to transactions T1 and T2, so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock? Generalize your view.

(OR)

b) For each of the following schedules, state whether it is conflict-serializable and/or view-serializable. If you cannot decide whether a schedule belongs to either class, explain briefly. The actions are listed in the order they are scheduled and prefixed with the transaction name. (16)

(i) T1: R(X) T2: R(X) T1: W(X) T2: W(X)

(ii) T1: W(X) T2: R(Y) T1: R(Y) T2: R(X)

(iii) T1: R(X) T2: R(Y) T3: W(X) T2: R(X) T1: R(Y)

(iv) T1: R(X) T1: R(Y) T1: W(X) T2: R(Y) T3: W(Y) T1: W(X) T2:R(Y)

(v) T1: R(X) T2: W(X) T1: W(X) T3: W(X)

14. a) Examine about RAID system. How does it improve performance and reliability? Discuss the level 3 and level 4 of RAID. (16)

(OR)

b) Examine the algorithms for SELECT and JOIN operations. (16)

15. a) Discuss the problems associated with developing and managing a data warehouse. (16)

(OR)

b) Write notes on object definition language and object query language. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS502 – Java Programming

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Given two strings, create a function that returns the total number of unique characters from the combined string.
2. Write a Java program to print the Fibonacci series of a given number.
3. Define an exception called "No match Exception" that is thrown when a string is not equal to "India". Write a program that uses this exception?
4. What is a stream? How is the concept of streams used in java?
5. What are the two types of applets?
6. Create an applet page featuring two text boxes and a single button for user login.
7. Write the syntax to draw Rectangle and Circle in a Frame.
8. Write a java AWT code to create a button by extending the frame class.
9. What is the purpose of the Socket class in Java?
10. How can you create a URL object in Java, and what methods are available to retrieve URL information?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the architecture and components of JDK, JRE and JVM. (8)

ii) Write a program to count the vowels and consonants in a given input string using switch case statement. (8)

(OR)

b) i) Compare Java with C and C++ with its characteristics, implementations and an example main method. (8)

ii) Write a program to multiply two matrixes using two-dimensional arrays. (8)

12. a) i) Create a "time" class which contains data members namely hours, minutes and seconds. Define default constructor, one argument, two argument and three argument constructors. Write a main program to invoke all the constructors? (8)

ii) Explain inter-thread communication with an example. (8)

(OR)

b) i) What is an Exception? Explain exception handling concepts with an example. (8)

ii) Design two interfaces namely SI(Simple Interest) and CI(Compound Interest) which has the methods to calculate simple interest and compound interest. Create a class to implement those interfaces and display the results. (8)

13. a) i) Explain the different stages in the life cycle of an applet. (8)

ii) Write a Java Applet that sets the background color to blue and foreground color to red and outputs a string message "A simple Applet". (8)

(OR)

b) i) Develop an applet to create a label, a text field and 4 check boxes with the caption "red", "green", "blue" and "yellow". (8)

ii) Write a program using an applet which will print "key pressed" on the status window when you press the key, "key released" on the status window when you release the key and when you type the characters it should print "Java Programming" at coordinates (150, 150) on Applet? (8)

14. a) i) Explain JLabel and JTextField controls with an example. (8)

ii) Write a program to implement a GUI based calculator application. It has two TextFields for two input numbers, one TextField for result and four Buttons named Add, Sub, Mul and Div for addition, subtraction, multiplication and division respectively. (8)

(OR)

b) i) List the different types of swing buttons. Write a program to create four types of buttons on JApplet. Use suitable events to show actions on the buttons and use JLabel to display the action invoked. (8)

ii) Explain the JScrollpane and JComboBox with a program. (8)

15. a) i) Develop a simple JDBC application to store the details of an employee Such as name, empid, date of joining, Designation, Mobile number, email ID in a employee table and retrieve it and display it in the console. (8)

ii) Create a login page using java swing and connect them to MySQL to store users details such as name, username, password, mobile number and mail ID. Show the login successfully message in the dialog box. (8)

(OR)

b) i) Explain JDBC Architecture with neat diagram. (8)

ii) Write a simple Java program that demonstrates how to create a TCP client socket and send a message to a server. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS503 - Java Programming

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Brief the purpose of java virtual machine.
2. How do command line arguments significant in Java?
3. Debug Line 1 and Line 2 of the following java program to produce the output "Hello World".

```
interface In1 {
    String a; //Line 1
   void display();
}
public class Main implements In1 {

void display()  //Line 2
{     System.out.print("Hello");   }
  public static void main(String[] args) {
     Main t = new Main();
     t.display();
     System.out.print(t.a);
  }
}
```

4. Determine the process and output of the following program.

```
public class Main {

  public static void main(String[] args) {

    int intPrimitive = 10;
    double doublePrimitive = 20.5;
    char charPrimitive = 'A';

    Integer intObject = Integer.valueOf(intPrimitive);
    Double doubleObject = Double.valueOf(doublePrimitive);
    Character charObject = Character.valueOf(charPrimitive);

  }
}
```

5. Whether the event handling mechanisms necessary Java. Justify your answer.
6. Evaluate the usage of the paint() method in an applet?
7. Compare AWT and Swing components.
8. Mention the importance of JScrollPane class in Swing.
9. Differentiate between Statement and a Prepared Statement in JDBC.
10. Illustrate the ResultSet interface in JDBC, with example.

(5 x 16 = 80 Marks)

Part B

Answer ALL Questions

11. a) Describe the elements Object-Oriented Programming with examples. (16)

(OR)

b) Explain various data types and operators in java with examples. (16)

12. a) Determine the output/error for the java program when each line (Line 1 to 4) executes individually. (16)

```
class a
{
   a(){System.out.println("a");}
}
class b extends a
{
   b(){System.out.println("b");}
}
public class Main{
public static void main(String args[])
{
    b obj1=new b();//Line 1
    a obj2=new b();//Line 2
    b obj3=new a();//Line 3
    a obj4=new a();//Line 4
  }
  }
```

(OR)

b) Write a java program that validates user input for time values (hours, minutes, and seconds). The program should check whether the input values are within the valid range, If any value falls outside the valid range, a custom exception, *InvalidHourException, InvalidMinuteException,* or *InvalidSecondException,* should be thrown, indicating which part of the time (hours, minutes, or seconds) is invalid.If no exceptions occur, print "Correct Time - " followed by the time in the format "hours:minutes:seconds." (16)

13. a) Describe the role of AWT Classes in creating GUI Components with examples. (16)

(OR)

b) Describe the various event listener interfaces available in Java and their roles in handling different types of events. Demonstrate the use of ActionListener and MouseListener interfaces in Java applications. (16)

14. a) Write a Java program that generates a simple menu bar with submenus for file, edit, and help. Implement the following functionality: (16)

File menu: Open, save, exit

Edit menu: Cut, copy, paste

Help menu: About

(OR)

b) Develop a simple GUI application using Swing components to perform a basic arithmetic calculation (addition, subtraction, multiplication, division). Considering the following key points. (16)

- Include a clear layout using layout managers.
- Ensure proper user input validation.
- Display the result in a user-friendly manner.

15. a) Write a Java program that connects to a MySQL database and retrieves a list of students with their marks. Results must be displayed in a tabular format. (16)

(OR)

b) Develop simple chat application using UDP sockets by allowing multiple clients to join the chat and send messages to each other. Consider using a separate thread for receiving and sending messages. Implement a user-friendly interface for sending and receiving messages. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS503 – Computer Networks

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the categories of networks.
2. What topology is suitable for a network at home or small office? Justify.
3. Compute $6^{342} \bmod 7$.
4. Compare token bus and token ring in terms of reliability, performance and applications.
5. What do you mean by packet switching?
6. Compare IPV4and IPV6.
7. What is a datagram?
8. What do you mean by reliable communication?
9. What is the role of SNMP? Why do we need it?
10. How does domain name system ease the addressing in a network?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the functionalities of the layers in OSI model of network with neat diagram. (16)

(OR)

b) Explain different types of transmission media in networking? What are the factors that influence the decision on the type of transmission media in a network? (16)

12. a) Describe how the data 10101100 will be sent using CRC and hamming code. (16)

(OR)

b) What are the error control mechanisms and how do you determine which error control mechanism is suitable in a scenario? Explain with real world examples. (16)

13. a) Assume that you are a network administrator for a company with an IP address of 192.168.10.0/24. You need to divide this network into 4 subnets to accommodate different departments. Each subnet should support at least 50 hosts. Determine the new subnet mask. Identify the subnet addresses for each new subnet. List the range of valid IP addresses for each subnet and provide the broadcast address for each subnet. (16)

(OR)

b) A network has 6 routers labeled v_1 to v_7 that are connected as shown below figure.1. Compute the routing table of the router v_3 applying link state routing. (16)

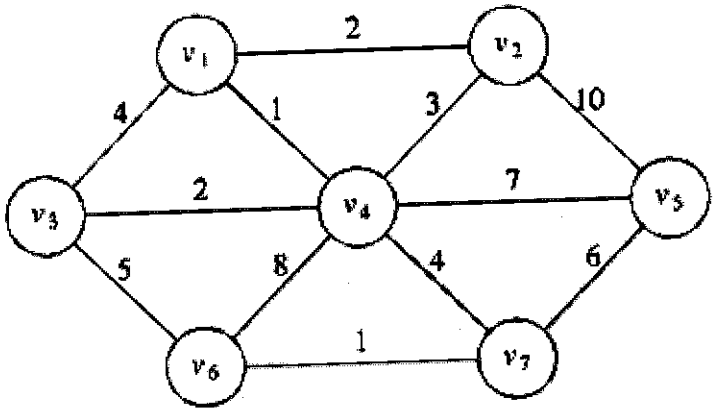


Figure.1.

14. a) Identify the factors that cause congestion in networks and analyze the appropriate congestion control techniques that can resolve the congestion in detail with real world examples. (16)

(OR)

b) Analyze the techniques to improve QoS in detail with real world examples. (16)

15. a) Explain the FTP and HTTP protocols in detail with their applications and working principles. (16)

(OR)

b) Discuss about the e-mail system, its protocol and how they integrate into world wide web. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V & VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18CSOE03 – Computer Networks

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List some of the guided and unguided Media.
2. Specify different addresses used in Internet Protocol stack along with their layer names.
3. Justify the need for the exponential back off algorithm followed in Ethernet for retransmission of frames after detecting collisions.
4. Define Hamming Code? Give example.
5. Differentiate between Bridges and Routers.
6. State CIDR and state how it helps in saving IP v4 address space?
7. Suppose host A sends two TCP segments back to back to host B over a TCP connection. The first segment has sequence number 90, the second has sequence number 110.
   1) How much data is in the first segment?
   2) Suppose that the first segment is lost but the second segment arrives at B. If piggybacked acknowledgement is sent by host B to host A, then what will be the acknowledgement number?
8. Justify the reason why congestion window is decreased exponentially while it is increased linearly when there is no congestion.
9. Differentiate Persistent HTTP and Non-persistent HTTP.
10. Mention, Why DNS lookups are run over UDP rather than TCP?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Outline the components of network architecture. (8)

    ii) Discuss the various Categories of Networks. (8)

(OR)

b) Explain the layers of OSI reference Model with neat diagram. (16)

12. a) i) With a neat diagram, explain the frame format of Ethernet. (8)

ii) Given the data word 11101101 and the divisor 1101. Show the generation of the codeword at the sender site and the checking process of the codeword at the receiver site using CRC technique. (8)

(OR)

b) i) Discuss the FDDI with their salient features. (8)

ii) Draw a timeline diagram for the sliding window algorithm with SWS=RWS=4 frames, and simulate the situation where the Frame 6 is lost. Use a timeout interval of about 2 * RTT and show the window content of sender after each acknowledgment received. (8)

13. a) An ISP is granted a block of addresses starting with 150.80.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows: (16)

1) The first group has 200 medium size businesses, where each needs approximately 128 addresses.
2) The Second group has 400 small businesses, where each needs approximately 16 addresses.
3) The Third group has 2000 households, where each needs 4 addresses.

Design the sub blocks and give the slash notation for each sub block. Find out how many addresses are still available after these allocations.

(OR)

b) For the network given in the Figure.1, the links are labeled with relative costs. Design the datagram forwarding table for each node using distance vector algorithm to find the shortest path to its destination. (16)

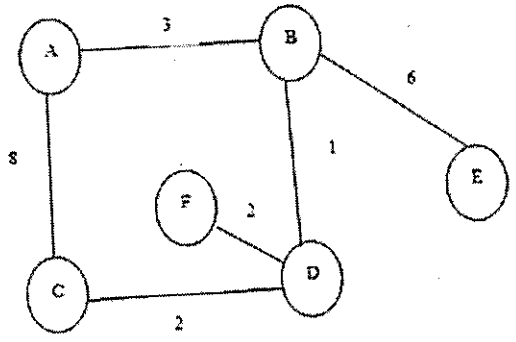


Figure.1

14. a) i) Discuss the techniques to improve the QoS in transport layer. (8)

ii) With the help of the TCP segment format, show how a TCP receiver receives the data from TCP sender and closes the data transmission process. (8)

(OR)

b) Explain in detail about Congestion control algorithm of TCP with a neat diagram. (16)

15. a) i) Outline the techniques for Encryption/Decryption of messages in data communication. (8)

ii) Suppose Alice, with a Web-based e-mail account (such as Hotmail or Gmail), sends a message to Bob, who accesses his mail from his mail server using POP3. Discuss how the message gets from Alice's host to Bob's host. Be sure to list the series of application-layer protocols that are used to move the message between the two hosts. (8)

(OR)

b) i) What is the role of DNS? When you give a request through your browser to open the webpage, assuming that corresponding IP address is not cached in your local host, show the steps involved in detail in resolving the required IP address with the help of DNS. (8)

ii) State the advantages of Passive mode FTP over Active mode FTP with an examples. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS504 – Principles of Compiler Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate tokens, patterns, lexemes with one example.
2. Consider the language of all strings from the alphabet {a, b, c} containing the substring "abcabb". Write a regular expression that describes this language.
3. What is meant by handle pruning?
4. Show that the grammar, $S \rightarrow aSbS \mid bSaS \mid \varepsilon$, is ambiguous or not.
5. List three kinds of intermediate representation.
6. Define Back patching.
7. What is a basic block?
8. Draw the Directed Acyclic Graph (DAG) for the statement.
   a = (a * b + c) - (a * b + c).
9. Explain common sub expression with one example.
10. What are the characteristics of peephole optimization?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss in detail about the operations of a compiler which transforms the source program from one representation into another. Illustrate the output for the input: (10)
    a = (b+c)*(b+c)*2.

    ii) Write a note on the recognition of tokens with one example. (6)

(OR)

b) i) Explain step-by-step conversion of the given NFA to DFA. Shown in figure.1. (10)

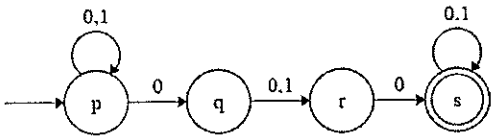


Figure.1

ii) Write the steps to convert regular expression to ε-NFA and then convert the given regular expression to ε-NFA. (6)

$(a|b)^*abb\ (a|b)^*$

12. a) i) Construct a stack implementation of a recursive descent parser for the given grammar if the input string is id+id*id (10)

E -> E + T | T

T -> T * F | F

F -> (E) | id

ii) Make the given grammar free from left recursion. (6)

A -> Ba | Aa | c

B -> Bb | Ab | d

(OR)

b) i) Construct SLR(1) parsing table for the given grammar. (10)

S -> AA

A -> aA | b

ii) Find the FOLLOW set for the given production rules: (6)

S -> ACB | Cbb | Ba

A -> da | BC

B -> g | ε

C -> h | ε

13. a) Suppose we have a production A → B C D. Each of the four nonterminals has two attributes: s, which is synthesized, and i, which is inherited. For each set of rules below, check whether the rules are consistent with i) An S-attributed definition ii) An L-attributed definition iii) Any evaluation order at all. (16)

1) A.s = B.i + C.i

2) A.s = B.i + C.s and D.i = A.i + B.s

3) A.s = B.s + D.s

4) A.s = D.i

B.i = A.s + C.s

C.i = B.s

D.i = B.i + C.i

(OR)

b) Apply the S-attributed definition and constructs syntax trees for a simple expression grammar involving only the binary operators + and -. As usual, these operators are at the same precedence level and are jointly left associative. All nonterminal have one synthesized attribute node, which represents a node of the syntax tree. (16)

Production:

$E \rightarrow E_1 + T$

$E \rightarrow T$

$T \rightarrow (E)$

$T \rightarrow id \mid num$

14. a) i) Discuss the various issues in the design of a Code Generator. (8)

ii) Construct the DAG for the following Basic Block. (8)

1. t1 := 4*i
2. t2 := a[t1]
3. t3 := 4*i
4. t4 := b[t3]
5. t5 := t2*t4
6. t6 := prod+t5
7. prod := t6
8. t7 := i+1
9. i := t7
10. if i <= 20 goto (1).

(OR)

b) i) Explain about run time storage management. (8)

ii) Write a simple code generator algorithm. With an example code, show how the algorithm generates code. (8)

15. a) Discuss in detail about optimization of basic blocks. (16)

(OR)

b) Explain global data flow analysis with necessary equations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS601 – Principles of Compiler Design

Time : 3 Hours

Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List phases of a compiler.
2. Define the terms: lexeme, token and pattern.
3. Perform left factoring for the following grammar:
   A → aBcC | aBb | aB | a
   B →ε
   C →ε
4. Define Context free grammar with an example.
5. Define Synthesized and Inherited attributes with examples.
6. Differentiate between Quadruples and Triples.
7. Find the cost of the following instruction sequences.
   MOV *4(R0), R1
   MOV R1, M
8. Mention the significance of Basic block in the process of compiler construction.
9. Derive the data flow equations for decision statements in reaching definitions.
10. What is activation record? Mention the fields in the activation record.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the various phases of compilation. Show the output of each phase for the following input: (16)

```
int c,d;
float a, b;
bool x=true;
if ( x == true )
        a=b*c +10
else
        a = b/c+10
```

(OR)

b) Construct NFA for the Regular Expression **(a/b)*ab/a** using Thomson's construction. Convert to equivalent DFA using subset construction algorithm and finally derive the minimized DFA. (16)

12. a) i) Consider the grammar (8)

$S \rightarrow AaAb \mid BbBb$

$A \rightarrow \varepsilon$

$B \rightarrow \varepsilon$

Construct the Predictive Parsing table and also check whether the Grammar belongs to LL (1).

ii) Construct an operator precedence parse table for the following grammar. Show the shift reduce actions for the string **ibibtaea.** (8)

$S \rightarrow iEts$

$S \rightarrow iEtSeS$

$S \rightarrow a$

$E \rightarrow b$

(OR)

b) Check whether the following grammar is a SLR (1) grammar or not. Justify your answer with reasons. (16)

$S \rightarrow AS / b$

$A \rightarrow SA / a$

13. a) i) Describe S-attributed and L-attributed definition. (8)

ii) Write semantic actions for the following assignment statement and also generate three address codes using annotated syntax tree. (8)

a= A[i] [j]

Assume i=5, j=5, a is an int variable and A is an int array.

(OR)

b) Write Semantic rules for Boolean expressions with and without back patching and also derive the three address code generated for the expression "(a < b) and not (c < d)" with and without back patching. (16)

14. a) i) Explain the following with example: (8)

a) Copy Propagation,

b) Dead-code Elimination and,

c) Peephole optimization,

ii) Write a simple code generation algorithm. Mention the status of register and address descriptor after the execution of the following statement: (8)

d := (a - b) + (a - c)

(OR)

b) i) Write an algorithm for finding next-use information. (8)

ii) Analyse the issues in the design of code generator. (8)

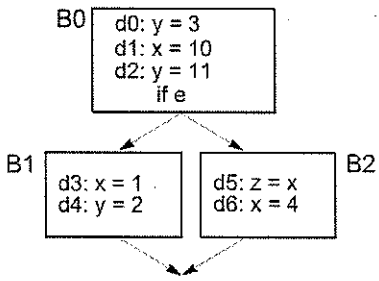
15. a) Construct Control Flow Graph for the following code fragment and perform code optimization; (16)

```
int  b=5, c=1, d=10,e, i=1, j=1, x, y;
int A[5], B[5];
/* consider the following code fragment*/
while (i < b)
{
        if (i*2< n)
        {
        e=d;
        x=A[i]+e;
        }
        else
        {
                do
                {
        y=B[j]+5;
                } while (c<=5);
        c++;
        j++;
        }
i++;
}
```

(OR)

b) i) Demonstrate Global data flow analysis. (8)

ii) Determine gen, kill, in, and out for the following flow graph using reaching definition of Basic Blocks in data flow analysis. Assume B's are Basic Blocks and d's are definition of each statement. (8)



Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CSH101 – Exploratory Data Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the significance of EDA.
2. Define pivoting.
3. How is missing data handled in EDA?
4. Compare aggregation and grouping.
5. What is meant by inequality?
6. Write the purpose of scaling and standardizing in univariate analysis.
7. Define bivariate analysis.
8. List two common methods used in bivariate analysis to examine relation between two variables.
9. Mention the characteristics of time series data.
10. Interpret the significance of third variable in multivariate analysis to understand dataset relationship.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the classical data analysis. Differentiate exploratory data analysis and bayesian data analysis. (16)

(OR)

b) Discuss the various data transformation techniques used in EDA. (16)

12. a) Explain the following operations in EDA: Concat, Append, Merge and Join. (16)

(OR)

b) Explain the process of data indexing and selection using pandas. (16)
Consider a dataframe with student data. Write code to

1) Create a dataframe
2) Select all rows and columns
3) Select some rows and columns
4) Select single column
5) Select multiple column

13. a) Discuss distribution variables and essential summaries in univariate analysis. (16)

(OR)

b) Explain the methods of measuring inequality in EDA with suitable example. (16)

14. a) Explain the process of creating percentages in bivariate analysis with suitable example. (16)

(OR)

b) Explain the process of handling several batches in bivariate analysis with suitable example. (16)

15. a) Explain the characteristics of Time Series data and its analysis. (16)

(OR)

b) Explain visualizing and grouping in TSA. Write a code to visualize and group data for a real - world example. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CSH201 – Full Stack Web Application Development

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write a typescript code for displaying "hello world".
2. Define iterators in typescript.
3. Recall the significance of angular.
4. Mention the parameters for router link.
5. How asynchronous programming differs from synchronous programming.
6. Mention the use of scheduling timers.
7. Express.js integrates with Template engine to dynamically generate HTML pages. Comment on this statement.
8. Mention the use of cookie-parser.
9. Compare unique indexes and sparse indexes.
10. Mention the methods to find and select data from a MongoDB collection.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Create a simple typescript project with the necessary functionalities. (16)

(OR)

b) Explain Modules, Enums, decorators with suitable example. (16)

12. a) Create reactive forms using angular CLI for the following fields: fname, lname, email, gender, district, dob and country. (16)

(OR)

b) Discuss the steps involved in creating a template form with suitable example. (16)

13. a) Assume you are starting a new textile shop. Create a simple static web site using node.js for the shop displaying the variety of clothes available. Explain the process involved is each step. (16)

(OR)

b) Explain about events in node.js. (16)

14. a) i) Discuss on configuring express.js. App settings with example. (8)

ii) Explain the Express.js Application Structure. (8)

(OR)

b) i) Write short notes on Error handling in Express.js (8)

ii) Discuss about Request and Response object. (8)

15. a) Explain the CRUD operations in MONGODB with suitable examples. (16)

(OR)

b) Explain documents and embedded documents in MONGODB with suitable examples. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS701 – Cryptography and Network Security

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare Symmetric and Asymmetric Encryption.
2. Convert the given text "Cryptography and Steganography" into cipher text using rail fence technique.
3. Find gcd (68, 8) using Euclidean algorithm.
4. Specify the applications of the public key cryptosystem.
5. List the schemes for the distribution of public keys.
6. Compare Message Authentication Function and Hash Function.
7. Define Kerberos.
8. What are the various types of firewall?
9. List out any four applications of IP Security.
10. Write short notes on Secure Socket Layer.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Write a note on different types of Security Attacks and Services in detail. (16)

(OR)

b) i) Encrypt the following using playfair cipher (6)

Plain Text: INTRUSION DETECTION

Key: COMPUTER

ii) Consider HELP as plain text and as key. Encipher and decipher using Hill cipher. (10)

$$K = \begin{vmatrix} 3 & 3 \\ 2 & 5 \end{vmatrix}$$

12. a) Explain in detail the round function and Key generation in DES algorithm. (16)

(OR)

b) Describe RSA algorithm and perform encryption and decryption to the system with p = 7, q = 11, e = 7 and M = 9. (16)

13. a) Explain the classification of authentication function in detail. (16)

(OR)

b) Explain in detail about variety of approaches has been proposed for the Digital Signature function. (16)

14. a) i) Discuss about X.509 Authentication Service in detail. (8)

ii) Discuss how firewalls helps in the establishing a security framework for an organization. (8)

(OR)

b) i) Explain briefly about trusted system with suitable example. (8)

ii) Illustrate about Password Management in detail. (8)

15. a) i) Write detailed notes on Pretty Good privacy. (8)

ii) Describe about S/MIME in detail. (8)

(OR)

b) i) Illustrate the architecture of IP Security. (8)

ii) Explain in detail about Encapsulating Security Payload. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS201 – Digital Principles and System Design

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State and apply DeMorgan's theorem.
   $((x+y)' + (x+y)')' = x+y$
2. Infer AND gate using only NOR gate.
3. Draw the circuit of a half adder.
4. Differentiate parallel and serial adder.
5. Distinguish between combinational circuit and sequential circuit.
6. Define priority encoder.
7. How many states are there in 3-bit ring counter? What are they?
8. Demonstrate error correction code.
9. Compare stable and unstable state.
10. Summarize about state assignment.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Reduce the Boolean function using K-Map technique and implement using gates. (16)

    $F(w,x,y,z) = \sum(0,1,4,8,9,10)$ which has the don't care conditions $d(w,x,y,z) = \sum(2,11)$

    (OR)

    b) Analyze the expression using Quine McCluskey (Tabulation) method. (16)

    $F(x1,x2,x3,x4,x5) = \sum m(0,2,4,5,6,7,8,10,14,17,18,21,31)+\sum d(11,20,22)$

12. a) i) Design and analyze an 8421 to gray code converter using only NAND gate. (8)

    ii) Design and analyze magnitude comparator. (8)

    (OR)

b) i) Explain the steps involved in designing BCD to 7 segment code converter. (8)

ii) Design full adder and full subtracter. (8)

13. a) i) Realize 4 X 16 decoder using two 3 X 8 decoders with enable input. (8)

ii) Discuss JK flip flop using D flip flop. (8)

(OR)

b) i) Develop the following Boolean function using 8 to 1 multiplexer. (8)
F(A, B, C, D) = A'BD' + ACD + B'CD + A'C'D

ii) Implement the above function using 16 to 1 multiplexer. (8)

14. a) Analyze and design a synchronous counter which count in the sequence 000, 001, 010, 011, 100, 101, 110, 111, 000 using D flip flop. (16)

(OR)

b) Implement the following Boolean functions using PAL. (16)

w(A,B,C,D) = $\sum$m(0,2,6,7,8,9,12,13)

x(A,B,C,D) = $\sum$m(0,2,6,7,8,9,12,13,14)

y(A,B,C,D) = $\sum$m(2,3,8,9,10,12,13)

z(A,B,C,D) = $\sum$m(1,3,4,6,9,12,14)

15. a) i) Discuss the procedure for reducing the flow table with an example. (8)

ii) Explain the steps for designing of asynchronous sequential circuits. (8)

(OR)

b) Implement the switching function F = $\sum$m(1,3,5,7,8,9,14,15) by a static hazard free two level AND OR gate network and explain it. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS301 – Digital Principles and System Design

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Express $(15)_{10}$ in octal and hexadecimal.
2. Draw the logic circuit of the Boolean expression $a\bar{b}c + ab\bar{c} + abc$ using only NAND gates.
3. Derive the Boolean expression for half adder.
4. Design a binary multiplier with 2-bit multiplicand and 2-bit multiplier.
5. Define a multiplexer.
6. Reduce the state table

Current State	Next State		Output	
	x = 0	x = 1	x = 0	x = 1
a	b	d	1	1
b	b	b	0	0
c	b	d	1	1
d	d	d	0	0

7. What are the functionalities of a universal shift register?
8. Draw the circuit of a single bit memory cell with read/write signals.
9. Differentiate synchronous and asynchronous sequential circuits.
10. What is flow table? Give example.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Simplify the Boolean expression $F(a,b,c,d) = \sum(0,2,6,8,9,10,13,15) + d(11)$ using K-Map and express the solution in SOP and POS forms. (16)

(OR)

b) Simplify the Boolean expression $F(a,b,c,d) = \sum(0,1,5,10,11,15) + d(4,14)$ using Quine-Mc-Cluskey method and draw the logic circuit for the simplified expression. (16)

12. a) Design a 6-bit carry look-ahead adder and draw the circuits for carry generation and addition. (16)

(OR)

b) Explain magnitude comparator with a suitable example. (16)

13. a) Design a 8-bit priority encoder with priority granted for low magnitude numbers. (16)

(OR)

b) Explain different types of flip-flops. (16)

14. a) Explain how timing signals can be generated using a 6-bit Johnson Counter. (16)

(OR)

b) Illustrate the use of programmable logic array in realizing a set of Boolean expressions with an example. (16)

15. a) Describe the analysis procedure of an asynchronous sequential circuit with an example. (16)

(OR)

b) Explain the hazards in designing the asynchronous sequential circuits and discuss a procedure to eliminate them. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS401 – Design and Analysis of Algorithms

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write an algorithm to find whether an element is present in a list of elements.
2. Why is Asymptotic notation used?
3. Differentiate Divide and Conquer method from dynamic programming method.
4. Search for 8 in a list of following elements 2, 4, 8, 9, 12, 15, 17, 21, 25 using binary search algorithm that follows divide and conquer methodology.
5. Justify that Dynamic Programming is an algorithm design method in which the solution to a problem is viewed as the result of a sequence of decisions.
6. What is principal of optimality?
7. What are the challenges in back tracking?
8. What would be the complexity of solving 4 queens problem?
9. What is FIFO Search?
10. State Cook's Theorem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write an Euclid's algorithm for finding Greatest Common divisor. Compute the complexity of the same. (8)

ii) For the following pairs of functions determine the smallest integer value of n (8)

(i) n^2, 10n

(ii) $n^2/\log n$, $n(\log n)^2$

(OR)

b) i) Write a procedure which finds the mode and frequency of an unsorted array. Analyze its computing time. Is your method better than sorting? (8)

ii) Apply Master's Theorem on the following Recurrence Relations. (8)

(i) $T(n) = 8T(n/2) + n^2$

(ii) $T(n) = 2T(n/2) + n/\log n$

12. a) i) Explain how merge sort is performed using divide and conquer method. (10)

ii) When is greedy algorithm preferred? Explain how is it done? (6)

(OR)

b) i) Calculate Minimum spanning Tree using Prim's Algorithm. Justify that it follows greedy methodology. (10)

ii) Explain how knapsack problem can be solved by greedy methodology? (6)

13. a) i) What is a multistage graph? Explain how dynamic programming is applied to find a minimum cost path from s to t in a multi stage graph. (12)

ii) How does all pair shortest path algorithm use dynamic programming problem solving approach. (4)

(OR)

b) i) Explain dynamic programming approach to solve travelling salesman problem. (12)

ii) How does dynamic programming solve optimal binary search tree problem? (4)

14. a) i) Solve 8 queens problem using back tracking approach. Show partial state space tree and explain the same. (12)

ii) What is graph colouring problem? How can it be solved? (4)

(OR)

b) i) Illustrate how Sum of subsets problem is solved using back tracking approach. (12)

ii) What are Hamiltonian cycles? Give example. (4)

15. a) i) Explain the principle of branch and bound technique? (4)

ii) Explain how 0/1 knap sack problem is solved using branch and bound Technique. (12)

(OR)

b) i) Illustrate BFS and DFS graph traversal algorithms and analyze the complexity of the same. (12)

ii) What are NP Hard and NP Complete Problems? Give Examples. (4)

Register Number :

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B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS402 – Theory of Computation

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Prove that $(01+1)^* = (1^*(01)^*)^*$
2. Draw an DFA recognizing the language $[\ (a+b)\ (a+b)\ ]^*$
3. Describe the folowing sets by regular expressions:
   a) L_1- the set of all strings of 0's and 1's ending in 00
   b) L_2- the set of all strings of 0's and 1's, where each string is beginning with 0 and ending with 1.
4. Show that the complement of a regular language is also regular.
5. Construct a parse tree of (id + id) * id for the grammar:
   $$E \rightarrow E + E \mid E * E \mid (E) \mid id$$
6. Can you say the language generated by a CFG in CNF is finite or infinite? If so, how? If not, why?
7. List the properties of CFL that are closed.
8. Provide justification for the assertion that Turing machines are equivalent to digital computers.
9. When we say a problem is decidable? Give an example of undecidable problem.
10. Elaborate on the importance of NP-Complete problems.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Prove that "If n is a positive integer such that n mod 4 is 2 or 3 then n is not a perfect square ". (8)

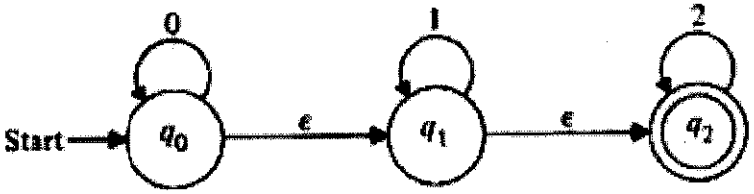
    ii) In the realm of Pythagorean triplets, establish the existence of a sophisticated two-parameter family. Provide a rigorous proof outlining how this family, contingent upon two positive integers m and n (m > n > 0), generates Pythagorean triplets. Justify the validity of the parameters and elucidate how the triplets adhere to the Pythagorean theorem. (8)

(OR)

b) i) Convert to a DFA the following NFA: (8)

δ	0	1
$\rightarrow p$	$\{p, r\}$	$\{q\}$
q	$\{r, s\}$	$\{p\}$
$*r$	$\{p, s\}$	$\{r\}$
$*s$	$\{q, r\}$	$\emptyset$

ii) Convert the following ε-NFA to NFA and list the differences between NFA and DFA. (8)



12. a) i) Construct a regular expression for the strings over the alphabets, Σ= {a, b} generating strings: (8)

a) "Whose first and last symbols are same."

b) "Whose first and last symbols are different."

c) "Whose last two symbols are same."

d) "Whose last two symbols are different."

ii) Construct a DFA for the below languages: (8)

a) $L_1 = \{ a^n b^m \mid n, m \geq 0 \}$

b) $L_2 = \{ a^n b^{2m} \mid n, m \geq 0 \}$

(OR)

b) i) Consider the DFA given by the transition table: (8)

δ	0	1
$\rightarrow q_1$	q_2	q_3
q_2	q_3	q_5
$*q_3$	q_4	q_3
q_4	q_3	q_5
$*q_5$	q_2	q_5

a) Draw the table of distinguish abilities for this automaton

b) Construct the minimum state equivalent DFA.

ii) State the Pumping Lemma of regular languages. Prove the following statement with justification: (8)

"The Language L = $\{ 0^i 1^j 0^k \mid k > i + j \}$ isn't regular "

13. a) i) Construct a CFG to generate even and odd set of palindromes over alphabet { a , b }. (8)

ii) What is an Instantaneous description of a PDA? How will you represent it? Also give the three important principles of ID and their transactions (8)

(OR)

b) i) Convert the CFG with the following productions to be in Greibach Normal Form (GNF): (8)

$$S \rightarrow ABA$$
$$A \rightarrow aA \mid \varepsilon$$
$$B \rightarrow bB \mid \varepsilon$$

ii) Define and discuss pumping lemma for CFL's. Prove that $L = \{ a^n b^{2n} a^n \mid n \geq 0 \}$ is not Context Free Language (8)

14. a) How do closure and decision properties serve as fundamental pillars in the study of Context-Free Languages, and how can insights derived from these properties guide the development of effective algorithms for language recognition and processing tasks in computational linguistics? (16)

(OR)

b) How can we design Turing machines that are both powerful and practical? Explore trade-offs between efficiency and simplicity when constructing Turing machines for real-world problems. (16)

15. a) State whether the instances of the Post Correspondence Problem (PCP) have a solution. The following are the instances with $\Sigma = \{0,1\}$. (16)

Index	List A	List B
1	1	111
2	10111	10
3	10	0

In case the PCP has a solution, describe the post-correspondence solution with justification.

(OR)

b) Prove that SAT is NP Complete. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS502 – Theory of Computation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Identify ε-NFA to represent a*b | c.
2. Differentiate between DFA and NFA.
3. State the precedence of Regular Expression operator.
4. Tabulate the regular expression for the following L1=set of strings 0 and 1 ending in 00
5. Compare Deterministic and Non deterministic PDA. Is it true that non deterministic PDA is more powerful than that of deterministic PDA? Justify your answer.
6. Illustrate the rightmost derivation (id+id)*id for using the grammar and also state whether a given grammar is ambiguous one or not.

   E➢E+E/E*E/(E)/id
7. Illustrate the Basic Turing Machine model and explain in one move. What are the actions take place in Turing Machine?
8. Develop the short notes on two-way infinite tape Turing Machine (TM).
9. List out the features of universal Turing machine.
10. State when a problem is said to be decidable and give an example of an undecidable problem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Give the NFA that accepts all strings that end in 010. Give its transition table and the extended transition function for the input string 01010 (8)

ii) Explain the steps in conversion of NFA to DFA and using the steps convert the following NFA to DFA shown in Figure.1. (8)

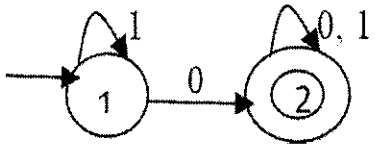


Figure.1

(OR)

b) i) Explain the steps in conversion of ε –NFA to NFA. Using the steps, convert the following ε –NFA to NFA (8)

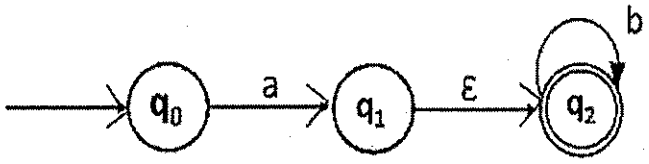


Figure.2

ii) Construct the DFA to recognize odd number of 1's and even number 0's. (8)

12. a) i) Using pumping lemma for the regular sets, prove that the language L= {anbn/n>=1} is not regular. (8)

ii) Evaluate a minimized DFA for the given DFA. Shown in Figure.3 (8)

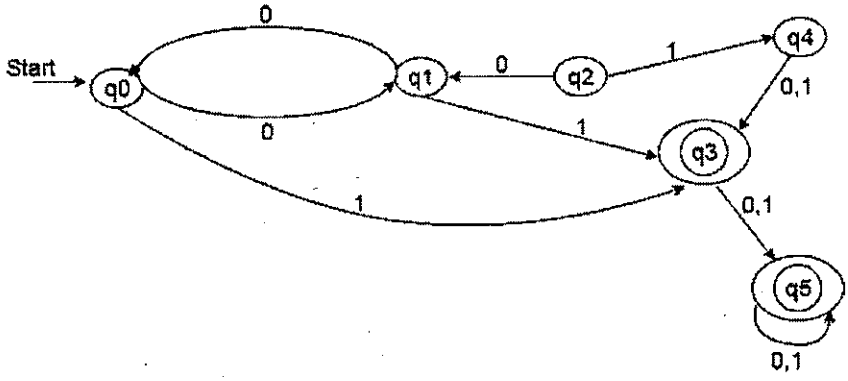


Figure.3

(OR)

b) i) Explain that the regular language are closed under : (8)

i) Difference.

ii) Concatenation

iii) Intersection.

ii) Deduce into regular expression using Rij method that denotes the language accepted by following DFA. Shown in figure.4. (8)

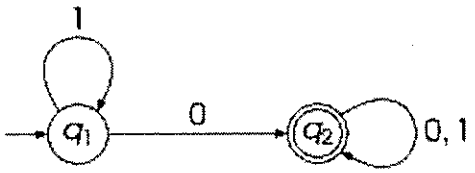


Figure.4

13. a) i) Express the following grammar G into Greibach Normal Form(GNF) (12)

$S \rightarrow BA$

$A \rightarrow SB \mid a$

$B \rightarrow AS \mid b$

ii) Examine the language L(G) generated by the grammar G with variables S,A,B, Terminals a, b and productions:- (4)

S->aB | bA

A ->a | aS | bAA

B ->b | bS | aBB

(OR)

b) i) Examine and construct a CFG G which accepts N(M), where M = ({q0, q1},{a,b},{z0,z},δ,q0,z0,Φ) and where δ is given by (12)

δ(q0,b,z0)={(q0,zz0)}

δ(q0, ε,z0)={(q0, ε)}

δ(q0,b,z)={(q0,zz)}

δ(q0,a,z)={(q1,z)}

δ(q1,b,z)={(q1, ε)

δ(q1,a,z0)={(q0,z0)}

ii) Design parse tree for the grammar S→aS | aSbS | ε. This grammar is ambiguous. Show that the string 'aab' has two parse trees. (4)

14. a) Illustrate the Turing machine for computing f (m,n) = m-n (proper subtraction). (16)

(OR)

b) Design and explain a TM to compute f(m, n) = m*n, for all m, n □ N. (16)

15. a) i) What are recursively enumerable languages and recursive sets? Generalize your answer. (4)

ii) State and describe RICE theorem and Show that the Diagonalization language (Ld) is not a recursively enumerable. (12)

(OR)

b) i) Explain about tractable problem. (4)

ii) Does PCP with two lists x = (b, babbb, ba) and y = (bbb, ba, a) have a solution. Analyze your answer and Identify that "MPCP reduce to PCP". (12)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS403 – Object Oriented Programming Using C++

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State any four benefits of object oriented programming.
2. List the uses of bitwise operators.
3. What is a class in object oriented programming?
4. What is operator overloading? What is its benefit?
5. How do you create a dynamic object of a class A? Illustrate with code snippet.
6. Demonstrate the calling sequence of constructors when an object is created for a derived class which has a single parent.
7. What is the criterion to write generic programming?
8. When do you rethrow an exception?
9. Write two examples in each of formatted and unformatted I/O.
10. List the modes of operating a file.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A vending machine has 5 different types of drinks with each type having 50 cans. The vending machine is fully loaded with new cans when the number of cans in a type of drink is less than or equal to 5. Write a program to simulate 3 days sale of the drinks with a menu displaying the number of cans available in each type and generating the inputs for number of cans in each type using random number generation. The number of sale in each day can also be randomly generated. Every sale should ensure only available drinks are sold and if the number of cans is less than or equal to 5, this message has to be displayed to the store keeper. Assuming the store keeper acts promptly, update the drink type cans to maximum count. (16)

(OR)

b) Every Indian citizen earning more than 3 lakhs a year has to pay the income tax to the government. Write a program to calculate the income tax based on the information given below: (16)

Employees		Business	
Income (LPA)	Tax %	Income (LPA)	Tax %
Upto 3	0	Upto 3	0
$> 3 \leq 5$	5	$> 3 \leq 10$	10
$> 5 \leq 10$	10	$> 10 \leq 50$	20
$> 10 \leq 15$	15	$> 50 \leq 100$	40
$> 15 \leq 20$	20	> 100	50
$> 20 \leq 30$	25		
Above 30	30		

LPA – Lakhs per Annum

12. a) Write a class to perform memory efficient matrix manipulation (Addition, Subtraction, Multiplication and Transpose) using operator overloading when applicable. Write a program to demonstrate the use of the matrix class. (16)

(OR)

b) Write a class to represent a Cartesian coordinate (x, y) where x and y are real numbers. Provide appropriate constructors to initialize the objects and implement member functions/friend functions to perform displacement (Given Δx and Δy, compute the displaced coordinates by adding respective values), scaling (Given the scaling factor α, multiply the coordinates with α) and reflection about x and y axes (Change the sign of the coordinate about which reflection is sought). (16)

13. a) Explain different types of inheritance with suitable examples. (16)

(OR)

b) Explain the use of virtual functions and abstract class with suitable examples. (16)

14. a) Write a generic class to represent an array of items that could be sorted based on > symbol. Demonstrate the use of the class to sort an array of integers, array of strings and an array of complex numbers. (16)

(OR)

b) In a banking application that supports deposit of amounts, it accepts a real number to represent the amount to be deposited. Write a class to represent a bank account and a member function to deposit money. The input to this function should a real number that can accept a number as large as a million. Use appropriate exception handling mechanism if the user enters non numeric data as input and any amount greater than a million or an amount less than zero. (16)

15. a) A supermarket uses computerized bill for the purchases. Write a program to generate the bill that uses the manipulators to print the billing information: (16)

- Supermarket name at the top. (Centre aligned)
- Date (Left aligned), time (Right aligned), cashier name (Left aligned), and bill number for reference (Right aligned).
- A table listing containing items purchased, including: (Centre aligned)
    - Serial number (S.N.) (Centre aligned)
    - Item name (Left aligned)
    - Quantity (Qty) (Centre aligned)
    - Price per unit (Right aligned)
    - Total price for that item (Qty * Price) (Right aligned)
    - Total amount due at the bottom. (Right aligned)
- A "Thank You!" message to the customer.

A sample of the bill is shown below:

```
------------------------------------------------------------
                      SUPERMARKET BILL
------------------------------------------------------------
Date: April 5, 2024           Time: 14:30:00
Cashier: Thamizh              Bill No: 123456789
------------------------------------------------------------

| S.N. |   Item Name       |  Qty  |  Price (Rs)  |  Total (Rs)   |
------------------------------------------------------------------
|  1.  |  Bread            |   2   |    Rs 20.00  |    Rs 40.00   |
|  2.  |  Milk             |   1   |    Rs 30.00  |    Rs 30.00   |
|  3.  |  Eggs (Dozen)     |   1   |    Rs 45.00  |    Rs 45.00   |
|  4.  |  Apples (1kg)     |   2   |    Rs 50.00  |   Rs 100.00   |
|  5.  |  Rice (5kg)       |   1   |   Rs 200.00  |   Rs 200.00   |
|  6.  |  Chicken (1kg)    |   1   |   Rs 160.00  |   Rs 160.00   |
|  7.  |  Soda (Can)       |   3   |    Rs 15.00  |    Rs 45.00   |
------------------------------------------------------------------
|                                    Total:      |   Rs 580.00   |
------------------------------------------------------------------
|                              Thank You!                          |
------------------------------------------------------------------
```

(OR)

b) Students' records are stored in a file with a student record containing the following information: Student ID, Name, Degree, Branch and CGPA. Write a program that will get the student ID as input and search the file for this student. The student information is printed if available and a "Not found" message in case of wrong or invalid ID. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS404 – Microprocessors and Microcontrollers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How 16 bit address is converted into 20 bit address in 8086?
2. What is the need of interrupts in microprocessor operations?
3. Compare closely coupled and loosely coupled configurations.
4. Define Bus. Why bus request and cycle stealing are required?
5. Identify the advantages and disadvantages of parallel communication over serial communication.
6. Why memory interfacing is required?
7. List out the ports available in 8051 microcontroller.
8. Mention some of the 8051 special function registers.
9. Identify the features of 8051 serial port in Mode-0.
10. What are the various types of sensors that can be interfaced with 8051?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the architecture of 8086 with a neat diagram. (16)

(OR)

b) Explain the various addressing modes of 8086 microprocessor. (16)

12. a) Examine the various operations of I/O programming in 8086. (16)

(OR)

b) Explain about the closely coupled configuration of 8086 based multiprocessing system with a suitable diagram. Mention the advantages of multiprocessor configuration. (16)

13. a) Examine how to interface a DMA controller with a microprocessor. Inspect how DMA controller transfers large amount of data from one memory location to another memory location. (16)

(OR)

b) i) Discuss how to interface an LCD display with 8086 microprocessor. (8)

ii) Write a program to display a character using LCD display. (8)

14. a) Draw and explain the pin configurations of 8051 microcontroller. (16)

(OR)

b) i) Demonstrate about the arithmetic and control instruction set in 8051. (8)

ii) Write an ALP to multiply the given numbers 48H and 30H. (8)

15. a) Explain about the interfacing of keyboard and display using 8051 microcontroller with a neat diagram. (16)

(OR)

b) Explain about the procedure to interface stepper motor with 8051 and write an ALP to run the stepper motor in both forward and reverse direction with delay. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS405 – Microprocessors and Microcontrollers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish NOP and HLT instructions.
2. Draw the flag register of 8086.
3. Differentiate minimum mode and maximum mode in 8086 microprocessors.
4. Describe influence of READY signal on Bus timings of 8086 microprocessor.
5. Write the role of ALE in 8086 Interfacing.
6. Appraise the purpose of DMA controller in microprocessor.
7. Evaluate the values to be loaded to TH0 and TL0 in the following assembly language code snippet for generating 1 second delay.
   MOV TMOD, #0x01
   MOV TH0, #0x____
   MOV TL0, #0x____
8. State the concept of special function registers in 8051 microcontrollers.
9. List the four types of interrupts supported by the 8051 microcontrollers.
10. What is the interrupt vector addresses associated with INT0 and INT1.(external interrupt pins on the 8051 microcontrollers)?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail about the internal architecture of 8086 microprocessor with neat sketch. (10)

    ii) Describe the process of entry and exit steps of an interrupt service subroutines (ISRs) when an interrupt occurs. (6)

(OR)

b) Write an assembly language program to calculate the factorial of a given number n. The number n should be input by the user, and the result should be stored in a specified memory location. Explain each step with suitable comments. (16)

12. a) i) Explain in detail about the system bus structure. (8)

ii) Elucidate READ and WRITE operation with timing diagrams and how the system bus contributes to the overall performance and efficiency of the 8086 system. (8)

(OR)

b) Describe the multiprocessor configurations supported by the 8086 microprocessors. Compare and contrast closely coupled and loosely coupled configurations, by mentioning their advantages and disadvantages. Furthermore, explain the role of coprocessors in these configurations and how they contribute to the system's performance. (16)

13. a) Explain with a neat sketch the process of interfacing an Analog-to-Digital Converter (ADC) with the 8086 microprocessors. Provide a complete assembly language program to read an analog input, convert it to a digital signal using the ADC, and display the result. Include a detailed explanation of the code with comments and the interfacing process. (16)

(OR)

b) Explain the process of interfacing a keyboard and a display with the 8086 microprocessors. Discuss the hardware and software components required for effective interfacing, the keyboard, display, and the microprocessor. Further provide the suitable assembly language program with a neat interfacing diagram. (16)

14. a) Discuss the architecture of the 8051 microcontrollers with a neat sketch, highlighting its key components, such as the CPU, internal memory, and external memory. (16)

(OR)

b) i) Explain the different types of addressing modes used in the 8051 microcontrollers, providing examples for each mode. (8)

ii) Write an assembly language program to blink an LED at 1 second delay. Note: LED is connected to pin P1.0 of 8051. (8)

15. a) i) Analyze the serial communication protocol used by the 8051 microcontrollers. Describe the steps involved in configuring the serial port and transmitting/receiving data using the serial port. (8)

ii) Assume that the crystal frequency is 11.0592 MHz. Write an assembly language program for the 8051 microcontrollers to transmit the ASCII string "INDIA" serially at a baud rate of 9600 bps. (8)

(OR)

b) Describe the process of interfacing an LCD module with the 8051 microcontrollers with a circuit diagram. Explain the commands and data transfer protocols used for displaying characters and custom symbols on the LCD. Write an assembly language program to display a message on the LCD. (16)

Register No :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING/ELECTRICAL AND ELECTRONICS ENGINEERING

22PTCS101 – Fundamental of Problem Solving and C Programming

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the main characteristics of the computer.
2. Convert hexadecimal number D12 into decimal number.
3. Write an algorithm to calculate the addition of two numbers.
4. Define symbolic constant.
5. What are pre-processor directives in C?
6. Define storage classes. List the different classes.
7. Difference between Branching statements and looping statements.
8. What is an array?
9. List the different types of Function.
10. Compare Structure and Union.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the detail about generation of computers (8)

ii) Describe in detail about the classification of computer (8)

(OR)

b) i) Draw a neat diagram, Explain the basic organisation of a computer and list the various function performed by an each unit (16)

12. a) i) Draw the flowchart to check whether the given number is a prime number or not. (10)

ii) How will you declare the variables? Give example. (6)

(OR)

b) Explain the different data types available in C with suitable examples? (16)

13. a) Illustrate different types of operators available in C with examples. (16)

(OR)

b) i) Explain input and output statements scanf() and printf() with example. (8)

ii) Write notes on pre-processor directives. (8)

14. a) i) Explain the following control statements using examples: WHILE statement; IF ELSE IF statement. (8)

ii) Define arrays. Explain the array types with an example program for each type. (8)

(OR)

b) i) Write a C program to reverse a given string. (10)

ii) Write a C program using to string functions concatenate two strings. (6)

15. a) i) Explain in detail about recursion with examples. (8)

ii) Explain in detail about pointers with examples. (8)

(OR)

b) Write a C program that gets and displays the report of n students with their personal and academic details using structures. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

23PTCS301 – Fundamental of Problem Solving and C Programming

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write an algorithm for swapping two numbers.
2. What is a flowchart?
3. Write a C program to check if the entered age is eligible to vote or not.
4. Write a program in C to find the sum of 'n' natural numbers.
5. Define Arrays.
6. Find the output for the below program

```
#include <stdio.h>
int main()
{
   int *ptr;
   int x;
   ptr = &x;
   *ptr = 0;
   printf(" x = %d\\n", x);
   printf(" *ptr = %d\\n", *ptr);
   *ptr += 5;
   printf(" x  = %d\\n", x);
   printf(" *ptr = %d\\n", *ptr);
   (*ptr)++;
   return 0;
}
```

7. Distinguish between call by value and call by reference in functions.
8. List out the storage classes available in C programs.
9. Write a syntax for creating the structure variables.
10. What is the output of the following C code if the file "data.txt" contains the text "Hello"?

```
FILE *file = fopen("data.txt", "r");
  char str[10];
  fscanf(file, "%s", str);
  printf("%s", str);
  fclose(file);
```

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the roles of the following components in the development and execution of a C program: (8)

Editor

Compiler

Assembler

Linker

Loader

Operating System

ii) Write the general structure of C. Explain with an example. (8)

(OR)

b) i) What is an identifier (variable)? What are the rules to construct identifier (varible)? Classify the following as valid/invalid Identifiers. (8)

i) num2 ii) $num1 iii) +add iv) a_2 v) 199_space vi) _apple vii)#12

ii) Write a C program which takes as input p,t,r,n. Compute and display simple interest and Compound interest. (8)

12. a) i) List all conditional control statements used in C. Explain any two with syntax and example. (8)

ii) Implement a C program to find the reverse of an integer number and check whether it is palindrome or not. (8)

(OR)

b) i) List the differences between while loop and do-while loop. write a C program to find sum of Natura numbers from 1 to N using for loop. (8)

ii) Write a C program that takes from user an arithmetic operator („+“, „-„, „*“, or „/“) and two operands. Perform corresponding arithmetic operation on the operands using switch statement. (8)

13. a) i) Define array. Explain with suitable example how to declare and initialize 1D array. (8)

ii) Write a C program to find the largest element in an array. (8)

(OR)

b) i) Explain string manipulation library functions with their syntaxes. (8)

ii) Write a C program to check whether the given string is palindrome or not without using in built function. (8)

14. a) i) Give the scope and lifetime of the following i)External variable ii) Static variable iii) Automatic variable iv) Register variable (8)

ii) Write a function program to find Armstrong numbers in the given range. (8)

(OR)

b) i) Explain recursive functions with example program. (8)

ii) Write a C function isprime(num) that accepts an integer argument and returns 1 if the argument is a prime or 0 otherwise. Write a program that invokes this function to generate prime numbers between the given ranges. (8)

15. a) i) Write a program in C to create and store information in a text file. (8)

ii) Write a program to maintain a record of "n" employee detail using an array of structures with three fields(id, name , salary) and print the details of employees whose salary is above 5000. (8)

(OR)

b) i) Explain array of structure and structure within a structure with an example. (8)

ii) Write a C program to read the file 'input.txt' to count the number of vowels. (8)

CSE

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

MECHANICAL ENGINEERING

23PTCS301 – Fundamental of Problem Solving and C Programming

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the characteristics of computer.
2. Convert the decimal number 175.25 into hexa decimal.
3. How will you declare the variable? Give example.
4. Define symbolic constant.
5. What is meant by ternary operator? Give example.
6. Define preprocessor directives. List any 4 directives.
7. How will you declare and initialize an array?
8. Define string. Give example.
9. What is meant by function? List any 4 Library functions.
10. Compare structure with union.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain the computer generations.	(10)
		ii)	Describe the evaluation of computer.	(6)
			(OR)	
	b)	i)	Draw the block diagram of basic computer organization of computer. Explain its functions.	(10)
		ii)	Classify the computers based on their characteristics.	(6)
12.	a)	i)	Draw the flowchart to check the given number N is palindrome or not.	(8)
		ii)	Write an algorithm to find the roots of the quadratic equation.	(8)
			(OR)	
	b)	i)	Illustrate the datatypes available in C with example.	(8)
		ii)	What is meant by identifier? What are the rules following the naming identifier? Give example.	(8)

13. a) Analyze the operators available in C with example. (16)

(OR)

b) Demonstrate the managing of input, output operations and storage classes. (16)

14. a) i) Examine the branching statements in C with example. (8)

ii) Analyze the looping statements with example. (8)

(OR)

b) i) Write a C program to perform matrix addition. (8)

ii) Write a C program to demonstrate the string functions. (8)

15. a) i) Compare the call by value and call by reference with example. (8)

ii) Write a C program to calculate the factorial of N using function. (8)

(OR)

b) i) Illustrate the structure with example program. (8)

ii) Describe the pointers and pointers arithmetic's with example. (8)

gister Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES EXCEPT EEE

22CS101 – Problem Solving and C Programming

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the advantages and disadvantages of High level programming language over Machine level language.
2. Outline the algorithm for finding the greatest among the given three numbers.
3. Compare while and do-while loop statement in C.
4. What is break statement? Mention its use.
5. How to access array elements using pointers?
6. Demonstrate the use of Strlen() in C?
7. Show the syntax of function definition in C.
8. Define recursion.
9. Differentiate between structure and union.
10. What are the different modes of file opening in C?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Identify the functions of Compiler, Linker, Assembler and an Operating System. (8)

ii) Build a flowchart and Pseudo code for generating the Fibonacci series up to 'n' terms. (8)

(OR)

b) i) Show the operator precedence and associativity in C. Apply the precedence and evaluate the expression : 5*(3+4)%35-28/7 (8)

ii) Classify the various Pre-processor directives with examples. (8)

12. a) i) Outline the syntax of decision making statements in C. (10)

ii) Depict the flowchart for solving the Quadratic equation for all possible cases. (6)

(OR)

	b)	i)	Illustrate the use of switch case statement to design a basic calculator.	(10)
		ii)	Outline an algorithm to find the given number is a prime or not.	(6)
13.	a)	i)	Show the C code to sort the given 'n' numbers in ascending order.	(8)
		ii)	Write a C program to perform two dimensional matrix multiplications.	(8)
			(OR)	
	b)	i)	Explain the relation between arrays and pointer with an example.	(8)
		ii)	Classify the various string handling functions with examples in C.	(8)
14.	a)	i)	Analyze the C code to sort the given 'n' numbers using function.	(10)
		ii)	Classify the various storage classes supported in C.	(6)
			(OR)	
	b)	i)	Elucidate the parameter passing mechanisms used in C.	(10)
		ii)	Develop a C program to find the factorial of a given number using recursion.	(6)
15.	a)	i)	Analyze the concept of nested structure with an example.	(10)
		ii)	Examine the role of pointers to structure in C.	(6)
			(OR)	
	b)	i)	List the procedure to access the members in union with a simple C program.	(10)
		ii)	Assess how to read and write a file in C.	(6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V & VI Semester (Full Time)

(2018 Regulations)

ECE/EEE/MECHANICAL ENGINEERING

18CSOE01 – Object Oriented Programming using C++

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare the operators << and >> in C++ and mention their precedence.
2. State the advantages of default arguments.
3. List out any four features of destructor.
4. Mention the benefits of type conversion.
5. Write the prototype for a typical pure virtual function.
6. Distinguish between early binding and late binding.
7. List any five common examples of exceptions.
8. Identify How is an exception handled in C++.
9. What is file mode? List any four file modes.
10. State the file stream classes used for creating input and output files.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write a C++ program with Class that checks whether the given number is odd or even and displays result. (10)

ii) List and explain the various access specifiers in C++ (6)

(OR)

b) i) Write a C++ program with Class that performs arithmetic operations and display results. (10)

ii) List and explain about merits and demerits of object oriented methodology. (6)

12. a) i) Write a C++ program to demonstrate parameterized and copy constructors. (12)

ii) Give the rules for operator overloading and list which operators cannot be overloaded. (4)

(OR)

b) i) Write a C++ program to add two complex numbers using operator overloading. (12)

ii) List the special characteristics of friend function. (4)

13. a) i) Illustrate the concept of multiple inheritance with suitable C++ program. (12)

ii) Mention the uses of this pointer. (4)

(OR)

b) i) Illustrate the concept of pointers to object with suitable C++ program. (12)

ii) Assess the importance of virtual functions. (4)

14. a) i) Write a C++ program using class template for finding the scalar product for int type vector and float type vector. (10)

ii) Explain how rethrowing of an exception is done. (6)

(OR)

b) i) Write a C++ program that illustrates multiple catch statements. (10)

ii) Write the syntax for member function template and explain. (6)

15. a) i) Discuss in detail the unformatted I/O operations with example program. (10)

ii) List and explain the use of any three manipulators with example. (6)

(OR)

b) i) A data file "DATA" contains the name and marks of a set of students. Write a C++ program that reads the contents of this file into an object, sorts the data in descending order of marks and writes the result to an output file "OUTPUT". (10)

ii) List and explain any three functions used for manipulating file pointers. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

ECE/EEE/MECHANICAL ENGINEERING

18CSOE05 - JAVA Programming

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Give the structure of java program.
2. Can a java source file be saved using a name other than class name? Justify.
3. List the different ways in which a string is created in Java.
4. Comment on the statement "Thread is a light weight process'.
5. Can we pass parameters to an applet from HTML page? How?
6. Differentiate applet and application.
7. List the different kinds of event listeners and identify its purpose.
8. Give the role of layout manager. Which layout is default in Java?
9. Identify the difference between byte stream and character stream IO classes.
10. List the type of JDBC drivers.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Elaborate the properties of object oriented programming. (8)

ii) Given an integer, n, perform the following conditional actions by implementing a Java program. (8)

- If n is odd, print "Weird"
- If n is even and in the inclusive range of 2 to 5 , print "Not Weird"
- If n is even and in the inclusive range of 6 to 20, print "Weird"
- If n is even and greater than 20 , print "Not Weird"

(OR)

b) i) Discuss why java is said to be platform independent. (8)

ii) You have x number of $5 notes and y number of $1 notes. You want to purchase an item for amount z. The shopkeeper wants you to provide exact change. You want to pay using a minimum number of notes. How many $5 notes and $1 notes will you use? Implement a program to find out how many $5 notes and $1 notes will be used. If an exact change is not possible, then display -1. (8)

12. a) i) Discuss about constructor overloading with suitable examples. (8)

ii) Write a java program to calculate the sum of even numbers present in the array using functions. Pass the input array to the function and return the calculated sum to the main method and display the result. (8)

(OR)

b) i) Demonstrate how a thread is created using extends Thread. (8)

ii) Write a program in which an array of integer data has to be initialized. During the initialization, if a user enters a value other than integer value, then it will throw "Input Mismatch Exception" exception. On the occurrence of such an exception, your program should print "You entered bad data." If there is no such exception it will print the total sum of the array. (8)

13. a) i) Explain the life cycle of applets with neat diagram. (8)

ii) Write an applet to accept username in the form of parameter and print " Hello<username>" (8)

(OR)

b) i) Explain the methods in graphics class with example. (8)

ii) Write a program in Java such that it creates a frame containing a smiling face using Graphics class. (8)

14. a) i) Discuss about the event handling mechanism in Java. (8)

ii) Create an application having buttons to add and subtract two numbers. Use suitable event listeners to calculate the values and display the result. (8)

(OR)

b) i) Discuss about the different types of layouts in Java AWT. (8)

ii) Create a java program that uses a Dialog box to read three letter input for a month from user and the using a switch case displays the number of days in the month in a dialog. If no such month is there, then display an error message using dialog box. Example: if the input is "MAR", then the ouput is "March month has 31 days". If the input is "XXX" then display error message " No such Month" (8)

15. a) i) Discuss about character stream, explain any one class under character stream with suitable example. (8)

ii) Write a java program, to read input from a file and count the number of characters in the file and display it as output. (8)

(OR)

b) i) Illustrate the steps to connect to the database in java? (8)

ii) Write the required code in order to update the following data in the table 'PLAYERS'. (8)

Column	UID	First_Name	Last_Name	Age
From	1	Ram	Gopal	26
To	1	Ram	Gopal	24

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18CSOE04 – Python Programming

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define lists and tuples.
2. State about logical operators available in python language with example.
3. Examine a simple program to find the factorial of number n.
4. Mention the purpose of Pass statement in python with suitable example.
5. Illustrate Assertions with an example.
6. What is a module? Write the syntax for creating the module and renaming the module.
7. Compare Local variable with Global variable.
8. Illustrate recursive function with an example.
9. Differentiate between static and class methods.
10. Write short notes on regular expression.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) List out the various features of Python and explain it with suitable example. (8)

ii) Demonstrate with code the various operations that can be performed on String. (8)

(OR)

b) Describe the following (16)

i) Creating the list
ii) Accessing values in the lists
iii) Updating the list
iv) Deleting the list elements

12. a) i) Describe in detail about Conditional structures in Python with example programs. (8)

ii) Explain in detail about List Comprehension with example. (8)

(OR)

b) i) Explain in detail about Control Structures with suitable examples. (8)

ii) Write a Python program to demonstrate the file I/O operations. (8)

13. a) Illustrate the concept of Exception Handling with an appropriate example. (16)

(OR)

b) i) Explain in detail about Modules in python with suitable example. (10)

ii) Create a calculator Module which contains basic arithmetic operations and use the respective operation by importing the module in the program. (6)

14. a) Describe about Functions and also illustrate different kinds of function arguments with an example. (16)

(OR)

b) Discuss in detail about Map, Filter and Reduce function in python with suitable programs. (16)

15. a) Explain in detail about Inheritance with sample programs. (16)

(OR)

b) i) Explain pattern matching Using Regular expression with example. (8)

ii) Illustrate operator overloading with suitable example. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSPE604 – Python Programming

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the features of Python.
2. Write the syntax of different loop statements in Python.
3. What is the use of functions?
4. Differentiate modules and packages.
5. How does an error differ from an exception?
6. Mention the different modes of opening a file in Python.
7. How to determine the attributes of a class?
8. What are Daemon threads?
9. Give the steps that are required to get your GUI up and running.
10. Define Web surfing.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Illustrate the use of break, continue and pass statements in Python with necessary block diagrams. (8)

ii) Show the output of the following code: (8)

```
>>> L = [1, 2, 3, 4, 5, 6, 7]
>>> print(L[3:7])
>>> print(tuple(L))
>>> print(len(L*2))
>>> print(5 in L)
```

(OR)

b) i) Outline a Python Snippet to compute the maximum of three given integers. (8)

ii) Write a Python program to create a dictionary D={1:1!, 2:2!, 3:3!, 4:4!, ... , N:N!}. (8)

12. a) i) Develop a Python code to generate first N Fibonacci numbers using recursive function. (8)

ii) Create a custom Python module named calculator.py with functions for performing addition, subtraction, multiplication and division of two numbers. Import and use these functions in another script. (8)

(OR)

b) i) A scalene triangle has all side lengths of different measures. In an isosceles triangle, the lengths of any two of the three sides are equal. In an equilateral triangle, all the lengths of the sides are equal. Write a Python code to read three sides of a triangle from the user and a function to check if the given sides form a scalene or an isosceles or an equilateral triangle. (8)

ii) Discuss in detail about different kinds of Arguments used in a function. (8)

13. a) i) Write a Python program to read a string and print the count of its occurrence in a text file. (10)

ii) How are context managers used in handling exceptions? (6)

(OR)

b) i) Write a Python code that uses an assert statement inside a loop to check if all elements in a list are even numbers. (10)

ii) Create a user-defined exception Negative Number Error and raise it when a function receives a negative number as input. (6)

14. a) i) Explain in detail about regular Expression with suitable illustration. (10)

ii) Write a Python program to extract only the domain names from valid email addresses read using regular expressions. A valid email address must have a username with letters, numbers, dots, or underscores followed by @ symbol, domain name with letters and a period. (6)

(OR)

b) i) Consider a class 'Inventory' with attributes item_name and quantity. Write a Python code to overload the '+' operator to add quantities of the same item and overload the '==' operator to check if two inventories have the same quantity. (10)

ii) Outline a recursive Python function to compute the sum of first N natural numbers using multiple threads. (6)

15. a) i) Create a multithreaded chat client that has separate threads to monitor user input (and sends the message to the server for broadcast) and another thread to accept incoming messages to display to the user. The client front-end GUI should have two portions of the chat window: a larger section with multiple lines to hold all the dialog, and a smaller text entry field to accept input from the user. (10)

ii) Develop a Python code to output the contents of any existing database table into an HTML table. (6)

(OR)

b) i) Design a database for managing an inventory system with tables for products, warehouses, and stock. Write Python script to add or remove stock for a specific product in a warehouse. (10)

ii) Build a web application in Python that fetches weather data from an external API (e.g., OpenWeatherMap) and displays it for a user-specified city. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

CIVIL ENGINEERING/ELECTRICAL AND ELECTRONICS ENGINEERING

23PTCS101 – Fundamental of Problem Solving and C Programming

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down the value of $(111101)_2$ in decimal base.
2. Write down the functionalities of each unit in a basic computer.
3. What are the characteristics of modular programming?
4. Use of Comments in C program reduces the speed of execution of a program. Justify your answer.
5. Modify the statement using conditional operators.

```
If (x>y)
   A = x
else
  A = y
```

6. Assume the code segment of a C program.

```
char s1[] = "New Delhi";
char s2[ ] = "Bangalore";
strncpy (s1,s2,3);
printf("%s",s1);
```

What is the output of the program?

7. What happens when an array with a specified size is assigned with values more than the specified size?
8. Why do we need a terminating null character in a string?
9. Define a union called cricket to describe the information player name, team name, batting average
10. Write any two rules to initialize structure variables at compile time.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) List out the characteristics of basic Computer. (6)

ii) Compute the value of x in $45.67_8 = (x)_2$ and $21.05_8 = (x)_2$. (10)

(OR)

b) i) Compute the value of x in $27C84.B_{16} = (x)_2$ and $ABC_{16} = (x)_2$ (10)

ii) Explain the different Classifications of computers. (6)

12. a) Write a C program to print the size of various data types in C. (16)

(OR)

b) Write algorithm and draw flowchart to find if the given number is odd or even. (16)

13. a) Write a C program to read a character from keyboard and prints it in reverse case. (16)

(OR)

b) Write a C program to find the number of and sum of all integers greater than 100 and less than 200 that are divisible by 7. Write down the rules for naming identifiers. (16)

14. a) Write a C program to print transpose of a matrix. (16)

(OR)

b) Given a string (16)

char str [ ] = "123456789";

Write a C program that display the following;

```
        1
      2 3 2
    3 4 5 4 3
  4 5 6 7 6 5 4
5 6 7 8 9 8 7 6 5
```

15. a) i) Describe three different approaches that can be used to pass structures as function arguments. (8)

ii) Write a C program to generate fibonacci series using function. (8)

(OR)

b) i) Write a C program to compute the number of days an employee came late to the office by considering his arrival time for 30 days (use array of structures and functions). (8)

ii) Write a C program to print the output for the expression. (8)
4* - *p2 / *p1 + 10 if *p1=12 and *p2=4

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2018 Regulations)

COMMON TO ALL BRANCHES

18CS101 – Fundamentals of Problem Solving and C Programming

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between computer hardware and software.
2. Why are compilers and interpreters used?
3. Determine the usage of <stdio.h> in programs.
4. What does the data type of a variable signify?
5. What is the purpose of the strlen( ) function in C?
6. Define sorting.
7. What will happen when the actual parameters are less than formal parameters in a function?
8. Write a C program to print "Hello World" using pointers.
9. What is the advantage of using structures?
10. Brief the different modes in which a file can be opened in a C program.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe various generation of programming languages, and list its advantages and disadvantages of languages in each generation. (8)

ii) Write an algorithm to print the count of even numbers between 1 and 200. (8)

(OR)

b) i) Illustrate structure of a C Program and explain each part in detail. (8)

ii) Draw a flow chart for finding largest of three numbers. (8)

12. a) i) Write a C program to perform addition, subtraction, division, multiplication and modulo division on two integer numbers. (8)

ii) Write a C Program to find the largest of two numbers using ternary operator. (8)

(OR)

b) i) Explain the importance of switch case statement. In which situations is a switch case desirable? Also give its limitations. With examples. (8)

ii) Write a short note on iterative statements that are supported by C Language. (8)

13. a) i) Explain various storage classes used in C with example program in detail. (8)

ii) Why should we incorporate preprocessor directives in our programs? Justify your answer with examples. (8)

(OR)

b) i) Write a C program to add two matrices. Ensure that both matrices have the same order (dimensions). (8)

ii) Differentiate Binary search from linear search. With suitable examples. (8)

14. a) i) Explain the concept of parameter passing by (8)

1. value
2. reference between functions in detail with example program

ii) Write a C Program to find the factorial of a number using recursion. (8)

(OR)

b) i) Write a C program using pointers to search a value from an array. (8)

ii) Write a function to calculate roots of a quadratic equation. The function must accept arguments and return result using pointers. (8)

15. a) i) Write a C program using structures to read and display the information about a student. (8)

ii) Differentiate between a structure and a union. Explain how members of a union are accessed using a program code. In which applications union can be useful? (8)

(OR)

b) i) Write a short note on array of structures in C. (8)

ii) Write a C program to read a file character by character, and display it simultaneously on the screen. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS602 - Web Technology

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write an HTML code to display the below text using header tags.
   Government College of Engineering
   Department of CSE
   Salem
2. What is XHTML, and how does it differ from HTML?
3. Write an HTML code to set the logo of the company as the background image, positioning it in the top right corner.
4. Get the email ID and password of the login page and validate the page as follows.
   i. Verify that the entered password has a minimum length of 8 characters; if not, prompt an alert message.
5. Define Document Object Model.
6. When do Post() method of servlet gets called?
7. List the differences between JSP and Servlet.
8. Write a JSP program to check whether the entered number is prime or not.
9. Discuss the challenges faced while integrating a web service client with the service provider?
10. Write a simple XML Schema definition for a data type representing a Book with title, author, and publication Year attributes.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the history of HTML and list the basic tags with examples. (8)

    ii) Demonstrate the structure of the HTTP request and response message. (8)

(OR)

b) i) Assume an ABC study center maintains the timetable for handling the classes. Help the ABC study center for creating a page as follows, (8)

ABC Study Center

Time Table

Day	Forenoon session	Afternoon session
Monday	Maths	Science
Tuesday	English	Social Science
Wednesday	Maths	
Thursday	Science	Maths
Friday	Science	
Saturday		

ii) Create three frames (top, left and right) in browser display area. In the top frame display the title of the book and In left frame, you need to display the table of content. On clicking the item in table of content, relevant information should be displayed in the right side frame. Write the HTML program for the above scenario. (8)

12. a) i) Explain the different types of cascading style sheet representations with example programs. (8)

ii) Create a form for a survey on the topic of your choice. Include a variety of answer options, including text fields, dropdowns, radio button, checkboxes, and a submit button. Design the look and feel of your form using CSS Style. (8)

(OR)

b) i) Develop a registration form using HTML with the fields: Full Name, Username, Email, Gender, Address, State, Contact Number and Zip code. Write a Java Script code to perform the following validation for the form. (8)

1. Check for Empty Field: Has the user left required filed empty. If Field is empty display the alert message.
2. Check for numbers: User entered number in the contact field length should be 10 and Zip code length should be 6.
3. Email Validation: Has the user entered the valid email address.
4. State should be in drop down option.

ii) Create a function called ***checkAnswer*** in a quiz application. Its inputs should include the user's response and the right answer. If the response is correct, the function should return true; if not, it should return false. (8)

13. a) i) Explain the importance of Document Object Model. (8)

ii) Illustrate how the elements of the HTML document tree structure can be accessed using JavaScript with appropriate examples. (8)

(OR)

b) i) Describe the architecture and life cycle of a servlet. (8)

ii) Write a servlet program to implement session tracking using HTTP session object. (8)

14. a) i) Demonstrate AJAX architecture with neat diagram. (8)

ii) Write XSLT code to display employee details in a table which is stored in XML. (8)

(OR)

b) i) Explain the use of java beans classes in JSP with examples. (8)

ii) Write a servlet program to display the waiting list status, given the PNR number of a train and retrieve the data at client end. (8)

15. a) i) Explain JAX-RPC concept with suitable example. (8)

ii) Develop a web service that would do basic arithmetic operations. (8)

(OR)

b) i) Illustrate the principles of WSDL, XML and SOAP and their interaction among them in web services applications. (8)

ii) Develop the web page for student management system using web services. (8)

Register Number:

Government College of Engineering:: Salem
(An Autonomous Institution Affiliated to Anna University, Chennai)
B.E. Degree Examinations – Nov/Dec 2024
V Semester (Full Time)
(2022 Regulations)
ELECTRONICS AND COMMUNICATION ENGINEERING
22CSOE01 – Object Oriented Programming Concepts

Time: 3 Hours | Maximum Marks: 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the advantages of object oriented programming over structured programming?
2. List out the benefits of OOPS.
3. Distinguish between the following two statements:

   time T2(T1);

   time T2 = t1;

   T1 and T2 are objects of time class.
4. What is typecasting? What are explicit and implicit type conversions?
5. Give the use of 'this' pointer with suitable example.
6. What is the need of abstract class in C++?
7. Compare Function overloading and function templates.
8. Write the statement to restrict all the exceptions.
9. Mention the functions used for random accessing in files.
10. Both cin and getline() function can be used for reading a string. Comment.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Briefly describe on the objected oriented features supported by C++. (8)

    ii) Discuss how data and functions are organized in an object oriented paradigm write the major applications of OOPs. (8)

(OR)

b) i) Explain the various operators that are available on C++ with neat illustration for each it. (8)

ii) Illustrate call by reference and return by reference with a program. (8)

12. a) i) Write a C++ program to calculate sum of distance and display the results using friend function. (8)

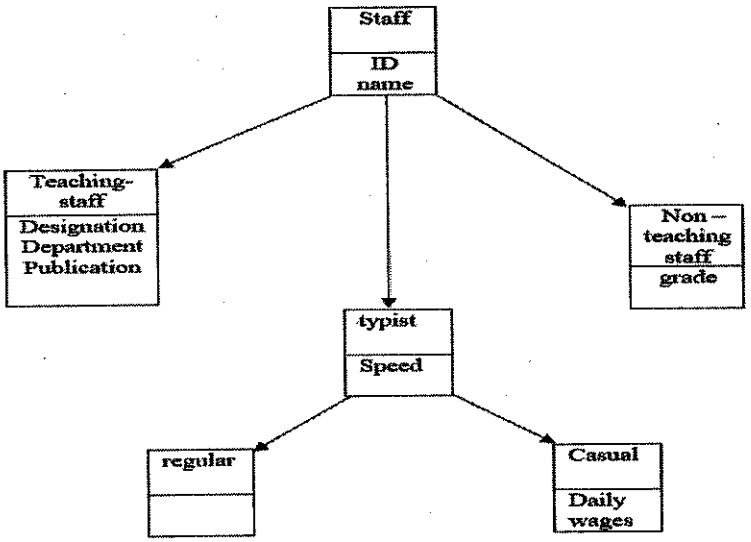
ii) Explain about the various types of access specifiers used in C++, explain with examples. (8)

(OR)

b) i) Write a C++ program to calculate root of quadratic equations by initializing the object using default constructor. (8)

ii) Write steps to overload + operator so that it can add two complex numbers. (8)

13. a) i) (10)



An educational institution wishes to maintain a data of its employees. The hierarchical relationship of related classes are as shown in figure. Define all the classes to represent above hierarchy and define functions to retrieve individual information as and when required.

ii) Distinguish between early and late binding with examples. (6)

(OR)

b) i) Write a C++ program demonstrating use of the pure virtual function with the use of base and derived classes. (10)

ii) Only destructor ca be made virtual. Justify your answer. (6)

14. a) i) Explain with example how can a class template be created. (8)

ii) Create a generic function max that gives the maximum value of three generic type arguments that are passed to it. Then test this function by calling it with char, int and float type. (8)

(OR)

b) i) Write a program that illustrates the application of multiple catch statements. (8)

ii) Write a C++ program using function template to find the product of two integer or floating point type of data. (8)

15. a) i) With a neat diagram discuss stream class hierarchy in C++. (6)

ii) Develop a program to read the "payroll.dat" file to find gross pay for each employee. (10)

(OR)

b) i) Write a C++ program using any five of the formatted I/O functions. (6)

ii) Write a C++ program involving working with a single file. Use if stream and of stream classes to write and read the information to and from a file using operators: - << and >>. Show how a file can be opened and closed. (10)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CSH403 – Digital and Mobile Forensics

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Why is Digital Forensics important?
2. How to find the Digital Evidence?
3. Define digital crime.
4. List the computer related offenses.
5. List out the usefulness of Digital Evidence.
6. How do we become ready for digital forensic investigations?
7. Define IMSI Catchers.
8. What is meant by iCloud?
9. What is meant by EDL mode?
10. Write some of the features of Android Debugging Bridge (ADB).

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Discuss in detail about Identification phase and collection phase of digital forensics process.	(16)
		(OR)	
	b)	Explain in detail about Examination, Analysis and presentation phases.	(16)
12.	a)	Elucidate about various Investigation methods for collecting digital evidence.	(16)
		(OR)	
	b)	Describe about International Cooperation used to collect Digital Evidence.	(16)
13.	a)	Elaborate the frameworks, standards and methodologies of digital forensic readiness.	(16)
		(OR)	

b) Write short notes on following, (16)

1) Digital forensic Laboratory.

2) Tools and infrastructure of digital forensics.

14. a) Explain the concepts of iOS in detail. (16)

(OR)

b) Describe the following, (16)

1) Forensic procedure and process

2) iOS forensic tools

3) Oxygen forensics

4) Mobile Edit.

15. a) i) With neat sketch, explain the general architecture of android and their tools. (10)

ii) Describe about file systems used in android. (6)

(OR)

b) i) Briefly explain about specific tools you can use to conduct the forensics analysis for android devices. (10)

ii) Write short notes on Android App decompiling. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSH206 – Web Application Security

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define authentication and authorization.
2. Why should the inputs from a form be validated?
3. What is security testing?
4. List the major phases of security incident response recommended by NIST?
5. State the purpose of session cookies.
6. What is token based authentication?
7. State the benefits of vulnerability assessment life cycle.
8. What do you mean by wireless testing?
9. What is broken authentication?
10. How do you restrict URL access?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the web application threats in detail with example for each scenario. (16)

(OR)

b) What are the security mechanisms provided by secured socket layer and transport layer? Explain in detail. (16)

12. a) Discuss about the Comprehensive Lightweight Application Security Process with neat diagram. (16)

(OR)

b) Explain Software Assurance Maturity Model for secure software development with neat sketch. (16)

13. a) Discuss the security measures against different threats with examples. (16)

(OR)

b) How do you secure service-to-service and micro-service APIs? Explain. (16)

14. a) Explain the features and functionalities of host-based and cloud based vulnerability scanners. (16)

(OR)

b) Explain external and internal penetration testing with suitable examples. (16)

15. a) Write short notes on: (16)

1) Social Engineering
2) Injection
3) Cross-site Scripting
4) Cross-site request forgery

(OR)

b) Explain the functionalities of Open VAS and Burp Suite in detail. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSH408 – Cyber Security

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention how traditional problems associated with computer crime?
2. Differentiate between identity theft and fraud.
3. List the types of evidence with examples.
4. Brief the steps to be followed when the computer is turned on in microsoft NFTS.
5. State the importance of e-mail servers.
6. List the tools to investigate and recover e-mail files.
7. Define ethical hacking with example.
8. What is meant by enumeration?
9. Compare the range of intruders skill levels.
10. Identify the purpose of intrusion detection exchange protocol RFC 4767.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Explain about the types of computer forensics techniques.	(16)
		(OR)	
	b)	Explicate about the preparation of incident response and data acquisition.	(16)
12.	a)	Explain about processing crime and incident scenes with example.	(16)
		(OR)	
	b)	Describe the current computer forensics hardware and software tools.	(16)
13.	a)	Discuss about the various data hiding techniques in detail.	(16)
		(OR)	
	b)	Describe about the Cell Phone and Mobile Devices Forensics.	(16)

14.	a)	i)	Write short notes on Footprinting and Reconnaissance.	(8)
		ii)	Explain about the importance of scanning networks.	(8)
			(OR)	
	b)	i)	Explain briefly about system hacking and its effects.	(8)
		ii)	Write short notes on sniffing with example.	(8)
15.	a)		Demonstrate host-based intrusion detection and its types.	(16)
			(OR)	
	b)		Explain honeypots with architecture diagrams.	(16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18CSM08 – Virtualization and Cloud Computing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Parallel Computing and Centralized computing.
2. Identify any two advantages of distributed computing.
3. Write briefly about Virtual Machines and its role on computing platform.
4. Mention the use of hypervisor in cloud computing.
5. Give your understanding about storage cloud.
6. Reveal the necessary information about the Docker hub.
7. Present a brief about Eucalyptus and its usage.
8. Brief about the application of Aneka framework.
9. Define Guest hopping.
10. Review a short note about challenges in IAM.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	How cloud provides Infrastructure as a service (IAAS)? Explain.	(8)
		ii)	What are the characteristics of cloud architecture that separates it from traditional one?	(8)
			(OR)	
	b)	i)	Elaborate in detail about elasticity feature in cloud.	(8)
		ii)	Investigate and describe how can a company benefit from cloud computing.	(8)
12.	a)	i)	List and discuss different types of virtualization with necessary representation.	(8)
		ii)	Outline with a short note about the problems in virtualizing in CPU, I/O and memory devices.	(8)
			(OR)	

b) i) Explicate in detail about the hypervisor and Xen architecture with a neat sketch. (8)

ii) Distinguish the special features of Hyper-V with architecture representation. (8)

13. a) i) Brief about the importance of SLA management in cloud with flow chart. (8)

ii) Delineate the important steps that need to be followed in preparing SLA's. (8)

(OR)

b) i) Narrate the challenges in High Performance computing. (8)

ii) With a schematic representation elucidate map reduce computation overflow. (8)

14. a) i) Narrate the specialty of AWS. Also, explain the best practices that help in building an application in the cloud. (8)

ii) Delineate in detail about Microsoft Azure architecture with schematic representation. (8)

(OR)

b) i) Write detailed steps to set the Google app engine environment for executing any program of your choice. (8)

ii) How consumers can deploy applications on infrastructure owned by cloud providers? Give a short overview. (8)

15. a) i) Discuss data security risks in the cloud. Explain how digital identity can overcome these risks. (8)

ii) Narrate the shortfalls of VM Migration attack. (8)

(OR)

b) i) Write a short note on the importance of Quality and Security in Cloud. (8)

ii) What is IAM and detail the segregation roles carried out by IAM when services of multiple organizations are maintained within the same geographical location? (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSH208 – Principles of Programming Languages

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Context Free Grammar.
2. Differentiate between a sentence and a sentential form.
3. State the need for scope rules.
4. What operator usually has right associatively?
5. Summarize the differences between an activation record and an activation record instance.
6. Illustrate call and return statements with an example.
7. Demonstrate the design issues for OOP languages.
8. Compile the differences between physical and logical concurrency.
9. Write the fundamentals of functional programming languages.
10. Define Logic.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss about the formal methods for describing syntax. (8)

ii) Explain about the attribute grammars. (8)

(OR)

b) i) Explain in detail about the describing semantics. (8)

ii) List the different types of parser and explain. (8)

12. a) i) List the various methods of binding and explain. (8)

ii) What are the various Primitive Data types? And Examine the various data types. (8)

(OR)

b) i) List the various assignments statements and explain. (8)

ii) Explain in briefly about the control structures. (8)

13. a) i) Define subprogram. Explain the subprogram with an example? (12)

ii) Examine the design issues of subprogram. (4)

(OR)

b) i) Explain in detail about the nested subprograms with an example? (12)

ii) Discuss the design issues of functions. (4)

14. a) Illustrate in detail about semaphores and monitors with an example. (16)

(OR)

b) Describe in detail about the exception handling and event handling with an example. (16)

15. a) i) Write short notes on Programming with Scheme. (4)

ii) Describe in detail about the lambda calculus. (12)

(OR)

b) i) Explain about Multi paradigm languages. (4)

ii) Describe in detail about the Prolog with an example. (12)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSH107 – Computer Vision

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Difference between ambient and directional light.
2. Identify the fundamental geometric transformations.
3. State the purpose of snakes algorithm.
4. Inspect the need of affinity matrix.
5. Difference between 2D and 3D feature-based alignments.
6. Define factorization.
7. What is meant by "Shape from X"?
8. Identify the purpose of Albedo and list out its applications.
9. Mention the usage of layered depth images.
10. List out the capturing techniques in video-based rendering.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Inspect the key components and concepts related to digital camera. (8)

ii) Examine briefly about the point operators with an example. (8)

(OR)

b) i) Analyze the ways how fourier transforms are employed in computer vision. (8)

ii) Examine the techniques used in image processing for multi-resolution analysis. (8)

12. a) i) Describe in detail about segmentation with example. (10)

ii) Explain about the overview of split and merge algorithm. (6)

(OR)

b) i) Elucidate briefly about mean shift algorithm. (10)

ii) Explain about the normalized cuts algorithm with an example. (6)

13. a) i) Write short notes on pose estimation and its applications. (8)

ii) Summarize the key points related to geometric intrinsic calibration. (8)

(OR)

b) i) Write short notes on spline-based motion. (8)

ii) Summarize the key points related to layered motion. (8)

14. a) Examine in detail about volumetric representation. (16)

(OR)

b) Examine about model-based reconstruction in detail. (16)

15. a) Explain in detail about light fields and lumigraphs. (16)

(OR)

b) Discuss the various methods and challenges of face recognition in detail. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CSH102 – Recommender Systems

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the goal of a recommender system?
2. List two Python libraries commonly used for implementing recommender systems.
3. What are the key components of a content-based recommender system?
4. How are classification algorithms used in content-based systems?
5. Define nearest-neighbor collaborative filtering.
6. How Pearson correlation used for computing similarity in collaborative filtering?
7. How to detect the attacks on recommender systems?
8. What is the role of anomaly detection in preventing attacks on recommender systems?
9. Differentiate online and offline evaluation.
10. Name two common accuracy metrics used in recommender system evaluation.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Compare and contrast traditional and non-personalized recommender systems. What are the advantages and disadvantages of each approach? Provide examples of real-world applications where these systems are used. (16)

(OR)

b) Describe the process of Singular Value Decomposition (SVD) and its application in recommender systems. How does SVD help to reduce the dimensionality of the data and improve the efficiency of recommendation generation? What are the potential drawbacks or limitations of using SVD in this context? (16)

12. a) Explain the high-level architecture of content-based recommendation systems, discuss the role of item profiles and user profiles. (16)

(OR)

b) Compare different classification algorithms that can be used in content-based recommendation systems. How do these algorithms improve the quality of the recommendations? (16)

13. a) Compare and contrast user-based and item-based collaborative filtering, highlighting the advantages and disadvantages of each. Provide real-world examples of where each method is used. (16)

(OR)

b) Explore the concept of rating normalization in CF. Why is it important? List the common normalization techniques? (16)

14. a) Discuss the various types of attacks that can be launched against recommender systems. What are the motivations behind these attacks? How do they differ in terms of their impact and detection difficulty? (16)

(OR)

b) Examine the strategies used for designing robust recommender algorithms. How can these algorithms be made more resilient to attacks? Discuss the trade-offs between robustness, accuracy, and user experience. (16)

15. a) Examine the goals of evaluation design in recommender systems. What factors should be considered when setting evaluation goals? How do these goals influence the choice of evaluation methods? (16)

(OR)

b) Discuss the different types of paradigms used for evaluating recommender systems, focusing on online and offline evaluation. write the advantages and disadvantages of each. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CSH407 – Cryptocurrency and Blockchain Technologies

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare centralized and distributed network.
2. List the properties of Hash Function.
3. Provide a solution to mitigate double spending.
4. What is meant by Bitcoin P2P network?
5. State monopoly problem.
6. State the use of Mining pools.
7. Mention some of the features of ethereum.
8. Define solidity.
9. What is meant by supply chain management?
10. Give the applications of blockchain in digital identity.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write a working procedure of Block chain Block. (8)

ii) Discuss about Block permissioned model of Block chain. (8)

(OR)

b) Illustrate the proof of membership and non-membership using Merkle tree. (16)

12. a) i) Interpret the advantages of scoofy coin over goofy coin. (8)

ii) Write a short note on precursor for Bitcoin scripting. (8)

(OR)

b) Explain Block mining including the different types of mining. (16)

13. a) Discuss in detail about Bitcoin's PoW system with its attack types. (16)

(OR)

b) Describe the following, (16)

Proof of Burn.

Proof of Elapsed Time.

14. a) Describe about Hyperledger fabric architecture. Also mention some of the benefits of Hyperledger fabric. (16)

(OR)

b) Formulate the creation of smart contract using ethereum. (16)

15. a) Describe about block chain and trading. Explain the limitation of block chain in supply chain finance. (16)

(OR)

b) Illustrate to prevent the fraud and identity theft in identity management with block chain. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12CS101 – Computer Concepts and C Programming

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the characteristics of the Computers.
2. Define Compiler.
3. Write the syntax for variable declaration, give example.
4. Mention few keywords.
5. List the features of switch statement.
6. Difference between while and do-while loop.
7. Define Library Functions. List any two library functions.
8. What is meant by Strings? Write syntax for declaring String.
9. Differentiate structure and union.
10. Mention any 4 file functions.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in detail about the various Generations of Computer. (16)

(OR)

b) Discuss in details about basic computer organization with neat sketch. (16)

12. a) Illustrate with an example of problem solving techniques. (16)

(OR)

b) Explain in detail about Basic data structure concepts. (16)

13. a) Explain various operators presents in C Programming. (16)

(OR)

b) Explain various branching statements with suitable flow charts for each of them. (16)

14. a) Explain the concept of Array with their types; Also give the syntax for declaration and initialization of Arrays with an example. (16)

(OR)

b) Illustrate the following, (16)

i) Any three string handling functions with an example.

ii) Write user defined function to swap two values.

15. a) Explain the concepts of structure in C. Also mention the declaration and accessing details with an example. (16)

(OR)

b) i) Describe about pointer in C with their declaration and initialization. (8)

ii) Write a C program to copy the content of one file to another file. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22CS103 – C programming for Electrical Engineers

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write a C program to find the largest of three numbers using conditional operator.
2. Distinguish while and do-while loop.
3. Which of the following array initializations are valid in a C Program? Correct the invalid initializations.
   a) int a[]=1,2,3;
   b) int TestArr[4]={0};
4. Write a C program to find average of 5 numbers using array.
5. Mention the usage of Pre-processor directives.
6. Can a function return multiple values? Illustrate with an example.
7. List the advantages of Pointer variable in C.
8. Compare structure and union.
9. Differentiate between array of pointers and a pointer to an array with an example.
10. What is the purpose of fopen () function? Write different file opening modes used with fopen () function.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write a C program to print all numbers between 2 and 'n' that are divisible by both 2 and 3 using do while loop. Read 'n' from the user. (8)

    ii) For sports events in a school, the following competitions are announced: Cricket, Running, Tennis, Football and Chess. Design the algorithm and write a C program to perform the following. From user get how many students are interested to register. If so, get the event in which the student wants to participate, and increment the number of students registered for the event by one. When all students details are entered, display count of all students registered, number of students registered for every event. For Cricket and football, check if (8)

the number of students registered for each event is less than 22. If less than 22 students are registered for cricket or football, display "cannot conduct the event".

(OR)

b) Explain the different types of Control Structures used in C. (16)

12. a) Explain how two dimensional arrays are declared and initialized in C. Create a C program to perform matrix addition and subtraction by passing arrays to a function. (16)

(OR)

b) i) Consider the following strings (8)

S1="Government College of "; S2=" Engineering";

1) Combine two strings s1 and s2
2) Reverse the combined strings
3) Find the length of the reversed string

Write a C program to do the above operations without using library functions.

ii) Discuss the various String handling functions, with their syntax and examples. (8)

13. a) i) Write a C Program to swap two variable's values using call by value and call by reference concept. (8)

ii) Write a C program to find the largest of three numbers using pointer to function (8)

(OR)

b) i) Write a C Program to generate Fibonacci series using recursive function. (8)

ii) Briefly discuss about Storage Classes with an example. (8)

14. a) A structure contains information regarding book store such as book name, book id, price, author, publication details. Create an array of structures to holds the records of N books. Write a C program to insert new book details into book stores and also print all books available in the book store according to the book id. (16)

(OR)

b) i) Write a program in C to find the maximum occurring character in a string. (8)

ii) Discuss about Passing structures as arguments to functions with an example. (8)

15. a) i) Write a C program that calculates the length of a string using pointers. The program should prompt the user to enter a string and then calculate its length by iterating through the characters using pointer arithmetic. Finally, display the length of the string. (8)

ii) Write a C Program to find sum of the series
$1/1! + 2/2! + 3/3! + ...+1/N!$ (8)

(OR)

b) i) Briefly discuss about File processing functions. (8)

ii) Write a C program to copy the content of one file into another file. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSPE802 – Business Intelligence and Its Applications

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Why do we need IT in Business?
2. What are the capabilities of Internet ready applications?
3. What is an unstructured data? Give example.
4. Give example for slice operation.
5. Why do we need Data ware house?
6. What is meta Data? Give example.
7. What are the types of facts? Give examples.
8. Show the life cycle of Dimensional Modelling.
9. Compare Score Card and Dash Board.
10. What is a balanced score card?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Briefly explain Baldridge Business Excellence Framework. (8)

ii) Perform Study on TenToTen Retail Stores in the context of Business Intelligence. (8)

(OR)

b) i) Explain a typical enterprise application Architecture. (8)

ii) Elaborate on core business functions and Processes. (8)

12. a) i) Discuss in detail characteristics and sources of unstructured data. Also explain they can be stored and managed. (8)

ii) Briefly Explain various OLAP Architectures. (8)

(OR)

b) i) Explain BI component Framework and roles and responsibilities of BI. (8)

ii) Compare Online Analytical Processing with online Transaction Processing. (8)

13. a) i) Discuss briefly Data Integration Technologies. (8)

ii) Why is Data Quality important? How do you maintain the same? (8)

(OR)

b) i) Why is Data Profiling needed? When and how will you perform the same? (8)

ii) Briefly explain ETL using Pentaho data Integration. (8)

14. a) i) Illustrate Start, Snow flake and Fact Constellation Schemas. (12)

ii) How is Data Modelling done? (4)

(OR)

b) i) Illustrate creation of Cubes in Excel. (12)

ii) Why are KPIs used in Companies? (4)

15. a) i) Why does Enterprise need Dashboards? Explain its types and steps for creating the same. (12)

ii) How will you evaluate the quality of an enterprise report? (4)

(OR)

b) i) Prepare an Enterprise report using Microsoft Excel. (12)

ii) What would be your best practices in creation of dash boards? (4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18CSM02 – Advanced Data Structures and Algorithms

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Abstract Data Type.
2. What are the advantages of using doubly linked list over singly linked list?
3. Demonstrate the infix (a+b)*(c+d)/f into postfix & prefix expression.
4. Define circular queue? How do you check the queue full condition?
5. List the real – time applications of tree data-structure.
6. Compare Min Heap and Max Heap with an example.
7. Prove that the maximum number of edges that a graph with n Vertices is n*(n-1)/2.
8. Identify the two classic algorithms for the minimum spanning tree problem.
9. Whether the heap sort is efficient than the quick sort? Justify your answer.
10. Mention the types of hashing functions?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Apply the various operations of the list ADT with examples. (16)

(OR)

b) Illustrate the steps involved in insertion and deletion of singly and doubly linked list with suitable examples. (16)

12. a) Demonstrate the Stack ADT and its operations. (16)

(OR)

b) Formulate the following expression conversion using stack: 12 + 3 * 14 – (5 * 16) +7. (16)

13. a) Construct an expression tree for the expression (a + b * c) + ((d * e + 1) * g), applying preorder, inorder and postorder traversals. (16)

(OR)

b) Construct a binary search tree for the following numbers starting from an empty binary search tree. (16)

45,26,10,60,70,30,40. Delete keys 10,60 and 45 one after the other and show the trees at each stage of deletion operation.

14. a) i) Demonstrate the algorithm of depth first search with examples. (8)

ii) Apply Prims & Kurskals Algorithm with examples. (8)

(OR)

b) i) Illustrate the algorithm of breath first search with example. (8)

ii) Describe Dijkstra's algorithm with an example. (8)

15. a) Write a C program to sort the elements using bubble sort, insertion sort and radix sort. (16)

(OR)

b) Determine the result of inserting the keys 2,3,5,7,11,13,15,6,4 into an initially empty extendible hashing data structure with M=3. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSH401 – Cyber Physical Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the key features of cyber physical systems.
2. Differentiate sequential and concurrent computation.
3. How sensors will differ from actuators?
4. Differentiate between synchronous and asynchronous models.
5. Identify the logical operators used to construct the boolean expressions.
6. Define deadlock. Give an example.
7. List out the requirements of cyber security.
8. What is meant by attack model?
9. What is meant by closed-loop system?
10. Mention the applications of cyber physical systems.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Explain any two application domains of cyber physical system.	(16)
		(OR)	
	b)	Explain about the basic principles, design and validation of cyber physical system and its challenges.	(16)
12.	a)	Illustrate with example about EDF scheduling.	(16)
		(OR)	
	b)	Explain about the fixed-priority scheduling with example.	(16)
13.	a)	Construct synchronous circuits using basic logic gates.	(16)
		(OR)	
	b)	Illustrate the concepts of asynchronous processes and its operations.	(16)
14.	a)	Elucidate the basic techniques in cyber physical system securities.	(16)
		(OR)	
	b)	Explain the attack model and its countermeasures in security of cyber physical system.	(16)

15. a) Explain about the quality attributes and challenges of the medical cyber physical system. Outline the challenges of Model-Driven development of Medical Cyber-Physical System. (16)

(OR)

b) Explain the system description and operational scenarios of Wireless Sensor Networks based Cyber-Physical Systems. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSH105 – Business Analytics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What do you meant by analytics?
2. Define Hypothesis.
3. Compare Datamart with Datawarehouse.
4. What is OnLine Analytic Processing(OLAP) in Business Intelligence?
5. Write about Business Forecasting.
6. List any four applications of Data mining.
7. Write short note on Human Resource planning.
8. What is supply chain network?
9. What is meant by Marketing Mix?
10. Define the term Sales Planning.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in detail about Analytics Life Cycle. (16)

(OR)

b) Explain in detail about Hypothesis Generation in business analytics. (16)

12. a) Analyse the uses of Data warehouse with an example. (16)

(OR)

b) Illustrate the process of Decision Making in detail with proper example. (16)

13. a) Compare and Contrast between Logic Driven and Data Driven Models in detail. (16)

(OR)

b) Explain in detail about Predictive Analysis Modelling. (16)

14. a) Describe the process of Training and Development in detail. (16)

(OR)

b) Elucidate the different applications of Analytics in HR and Supply Chain Management in detail. (16)

15. a) Explain in detail about the process of Selling. (16)

(OR)

b) Elaborate in detail about the different applications of Analytics in Marketing and Sales. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS303 – Computer Organization and Architecture

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Identify the difference between memory locations and memory addresses.
2. List any four categories of instructions based on the operations they perform and provide one example for each category.
3. List the steps involved in performing addition on floating-point numbers.
4. Subtract $(11010)_2 - (10001)_2$ using 2's complement.
5. Outline the five stages involved in the execution of an instruction.
6. Identify the role of cache memory in pipeline.
7. Draw the memory hierarchy in a typical computer system.
8. Differentiate between SRAM and DRAM.
9. Identify the primary advantage of using USB over traditional serial ports for I/O operations.
10. Name three standard I/O interfaces commonly used in modern computer systems.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the basic functional units of a computer system and explain their roles in the execution of an instruction. (8)

ii) Discuss the advantages and disadvantages of different types of buses in terms of speed, cost, and data transfer efficiency. (8)

(OR)

b) i) Discuss any four types of addressing modes and explain how they are used to access operands in an instruction. (8)

ii) Compare and contrast the different instruction sequencing methods. (8)

12. a) Analyze the design of a fast adder and explain how it improves the performance of arithmetic operations in digital circuits. (16)

(OR)

b) Illustrate how floating - point numbers are represented in IEEE 754 format and explain how arithmetic operations such as addition and multiplication are carried out using this format. (16)

13. a) Analyze the advantages and disadvantages of hardwired control versus microprogrammed control. How does each approach affect the flexibility and speed of the control unit in a CPU? (16)

(OR)

b) Apply the concept of data hazards in pipelining. Illustrate how forwarding and stalling can be used to resolve a data hazard in a pipeline. (16)

14. a) Illustrate the role of cache memory in a computer system. How does it improve the performance of a CPU by storing frequently accessed data? (16)

(OR)

b) Compare and contrast the concept of virtual memory with physical memory. How does virtual memory allow a system to use more memory than is physically available? (16)

15. a) Illustrate how a system can use Direct Memory Access to transfer data quickly between a network card and the main memory. Describe how you would ensure proper timing and synchronization between the DMA controller and the system to make the data transfer efficient. (16)

(OR)

b) Illustrate how a typical PCI bus works to facilitate communication between a peripheral device and the CPU. Discuss how it handles data transfers and provides device addressing. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDC12 – Computer Aided Modeling and Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Give the general configuration of a CAD computer system.
2. List the output primitives.
3. Mention the limitations of the non-parametric representation of a curve.
4. Differentiate Bezier surfaces and Hermite cubic surfaces.
5. List any four of the advantages of NURBS.
6. What are the solid primitives used in CAD?
7. Define assembly tree.
8. What is the role of tolerance in an assembly?
9. List any four hidden line algorithm.
10. Differentiate raster algorithm with vector algorithm.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the mid-point circle algorithm. Develop a pseudo-code for constructing a circle using this algorithm. (16)

(OR)

b) i) Translate a triangle ABC with coordinates A (1, 1), B (5, 2), and C (3, 3) about the origin by three units in the x-direction. (12)

ii) How an image is generated and maintained in a direct beam refresh terminal? (4)

12. a) Determine the equation of the plane that passes through the points P_0 (1,2,3), P_1 (3,4,-1), and P_2 (1,-2,2). Find the coordinates of the center point of the plane. Also find the tangent vectors and the normal vector at this point. (16)

(OR)

b) i) Summarize the characteristics of a Bezier curve. (8)

ii) Describe the characteristics of a B-spline curve. (8)

13. a) Explain the architecture of NURBS with an example. (16)

(OR)

b) Sketch and explain the following feature operations using CSG. (16)

i) Extruded

ii) Revolved feature

iii) Chamfer

iv) Pocket.

14. a) With the help of an example, explain the concept of interferences of positions and orientation in which the parts are to be assembled. (16)

(OR)

b) i) Describe the datum features with a neat sketch. (8)

ii) How is a computer animation is helping in assembly of parts? Explain in detail. (8)

15. a) Discuss the steps involved in hidden line removal algorithms with neat sketches. (16)

(OR)

b) List the algorithms used for rendering a 3D image. Explain any one algorithm in detail. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSPE607 – Data Mining and Warehousing

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Identify the steps involved in the process of KDD. How does it relate to data mining?
2. What is meant by interestingness of pattern?
3. Classify the Data Cube.
4. What is Data warehousing? Explain the benefits of Data warehousing.
5. Mention the features of Decision tree induction.
6. Define the Bayes classification.
7. What the services are provided by grid based clustering?
8. State the design goals of constraint based clustering methods.
9. What is meant by Spatial Database?
10. Define Text Database.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain the various data mining functionalities in detail.	(8)
		ii)	Explain in detail about the data mining task Primitives.	(8)
			(OR)	
	b)	i)	Explain the integration of data mining system with a data warehouse.	(8)
		ii)	Write short note on the issues of data mining.	(8)
12.	a)		Explain the multidimensional data model with an example.	(16)
			(OR)	
	b)		Explain the Data warehouse architecture with neat diagram.	(16)
13.	a)	i)	Summarize in detail about constraint and correlation based association mining.	(12)
		ii)	How would you evaluate accuracy of a classifier? Explain.	(4)
			(OR)	

b) i) Define classification? With an example explain how support vector machines can be used for classification. What are the prediction techniques supported by a data mining systems? (12)

ii) Formulate the principle frequent item set and closed item set. (4)

14. a) Identify the steps in K-means algorithm and evaluate the following table using K- means. (16)

Subject	A	B
1	1.0	1.0
2	1.5	2.0
3	3.0	4.0
4	5.0	7.0
5	3.5	5.0
6	4.5	5.0
7	3.5	4.5

(OR)

b) Demonstrate in detail about model based clustering methods and Density based methods. (16)

15. a) i) What additional preprocessing steps are needed for data mining of complex data types? Explain. (12)

ii) Discuss about the Multimedia Database. (4)

(OR)

b) i) Explain in detail about the applications and trends in data mining. (12)

ii) Discuss about the World Wide Web. (4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18CSOE08 – Neural Networks

(Hand-held Calculators to be Permitted)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is a recurrent network?
2. Consider a two-input neuron with a weight matrix as [1 -1] and a bias value of 1.5. Draw the output graph plotted against inputs P1 and P2 for the activation function hard limits. (Symmetrical)
3. Choose an appropriate decision boundary that can separate dark and light points. Find the weight and bias based on the chosen boundary. Shown in figure.1.

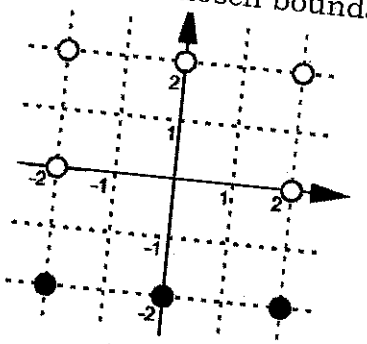


Figure.1

4. Write the unified learning rule for updating bias for a perceptron network.
5. State Hebb's Postulate.
6. Write the variants of Hebb's learning rule and its implication.
7. Mention some applications of the ADALINE network.
8. How Hopfield network differ from other learning networks?
9. Mention a few applications of neural networks in the medical field.
10. What is SOFM?

(5 x 16 = 80 Marks)

Part B

Answer ALL Questions

11. a) i) Design a perceptron network that outputs 1 and -1 for the following vectors: $\left\{P = \begin{bmatrix}-1\\0\end{bmatrix}, \begin{bmatrix}1\\2\end{bmatrix} a = 1\right\}$ $\left\{P = \begin{bmatrix}-1\\1\end{bmatrix}, \begin{bmatrix}0\\2\end{bmatrix} a = -1\right\}$ (10)

Find and sketch a decision boundary for a network that will solve this problem. Find weights and biases that will produce the decision boundary.

ii) Draw the network diagram and verify the designed network solves the problem for the given vectors as inputs. (6)

(OR)

b) i) Design a Hamming network to recognize the following prototype vectors: $\left\{P = \begin{bmatrix}1\\1\end{bmatrix}, \begin{bmatrix}-1\\-1\end{bmatrix}, \begin{bmatrix}-1\\1\end{bmatrix}\right\}$ (10)

Find the weight matrices and bias vectors for the Hamming network.

ii) Apply the input vector $P = \begin{bmatrix}1\\0\end{bmatrix}$ to calculate the total network response. (6)

12. a) i) Train a perceptron network with the following training set: (12)

$$\left\{p_1 = \begin{bmatrix}-1\\-1\end{bmatrix}, t_1 = 0\right\}; \left\{p_2 = \begin{bmatrix}0\\0\end{bmatrix}, t_2 = 0\right\}; \left\{p_3 = \begin{bmatrix}-1\\1\end{bmatrix}, t_3 = 1\right\}$$

The initial weight and bias as $w(0) = [1 \quad 0]$; $b(0) = 0.5$.

Train the network with the perceptron rule and present each input vector along with the respective output for each iteration.

ii) Plot the final decision boundary to demonstrate graphically the patterns are correctly classified. (4)

(OR)

b) i) Explain the proof of convergence of the perceptron learning rule under the condition that a solution does exist. (12)

ii) Highlight the limitation of the perceptron learning rule. (4)

13. a) i) Apply the unsupervised learning (instar's rule) to establish linear associations in classifying an orange. The network has two inputs, one the actual visual (w^0) of the orange and the other one includes three features of the orange. (12)

$$\left\{p_1^0 = 0, p(1) = \begin{bmatrix}1\\-1\\-1\end{bmatrix}\right\}; \left\{p_2^0 = 1, p(2) = \begin{bmatrix}1\\-1\\-1\end{bmatrix}\right\};$$

ii) Describe the Kohonen rule in associate learning. (4)

(OR)

b) i) Describe a simple recall network that can perform pattern recall by associating a stimulus with a vector using a suitable illustration. (12)

ii) Derive learning equations using Outstar's rule. (4)

14. a) i) Explain how the LMS algorithm helps in the learning rule of ADALINE networks. (12)

ii) Calculate the maximum stable learning rate in the LMS algorithm to the following target inputs and outputs. (4)

$$\left\{P = \begin{bmatrix} 1 \\ -1 \\ -1 \end{bmatrix}, t = -1\right\} \left\{P = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}, t = -1\right\}$$

(OR)

b) i) Illustrate the backpropagation algorithm for a chosen network and apply it to a particular problem. (12)

ii) Compare incremental training and batch training. (4)

15. a) i) Explain the techniques adopted in adaptive noise cancellation applications. (10)

ii) Demonstrate a network that can work as an adaptive filter. (6)

(OR)

b) i) Explain the application of supervised learning in pattern recognition problems. (10)

ii) Illustrate one application of neural networks for prediction. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS704 – Mobile Computing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the difference between mobile computing and mobile communication.
2. What is the need of guard bands in FDMA?
3. What is meant by route optimization?
4. Define encapsulation in mobile IP.
5. Define handoff. Write its type.
6. Mention the main elements of UMTS.
7. List the applications of MANET.
8. Discriminate proactive and reactive.
9. What are the special constraints and requirement of mobile OS?
10. What is M- commerce? State their pros and cons.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the characteristics of mobile computing. (8)

ii) Demonstrate the structure of mobile computing applications. (8)

(OR)

b) i) Explain the Fixed assignment and Demand based allocation schemes. (8)

ii) Illustrate the issues in the wireless MAC. (8)

12. a) i) Explain DHCP protocols architecture with neat diagram. (8)

ii) Elaborate IP-in-IP, minimal IP and GRE encapsulation methods. (8)

(OR)

b) i) Draw the architecture of TCP/IP and explain in detail. (8)

ii) Explicate the TCP congestion control algorithm. (8)

13. a) Draw the GSM architecture and explain different subsystem in detail. (16)

(OR)

b) Explicate GPRS protocol architecture. (16)

14. a) Illustrate the routing recovery and routing maintenance in DSR. List its merits and demerits. (16)

(OR)

b) Describe the architecture of VANET with functionality of each component. Compare VANET with MANET. (16)

15. a) Explain Android platform with its features, software stack and SDK. (16)

(OR)

b) Illustrate the process of mobile payment and security issues. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

MECHANICAL ENGINEERING

23PTME103 – Manufacturing Technology - I

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write short notes on theory of metal cutting.
2. What is flank wear? List out the causes of flank wear.
3. List out the work holding devices used in lathe.
4. What do you mean by multi spindle automatic lathe? How it will differ from single spindle lathe?
5. How the planer machine differs from shaper machine?
6. What are the different methods of indexing?
7. Explain the specification of grinding wheel given as "51 A 36 L 5 V 40 51".
8. Compare pull and push type broaching.
9. Define NC, DNC and CNC systems.
10. What is canned cycle in part programming?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With the aid of neat sketch, describe the mechanism of chip formation. (8)

ii) Explain the various types of chips formed while machining. (8)

(OR)

b) i) Explain the characteristics of various cutting tool materials. (8)

ii) What is Taylor's tool life equation? Compare the tool life of two cutting tools namely HSS and carbide at a speed of 30 m/min. The tool life is 130 min. The tool life equation for HSS tool is given by $VT^{1/7} = C1$ and for carbide $VT^{1/5} = C2$ at a cutting speed of 24 m/min. (8)

12. a) i) Briefly explain any two taper turning method with neat sketch. (10)

ii) A solid work piece of 40 mm diameter and 160 mm long is to be turned over in 4 passes. If the approach length is 15 mm, over travel 10 mm, feed 0.8 mm/rev and cutting speed 30 m/min. Find the machining time. (6)

(OR)

b) i) Classify automatic lathes. Explain the features of Swiss type automatic lathe with clear sketch. (10)

ii) Compare the various features of capstan and turret lathe. (6)

13. a) i) Explain any five operations performed on a milling machine with suitable sketch. (12)

ii) Explain up milling and down milling operation with sketch. (4)

(OR)

b) i) Describe with neat sketch, the quick return mechanism used in shaper machine. (4)

ii) Brief the following with clear sketch. (12)

i) Drilling
ii) Boring
iii) Reaming
iv) Tapping

14. a) Explain the following surface finishing processes. (16)

i) Honing
ii) Lapping
iii) Polishing
iv) buffing

(OR)

b) Classify broaching machine and Explain the construction and working of horizontal broaching machine with neat sketch. (16)

15. a) Explain the constructional and special features of CNC machine. Mention its advantages and disadvantages of CNC system. (16)

(OR)

b) Write a part program for the part given in figure 1. (16)

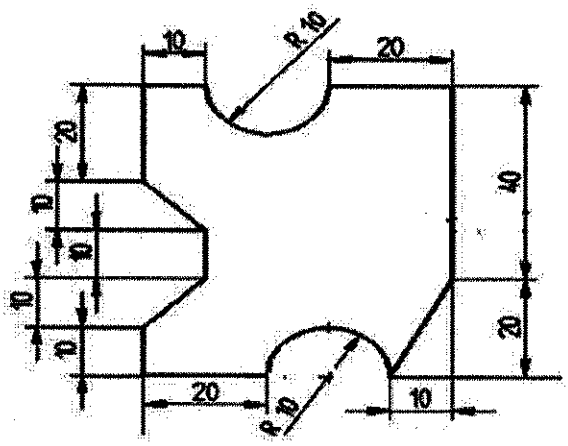


Figure 1.

Register Number :

Government College of Engineering :: Salem
(An Autonomous Institution Affiliated to Anna University, Chennai)
B.E. Degree Examinations – Nov/Dec 2024
III Semester (Part Time)
(2023 Regulations)
CIVIL ENGINEERING
23PTCE304 – Construction Technology and Equipments

Time : 3 Hours Maximum Marks : 100

Part A

Answer ALL Questions (10 x 2 = 20 Marks)

1. What are the requirements of foundations?
2. When under reamed piles are preferred?
3. Define quoins in masonry.
4. Mention few rules to be followed in brick masonry for good bonding.
5. What are the factors that affect the choice of floor finishes?
6. List the materials commonly used for damp proof course.
7. Give the thumb rule for proportioning rise and tread of a stair.
8. State the requirements of good roof.
9. What are the common sizes of door adopted for external door of residential building and public buildings?
10. What are the requirements of good form work?

Part B

Answer ALL Questions (5 x 16 = 80 Marks)

11. a) i) Enumerate the reasons for causes of failure of foundation and explain the remedial measures. (10)

ii) Write a note on settlement of foundation. (6)

(OR)

b) i) Suggest the type of deep foundation adopted for different soil conditions and situations and explain them. (10)

ii) What are the objectives of foundation? (6)

12. a) i) Discuss in detail the common types of joints used in stone masonry. (10)

ii) Compare stone masonry and brick masonry. (6)

(OR)

b) i) Draw the plan of 1- brick thick wall using English bond and Flemish bond. Also discuss their essential features. (10)

ii) Explain the factors influencing strength of brick masonry. (6)

13. a) Justify the type of flooring suitable for i) Residential buildings ii) Industrial building iii) Hospitals iv) Auditoriums. Also explain the construction procedure for each of them. (16)

(OR)

b) Explain the causes, effects of dampness and the methods adapted to damp proof buildings. (16)

14. a) Suggest the usage of following stairs and explain in detail their salient features. (16)

i) Turning stairs

ii) Continuous stairs

(OR)

b) Write a detailed note on the following types of roofing. (16)

i) Pitched roof

ii) Hip roof

iii) Gable roof

iv) Flat roof

15. a) Discuss the following with neat sketches. (16)

i) Raking shore

ii) Pit method of underpinning

iii) Masons scaffolding

iv) RCC lintels

(OR)

b) Discuss the various methods of plastering and pointing. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

MECHANICAL ENGINEERING

23PTME303 – Engineering Materials and Metallurgy

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is an equilibrium phase diagram?
2. Compare peritectic and eutectoid reactions.
3. What is austempering?
4. Name any two shallow hardening processes.
5. Composite materials are replacing metallic materials in many engineering applications-comment.
6. Differentiate between composite and an alloy. Give one example.
7. Define twinning process.
8. List the main parameters which may be determined in a tensile test.
9. What is surface engineering and why is it important in material science?
10. What is the role of elastic contact mechanics in understanding surface engineering?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss on substitutional solid solution with an example. Explain the factors that affect the formation of substitutional solid solution. (16)

(OR)

b) Draw a neat sketch of Iron-Carbon Equilibrium diagram and label the various phase fields. Also explain the various invariant reactions. (16)

12. a) Write a short notes on the following: (16)

i) Full annealing

ii) Recrystallation annealing

iii) Normalizing

iv) Hardening

(OR)

b) Explain the principle and procedure of Jominy end quench test with a diagram. Also sketch the graph hardness Vs distance from quenched end. (16)

13. a) List the important engineering ceramic materials and discuss its general applications of ceramic materials in various engineering fields. Also list the advantages and disadvantages of ceramics? (16)

(OR)

b) Explain in detail various types of composites. (16)

14. a) What are the deformation mechanisms that are encountered in metallic materials? Discuss any one of the deformation mechanism in detail. (16)

(OR)

b) Name and explain the different types of hardness tests with respect to the procedure, relative advantages and disadvantages. (16)

15. a) What are some of the most common NDT methods. and how are they selected based on material and defect type? Explain in detail. (16)

(OR)

b) What are different types of diffusion techniques. and how do they modify surface properties? Explain in detail. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2023 Regulations)

MECHANICAL ENGINEERING

23PTME202 – Thermal Engineering

(Steam table, Mollier chart, Refrigerant property table and Psychrometric chart to be permitted)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define mean effective pressure.
2. The bore and stroke of an IC engine are 7 cm and 6.36 cm respectively. Calculate the swept volume of the engine.
3. What parameters are used to reduce knocking of an IC engine?
4. Define stoichiometric air fuel ratio.
5. What is meant by supersaturated flow of nozzle?
6. Compare impulse and reaction turbines.
7. Write down the formula to find volumetric efficiency of reciprocating air compressor.
8. Define free air delivery in a reciprocating air compressor.
9. List out any four important properties of a good refrigerants.
10. Define RSHF.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The minimum pressure and temperature in an Otto cycle are 100 kPa and 27°C. The amount of heat added to the air per cycle is 1500 kJ/kg. (16)

    i) Determine the pressures and temperatures at all points of the air standard Otto cycle.

    ii) Also calculate the specific work and thermal efficiency of the cycle for a compression ratio of 8:1.

(OR)

b) Derive the expression for mean effective pressure and air standard efficiency for a Diesel cycle. (16)

12. a) Explain the working principle of a fuel injection pump with suitable sketch with its recent technological advancements. (16)

(OR)

b) The power output of an I.C. engine is measured by a rope brake dynamometer. The diameter of the brake pulley is 700 mm and the rope diameter is 25 mm. The load on the light side of the rope is 50 kg mass and spring balance reads 50 N. The engine running at 900 r.p.m. consumes fuel of calorific value of 44000 kJ/kg, at a rate of 4 kg/h. Assume g = 9.81 m/s^2. Calculate: (16)

i) Brake specific fuel consumption

ii) Brake thermal efficiency.

iii) Mechanical Efficiency.

13. a) Derive an expression for maximum discharge through convergent - divergent nozzle for steam and also describe the effect of friction in a nozzle. (16)

(OR)

b) What is the significance of compounding in a turbine? Explain the pressure compounding with suitable sketch. (16)

14. a) Why intercooling is necessary in a multistage air compressor? Also derive the expression for volumetric efficiency for reciprocating air compressor. (16)

(OR)

b) A single-stage double-acting air compressor is required to deliver 14 m^3 of air per minute measured at 1.013 bar and 15°C. The delivery pressure is 7 bar and the speed 300 r.p.m. Take the clearance volume as 5% of the swept volume with the compression and expansion index of n = 1.3. Calculate: (16)

1) Swept volume of the cylinder

2) The delivery temperature and

3) Indicated power.

15. a) Explain the working principle of a vapour absorption refrigeration system with suitable sketch and compare it with vapour compression refrigeration system. (16)

(OR)

b) Illustrate with suitable sketch about central air-conditioning system and compare it with window air conditioning system. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2023 Regulations)

MECHANICAL ENGINEERING

23PTME203 – Manufacturing Technology - II

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define gear indexing.
2. State any two differences between gear shaping and gear planning.
3. What are the advantages of special casing process?
4. What are the benefits of slush casting?
5. What is the high speed forming process?
6. What is the process of electromagnetic forming?
7. Why do we need advanced machining processes?
8. What are the classifications of advanced machining processes?
9. Define rapid prototyping.
10. What are the types of rapid prototyping?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the principle operations of gear hobbing and what are the advantages of gear hobbing? (16)

(OR)

b) Explain the gear grinding and gear lapping processes with neat sketches. (16)

12. a) i) Explain the squeeze casting process and its advantages. (8)

ii) Discuss the principles of carbon dioxide (CO_2) process of casting. (8)

(OR)

b) Discuss the process of continuous casting for solid bars and hollow section with the help of sketches. (16)

13. a) i) Describe how high velocity forming process is beneficial in comparison to conventional forming process. (6)

ii) Explain with neat sketch unconfined type explosive forming. (10)

(OR)

b) State process parameters of electromagnetic forming process. Also explain its working principle with schematic. (16)

14. a) Explain with a neat sketch the principle and working of Electro-chemical Machining (ECM) process. (16)

(OR)

b) i) Discuss the importance of abrasive jet machining. (4)

ii) Explain briefly with a neat sketch the principle and working of Ultrasonic machining process. (12)

15. a) Discuss the limitations and principles of rapid prototyping. (16)

(OR)

b) i) Explain the working principle of selective laser sintering. (8)

ii) Discuss the operation, product and accuracy of solid ground curing. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2023 Regulations)

MECHANICAL ENGINEERING

23PTME201 – Engineering Mechanics

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define principle of transmissibility.
2. What differences exist between Kinetics and Kinematics?
3. Write down the conditions of equilibrium of a particle in space.
4. What are the reactions at a fixed support of a plane beam that are possible?
5. State perpendicular axis theorem.
6. Differentiate between 'Mass moment of inertia' and 'Area moment of inertia'.
7. Classify the types of friction.
8. Define impending motion.
9. Discuss about the equations of motion of a particle under gravitation.
10. Define Co-efficient of restitution.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Two smooth circular cylinders each of weight 1000 N and radius 15 cm are connected at their centers by a string AB of length 40 cm and rest upon a horizontal plane, supporting above them a third cylinder of weight 2000 N and radius 15 cm as shown in Figure.1 Predict the force S in the string AB and reactions on the floor at the points of contact D and E. (16)

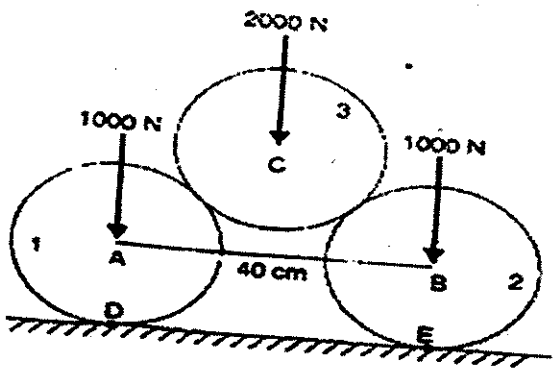


Figure.1.

(OR)

b) The forces shown in the figure.2 below are in equilibrium. Determine the forces F1 and F2. (16)

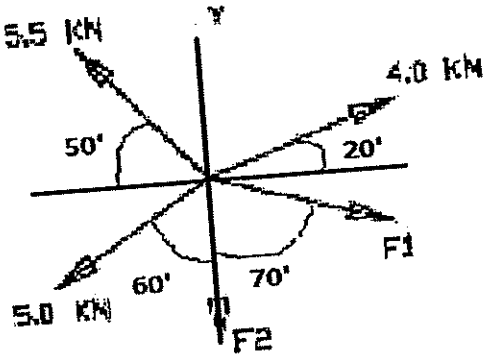


Figure.2.

12. a) A cylindrical roller has a weight of 10 kN and it is being pulled by a force which is inclined at 30° with the horizontal as shown in figure.3. While moving it comes across an obstacle of 10 cm height. Predict the force required to cross this obstacle when the diameter of the roller is 70 cm. (16)

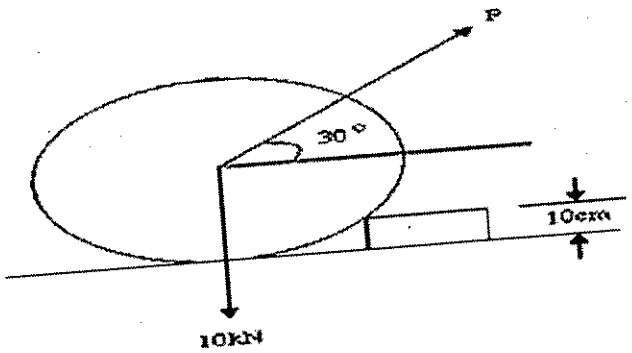


Figure.3

(OR)

b) Illustrate the system of forces shown in figure.4 to a force – couple system at A. (16)

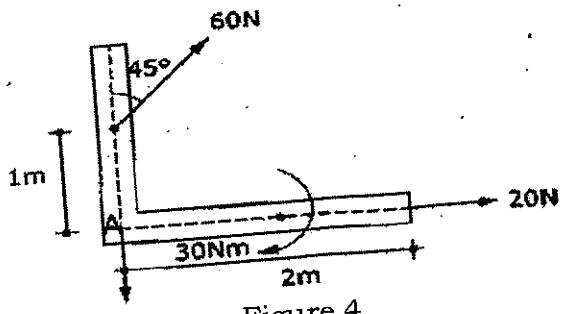


Figure.4

13. a) Determine the co-ordinates of centroid of the shaded area shown in figure.5 (16)

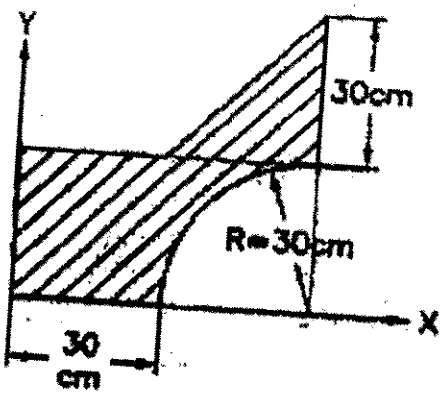


Figure.5

(OR)

b) Determine the principal moments of inertia and find location of principal axes of surface shown in figure.6 (16)

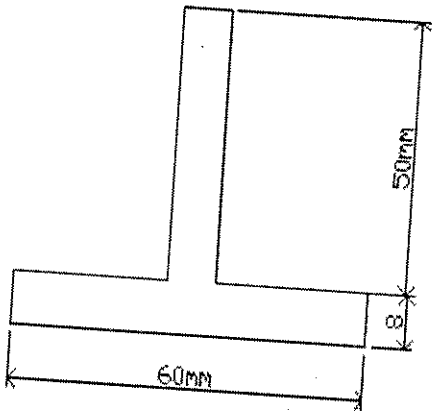


Figure.6

14. a) Block (2) rests on block (1) and is attached by a horizontal rope AB to the wall as shown in figure.7 What force P is necessary to cause motion of block (1) to impend? The co-efficient of friction between the blocks is ¼ and between the floor and block (1) is 1/3. Mass of blocks (1) and (2) are 14kg and 9 kg respectively. (16)

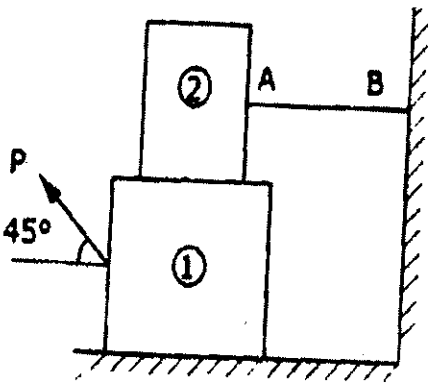


Figure.7

(OR)

b) A ladder of weight 1000 N and length 4 m rests as shown in figure.8. (16)
If a 750 N weight is applied at a distance of 3 m from the top of ladder, it is at the point of sliding. Determine the coefficient of friction between ladder and the floor.

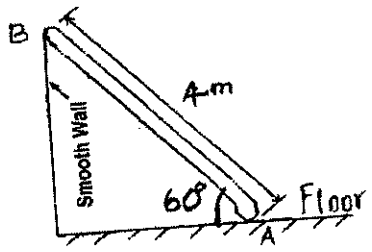


Figure.8

15. a) A train is traveling from A to D along the track shown in fig. Its initial velocity at A is zero. The train takes 5 min to cover the distance AB, 2250 m length and 2.5 minutes to cover, the distance BC, 3000 m in length, on reaching the station C, the brakes are applied and the train stops 2250 m beyond, at D i) Find the retardation on CD ii) the time it takes the train to get from A to D and iii) its average speed for the whole distance. (16)

(OR)

b) A block of mass 50 kg slides down a 35° incline and strikes a spring 1.5m away from it as shown in Figure.9 The maximum compression of the spring is 300 mm when the block comes to rest. If the spring constant is 1 kN/m, Solve the coefficient of kinetic friction between the block and the plane. (16)

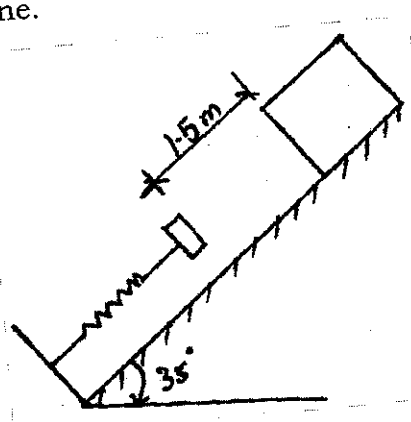


Figure.9

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester(Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC301 – Semiconductor Devices and Circuits

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is diffusion current?
2. Differentiate between intrinsic and extrinsic semiconductors.
3. Define the ripple factor for a half-wave and full-wave rectifier.
4. Compare the rectifier and regulator.
5. Compare CB,CC,CE Configuration.
6. Define pinch-off voltage.
7. What are the advantages of common source amplifiers over common gate amplifiers?
8. Interpret internal capacitive effect.
9. A feedback amplifier has an open loop gain of 300 and feedback factor ß = 0.01. Find the closed loop gain with feedback.
10. List the applications of class C tuned amplifier.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the drift and diffusion currents for PN diode. (8)

ii) Derive the quantitative theory of PN diode currents and give diode current equation. (8)

(OR)

b) i) With a neat diagram explain the working operation of a PN junction under forward bias and in reverse bias condition. (8)

ii) Explain the working of Schottky barrier diode with neat diagram. (8)

12. a) i) With a neat sketch explain in detail the working of center tapped Full wave Rectifier. (8)

ii) The four semiconductor diodes used in a bridge rectifier circuit each having a forward resistance of 0.1 Ω and infinite reverse resistance, feed a d.c. current of 10A to a resistive load from a sinusoidally varying alternating supply of 30 V(r.m.s). Determine the resistance of the load and the efficiency of the circuit. (8)

(OR)

b) i) Draw the functional block diagram of SMPS and describe the components used in it. (8)

ii) Determine the ripple factor of an L-type choke input filter comprising of a 10 H choke and 8μf capacitor, used with a full-wave rectifier. Compare the above result with a simple 8μf capacitor input filter with a load current of 50 mA and also 150 mA, assuming the d.c. output voltage to be 50 V. Neglect the d.c. resistance of choke and assume supply frequency of 50 Hz. (8)

13. a) i) The reverse leakage current of the transistor when connected in CB configuration is 0.2 mA and it is 18 μA when the same transistor is connected in CE configuration. Determine α_{dc} and β_{dc} of the transistor. Assume I_B = 30 mA. (8)

ii) Elaborate the operation of N-channel enhancement MOSFET along with their transfer characteristics. (8)

(OR)

b) i) Explain the working of N channel JFET with its drain characteristics. (8)

ii) Derive the drain current equation of JFET. (8)

14. a) i) Draw the small signal equivalent circuit for common emitter amplifier and derive its voltage gain, current gain, input impedance and output admittance. (8)

ii) A BJT has g_m = 38 mhos, $r_{b'e}$ = 5.9 kΩ, h_{ie} = 6 kΩ, $r_{bb'}$ = 100 Ω, $C_{b'c}$ = 12 pF, $C_{b'e}$ = 63 pF and h_{fe} = 224 at 1 KHz. Calculate α , β cutoff frequencies and f_T. (8)

(OR)

b) i) Describe different methods used for coupling of multistage amplifiers with their frequency response. (8)

ii) For the circuit shown in figure.1. Calculate R_i , A_i , A_V and R_o if the h – parameters are h_{ie} = 1.1 kΩ, h_{fe} = 50, h_{oe} = 25 μA/V and h_{re} = 2.5 x 10^{-4}. (8)

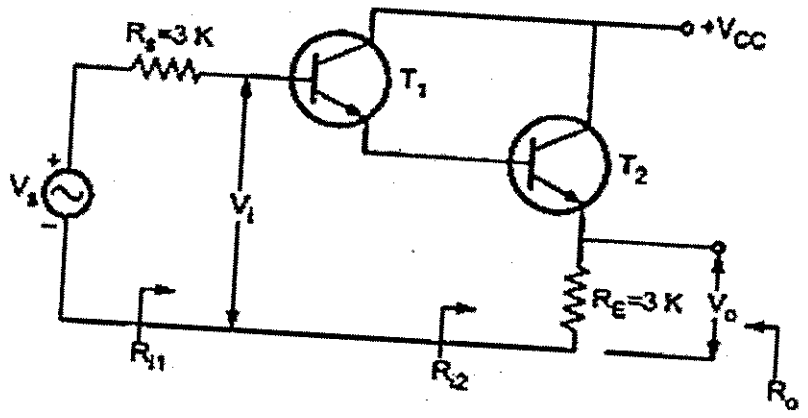


Figure.1.

15. a) i) Explain the operation of complementary symmetry push-pull class B power amplifier. Derive the expression for maximum conversion efficiency. (8)

ii) Prove that the maximum efficiency of class A transformer coupled amplifier is 50% and that of class B type is 78.5%. (8)

(OR)

b) i) Draw the circuit diagram of voltage shunt amplifier and derive an expression for input and output impedances. (8)

ii) What is the effect of a current series negative feedback on input resistance and output resistance of a BJT amplifier? Explain the same, with necessary circuit, equivalent circuit and equations. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

23PTEC101 – Semiconductor Devices and Circuits

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the difference between diffusion current and drift current?
2. Define reverse recovery time in a diode.
3. Draw the circuit diagram of the negative clipper using diode.
4. What is a voltage multiplier circuit?
5. If a transistor has alpha(α) of 0.97, find the value of beta(β).
6. List the various parameters that affect the stability of the amplifier circuit.
7. Define Cut-off Frequency in an amplifier.
8. What are the advantages of multistage amplifiers?
9. Define crossover distortion.
10. State the condition for stability based on the gain margin and phase margin.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the operation of the PN junction diode under forward and reverse bias conditions with necessary diagrams. (10)

    ii) Explain transition capacitance and diffusion capacitance in a PN junction diode. (6)

(OR)

    b) i) Explain the Zener breakdown and Avalanche breakdown in detail. (10)

    ii) Explain the tunneling phenomenon in a tunnel diode with the help of an energy band diagram. (6)

12. a) Explain the operation of a full wave rectifier circuit with the help of neat sketches and derive the expressions for V_{dc},V_{rms}, PIV, and efficiency. (16)

(OR)

b) Explain the working of a Zener diode-based voltage regulator circuit. Derive its load and line regulation expressions. (16)

13. a) Describe the Eber's Moll model for an NPN transistor with a neat sketch. (16)

(OR)

b) Derive the Q-point parameters of a fixed-bias CE amplifier and calculate its stability factors. (16)

14. a) Explain the low-frequency response of a common-emitter amplifier. Derive the expressions for lower cutoff frequency. (16)

(OR)

b) Discuss the frequency response of multistage amplifiers. Calculate the overall upper and lower cutoff frequencies. (16)

15. a) List the different types of power amplifiers. Explain the operation of a series-fed Class A amplifier and derive its efficiency. (16)

(OR)

b) Explain the current shunt feedback amplifier with an example circuit and derive expressions for its input impedance and output impedance. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC302 – Digital System Design

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Convert $(115)_{10}$ and $(235)_{10}$ to hexadecimal numbers.
2. Show how to connect NAND gates to get an AND gate.
3. Implement full adder using of half adder.
4. Design a 2:1 multiplexer.
5. Give the characteristic equation and characteristic table of a T- flip-flop.
6. How many flip flops are required to build a binary counter that counts from 0 to 7?
7. Define the term, state table.
8. Difference between Static hazard and Dynamic hazard.
9. Outline the advantages of EEPROM over EPROM.
10. Distinguish between PAL and PLA.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Determine the minimal sum of products for the following function $F(W,X,Y,Z)= \sum m(1,3,4,5,9,10,11) + \sum d(3,4,11)$. And apply DeMorgan's theorem for NAND-NOR implementation. (16)

(OR)

b) Construct a karnaugh map for the following function $F(A,B,C,D,E) = \sum(0,5,6,8,9,10,11,16,20,24,25,26,27,29,31)$ and draw the logic diagram. (16)

12. a) With necessary diagrams, explain in detail about the working of a 4-bit look ahead carry adder. Also mention its advantages over conventional adder. (16)

(OR)

b) Design a simple logic circuit using 4 x 1 multiplexer which has four inputs A,B,C,D. The output X of the circuit is logic 1 if two or more inputs are logic 1. (16)

13. a) Discuss about a 3 bit (MOD 8) Synchronous UP/Down counter with neat state diagram, state table, excitation table, K-map simplification and its circuit diagram. (16)

(OR)

b) Summarize 4-bit SISO, SIPO, PISO, and PIPO shift register and draw its waveforms. (16)

14. a) Design an asynchronous sequential circuit with two inputs x1 and x2 and one output Z. Initially, both inputs are equal to zero. When x1 or x2 becomes 1, the output Z becomes 1. When the second input also becomes 1, the output changes to 0. The output stays at 0 until the circuit goes back to the initial state. (16)

(OR)

b) What are static - 0 and static - 1 hazard? Explain the removal of hazards using hazard covers in K-map. Implement the following logic and analyse for the pressure of any hazard If hazard is present briefly explain the type of hazard and design a hazard - free circuit. (16)

15. a) Explain how read operation and write operation is performed in random access memory with suitable timing diagram. (16)

(OR)

b) Determine the circuit used to realize the following Boolean functions using PALs. (16)

(i) $X(A,BC,D)=\sum(0,2,6,7,8,9,12,13)$

(ii) $Y(A,B,C,D)=\sum(2,3,8,9,10,12,13)$

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Part Time)

(2023 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

23PTEC102 – Digital System Design

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Prove the following Boolean identifies
   i) $A+\bar{A}B + AB = A + B$ ii) $A\bar{B} + \bar{A}B+AB +\bar{A}\bar{B} =1$
2. Mention the limitations of Karnaugh map.
3. Draw the truth table for a Half adder circuit and write the Boolean expressions.
4. Write the difference between Multiplexer and Demultiplexer.
5. List the different types of flip-flop.
6. Draw the logic diagram of T flip flop using JK flip flop.
7. Distinguish between synchronous sequential circuits and asynchronous sequential circuits.
8. What do you mean by Hazards? Give its types.
9. Write the advantages of PROM and EPROM.
10. List the basic types of programmable logic devices.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Simplify the Boolean function in Sum of Products (SOP) form using K-map $F(w, x, y, z) = \sum m(0, 1, 2, 5, 8, 9, 10)$. (16)

    ii) Simplify the given Boolean function in POS form using K-map $F(A, B, C, D) = \Pi M(0, 1, 4, 7, 8, 10, 12, 15) + d(2, 6, 11, 14)$

(OR)

b) Minimize the following function using Karnaugh map $F(A, B, C, D) = \sum m(0, 1, 2, 3, 4, 5, 6, 11, 12, 13)$ and implement with logic gates. (16)

12. a) Design Full subtractor and derive expression for difference and borrow. Realize using two half subtractor. (16)

(OR)

b) Describe the working of a magnitude comparator with a suitable logic diagram and explain the operation of a carry look ahead adder. (16)

13. a) Explain the operation of master slave flip flop and show how the race around condition is eliminated in it. (16)

(OR)

b) Draw the different types of shift register and explain its operation. (16)

14. a) Discuss about various types of hazards in asynchronous sequential circuit and explain the hazard free realizations. (16)

(OR)

b) Analyze a circuit with primary inputs A and B to give an output Z equal to 1 when A becomes 1 if B is already 1. Once Z =1 it will remain so until A goes to 0. Draw the total state diagram, primitive flow table for designing this circuit. (16)

15. a) Implement the following using PAL (16)

W (A, B, C, D) = $\sum(0, 2, 6, 7, 8, 9, 12, 13)$

X (A, B, C, D) = $\sum (0, 2, 6, 7, 8, 9, 12, 13, 14)$

Y (A, B, C, D) = $\sum(2, 3, 8, 9, 10, 12, 13)$

Z (A, B, C, D) = $\sum(1, 3, 4, 6, 9, 12, 14)$

(OR)

b) i) Explain in detail about static RAM and dynamic RAM cell. (16)

ii) Explain the architecture of Programmable Array Logic with four inputs and four outputs.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC303 – Network Theory And Synthesis

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Transform the circuit from delta to Wye network Shown in figure.1.

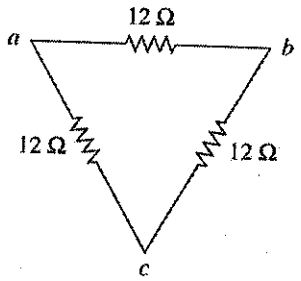


Figure.1

2. Write the mesh equations for the given circuit Shown in figure.2.

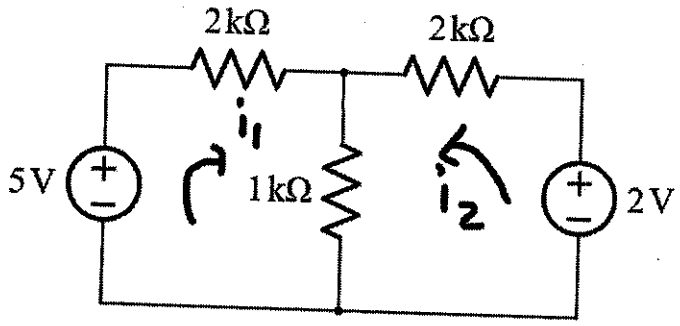


Figure.2

3. Illustrate the time constant of RL Circuit having the resistance R = 20 Ω and L = 0.5mH.
4. What is transient response?
5. Determine the resonant frequency of the series RLC circuit with R=20 Ω, L = 10 mH and C = 0.6 μF.
6. Define mutual inductance.
7. Write the Open-Circuit Impedance Parameters of a Two-Port Network.
8. Brief the term "Reciprocal Network".
9. What is a Hurwitz polynomial?
10. Differentiate between Foster and Cauer forms of LC networks.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Find the Norton equivalent with respect to the terminals a, b in the circuit Shown in Figure.3. (16)

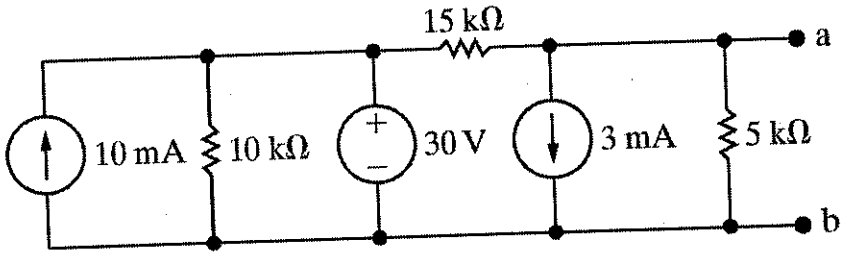


Figure.3

(OR)

b) Find the maximum power transferred to resistor R in the below circuit Shown in Figure.4. (16)

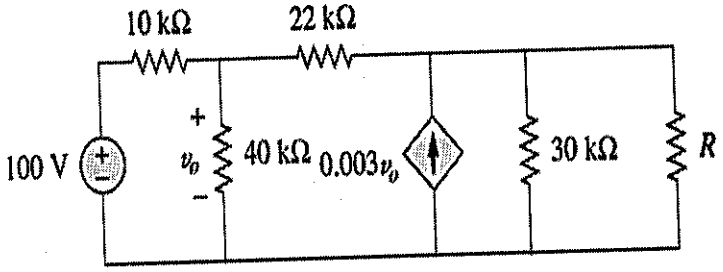


Figure.4

12. a) In the circuit shown in Figure.5, at t = 0^+, the voltage across the coil is 120V. Find the value of resistance R using the Laplace transforms. (16)

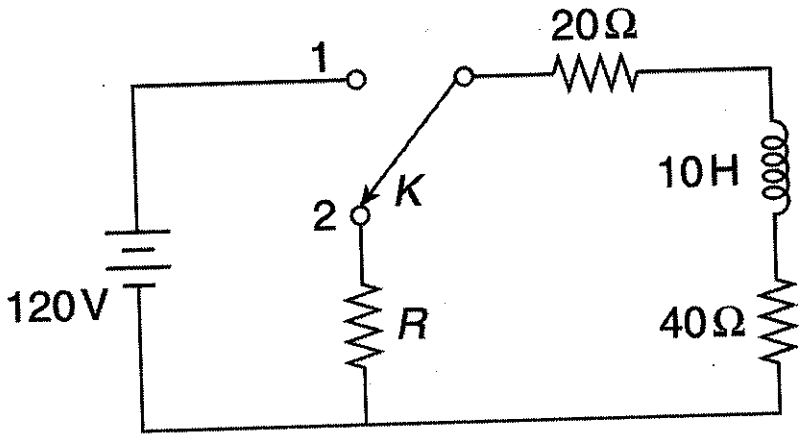


Figure.5

(OR)

b) Find the driving point admittance of the network shown in Figure.6. (16)

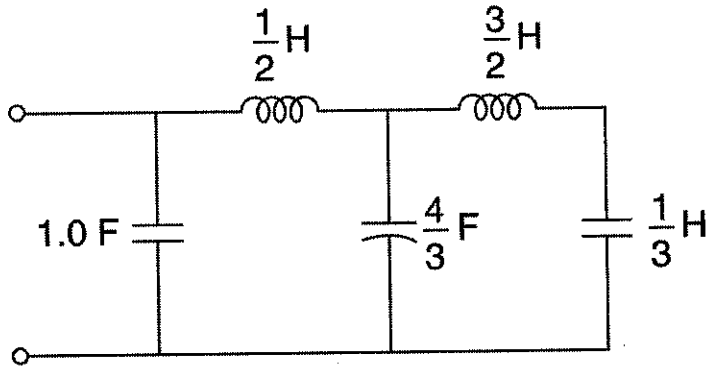


Figure.6

13. a) A circuit consisting of a coil with an inductance 10 mH and resistance 20 Ω is connected in series with a capacitor and a generator with an rms voltage of 120 V. Find (16)

(a) The value of the capacitance that will cause the circuit to be in resonance at 15 kHz.

(b) The current through the coil at resonance.

(c) the Q of the circuit.

(OR)

b) Find the value of voltage Vo in the given circuit shown in Figure.7 (16)

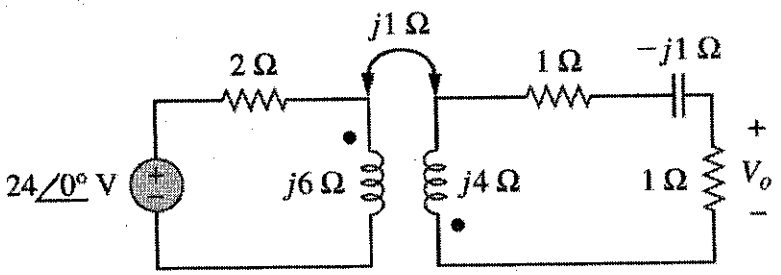


Figure.7

14. a) Find the Z-parameters for the symmetrical two-port network shown in Figure.8 below (16)

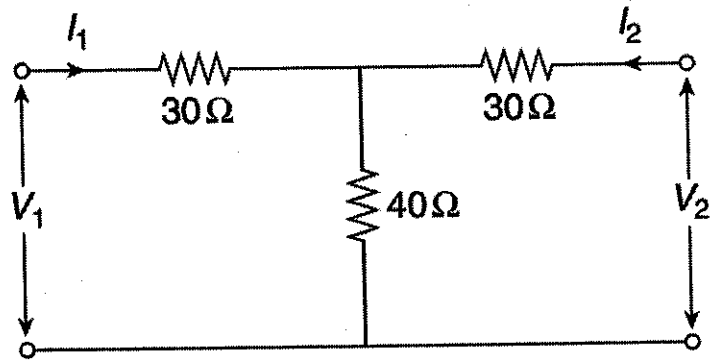


Figure.8

(OR)

b) Find the y-parameters for the symmetrical two-port network shown in Figure.9 below (16)

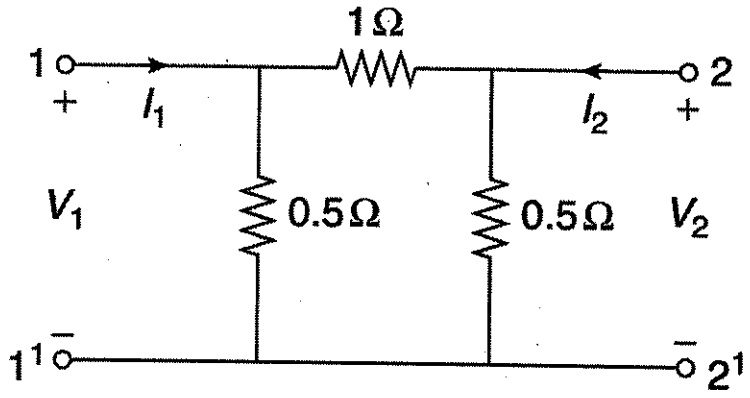


Figure.9

15. a) Determine whether the function $F(s) = \frac{s^2+6s+5}{s^2+9s+14}$ is a positive real functions (PRF) and hence realizable. (16)

(OR)

b) Find the Foster form-I of the given expression Z(s). (16)

$$Z(s) = \frac{(s+1)(s+3)}{s(s+2)}$$

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC304 – Network Theory and Synthesis

Time : 3 Hours | Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. Define Mesh Analysis. Draw a Simple Circuit to Illustrate It.
2. What is a Delta-Wye Transformation? Provide an Example with a Circuit Diagram.
3. Derive the expression for transient response of an RC circuit to a step input.
4. Compute poles and zeros of a given immittance function.

$$H(s) = \frac{s^2 + 4s + 3}{s^2 + 5s + 6}.$$

5. Define Q factor in an RLC circuit.
6. Show the relationship between mutual inductance and the coefficient of coupling.
7. State the condition for reciprocity in a two-port network.
8. Derive the relationship between Z and Y parameters.
9. List the properties of Hurwitz polynomials.
10. Define positive real functions with examples.

(5 x 16 = 80 Marks)

Part B

Answer ALL Questions

11. a) Determine the current I_0 in the circuit using mesh analysis. Shown in figure.1. (16)

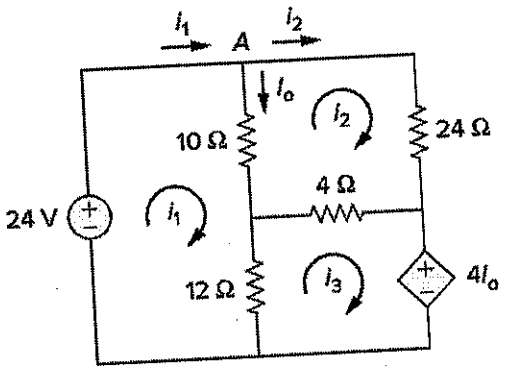


Figure.1

(OR)

b) Determine the Thevenin equivalent at terminals a-b of the given circuit. Shown in figure.2. (16)

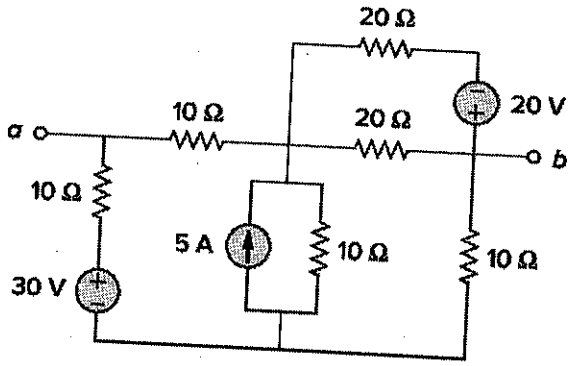


Figure.2

12. a) The Switch in the network of circuit is opened at t = 0.Find i(t)t>0 if, a) L = 1/2 H and C = 1 F b) L = 1H and C = 1 F. Shown in figure.3. (16)

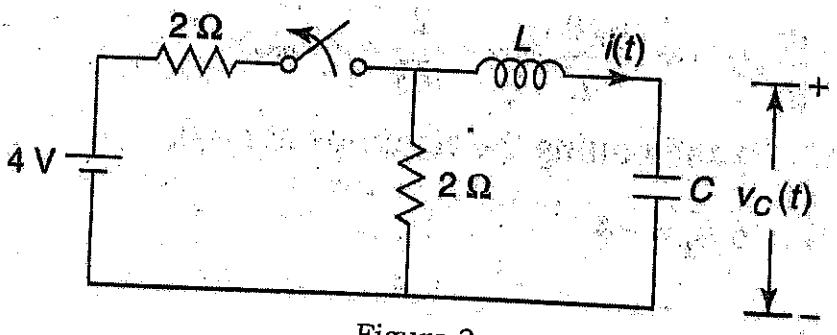


Figure.3

(OR)

b) Find the driving-Point admittance function and Draw Pole-Zero plot for the network shown in figure.4. (16)

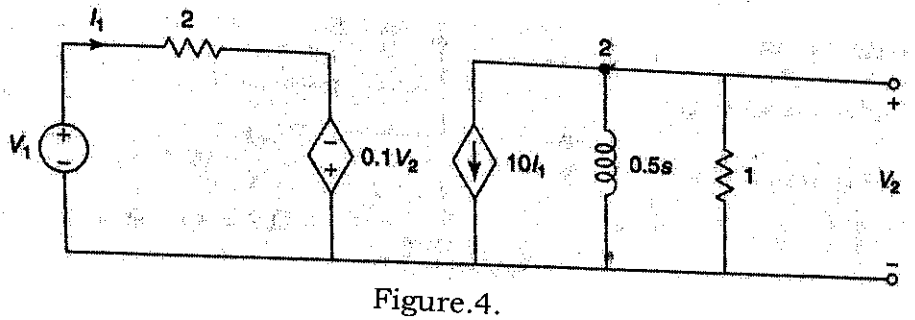


Figure.4.

13. a) Derive the expression for the resonant frequency of the parallel circuit as shown in figure.5. (16)

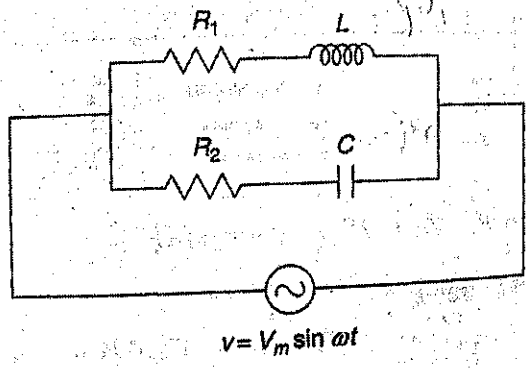


Figure.5.

(OR)

b) Obtain the dotted equivalent circuit for the coupled circuit shown in figure.6 and find mesh currents. Also, find the Voltage across the capacitor. (16)

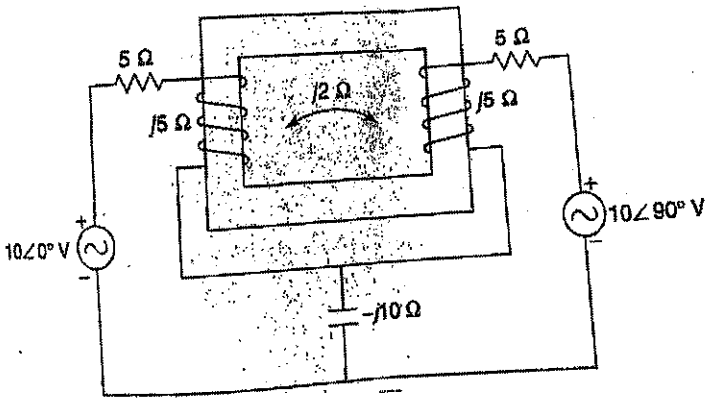


Figure.6.

14. a) Find Y parameters for the network shown in figure.7. (16)

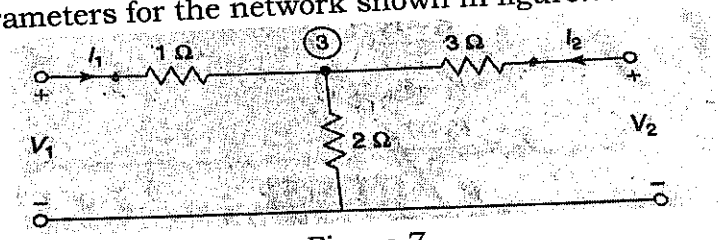


Figure.7.

(OR)

b) Obtain ABCD parameters for the network shown in figure.8. (16)

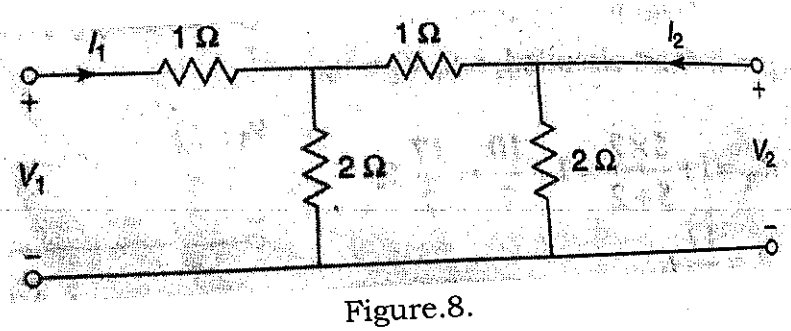


Figure.8.

15. a) Explain the concept of Positive Real Functions (PRFs). Provide the definition and discuss the necessary and sufficient conditions for a function to be positive real. (16)

(OR)

b) Describe the Foster and Cauer forms of LC network synthesis. Discuss the synthesis procedure of LC networks using these forms with suitable examples. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC304 – Transmission Lines and Waveguides

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define characteristic impedance and propagation constant of a transmission line.
2. Write the equation of Reflection coefficient and Reflection Loss.
3. List the applications of halfwave line?
4. Write down the relation between VSWR and reflection coefficient.
5. Mention the cutoff frequency of TEM wave?
6. Define velocity of propagation.
7. How to excite the modes in rectangular waveguide?
8. Justify the impossibility of TEM wave in waveguide.
9. What are the dominant modes in circular waveguide?
10. Write an expression for quality factor of a rectangular cavity resonators.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the expression for general solution of the transmission line. (16)

(OR)

b) What are the types of distortion? Derive the condition for distortion less transmission line. (16)

12. a) Derive the general expression for voltage, current and input impedance of a dissipation loss line. Also sketch the voltage and current for open and short circuited line. (16)

(OR)

b) A 30 m long lossless transmission line with characteristic impedance Z_0 of 50 Ω is terminated by a load impedance Z_L = 60 + j40 Ω. The operating wavelength is 90 m. Find the reflection coefficient, Standing Wave Ratio, input impedance, input admittance and the position of first voltage minimum and maximum using SMITH chart. (16)

13. a) Discuss the transmission of TE and TM wave propagating between parallel planes with necessary field components. (16)

(OR)

b) Derive the expression for wave impedance of TE and TM and TEM wave between a pair of perfect conducting plane. (16)

14. a) i) Derive the expressions for the field components of TE waves guided along a rectangular wave guide. (8)

ii) Discuss the characteristics of TE and TM waves in Rectangular wave guides. And also derive the cutoff frequency, wavelength and phase velocity from the propagation constant. (8)

(OR)

b) i) Derive the expression the field components of TM waves in Rectangular wave guides. (8)

ii) A pair of perfectly conducting planes is separated by 2.8 cm in air. For TM10 mode determine the cut-off frequency, cut-off wavelength, phase velocity and group velocity, if the operating frequency is 5 GHz. (8)

15. a) i) Derive the expressions for TM wave components in circular waveguide using Bessel function. (10)

ii) Explain in detail on excitation of modes in a circular waveguide. (6)

(OR)

b) i) Derive the expression for field components of TE waves in rectangular cavity resonator. (10)

ii) Calculate the resonant frequency of an air filled rectangular resonator of dimensions a = 3 cm, b = 5 cm, d = 6 cm operating in TE101 mode. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

23PTEC303 – Transmission Lines and Waveguides

(Smith chart to be Permitted)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define attenuation constant.
2. What is meant by distortion less line? Also, recall the condition for distortion less.
3. If the VSWR of transmission line is 1.5, then calculate its reflection coefficient.
4. Define single stub matching.
5. Compare and contrast TE and TM waves.
6. Mention the properties of TEM waves.
7. Define cutoff wavelength for TM waves in a rectangular waveguide.
8. Define the term "dominant mode" in a rectangular waveguide.
9. How does the wave impedance changes with frequency in a circular waveguide?
10. Recall the Bessel functions.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the general transmission line equations for voltage and current at any point on a line. (16)

(OR)

b) The primary constant of a low frequency transmission line per km are $R = 6\ \Omega$, $L = 2.2$ mH, $C = 0.005\ \mu F$ and $G = 0.25\ \mu\mho$. Calculate the following at frequency of 1 KHz, (16)

i) the transmitting impedance of which no reflection will be set up in the line.

ii) the attenuation suffered by the signal at 1 KHz, while travelling a distance of 100 Km.

iii) the phase velocity with which the signal travels.

12. a) i) Draw and interpret the significances of of quarter wave line. (8)

ii) Determine the VSWR, reflection coefficient of a line terminated with matched load, short circuited load and open circuited load. (8)

(OR)

b) i) With the help of Smith chart, find the sending end line impedance for a high frequency line having characteristic impedance of 50 Ω. The line is of length 1.185 λ and its terminated in a load of 110 + j80 Ω. (8)

ii) Determine the input impedance of open and short circuited dissipation less transmission line. (8)

13. a) Derive the expression for the electric and magnetic fields of a transverse electric (TE) wave in a rectangular waveguide. (16)

(OR)

b) Explain the propagation of transverse magnetic (TM) waves in a waveguide. Derive the expressions for the electric and magnetic fields. (16)

14. a) Derive the electric and magnetic field expressions for Transverse Electric (TE) waves in a rectangular waveguide. Discuss their significance. (16)

(OR)

b) Derive the electric and magnetic field expressions for Transverse Magnetic (TM) waves in a rectangular waveguide. Discuss their significance. (16)

15. a) Derive the electric and magnetic field expressions for the TE_1 mode in a circular waveguide using the appropriate Bessel functions. Discuss the significance of these modes. (16)

(OR)

b) Discuss the concept of wave impedance for TE and TM waves in a circular waveguide. Derive the expressions for wave impedance for both modes and explain their physical meaning. (16)

(OR)

b) Discuss on the material and heat balance during the operation of the bast furnace. (16)

13. a) i) Discuss the constructional features of hearth and bosh parts of the blast furnace indicating suitable refractory materials for the same. (8)

ii) Explain with sketch the burden distribution using Paul - Wurth belless top. List its advantages and disadvantages over double bell system. (8)

(OR)

b) i) What are the advantages of preheating the blast? Explain with sketch the working of hot blast stoves. (8)

ii) State the general stages of blast furnace gas cleaning system indicating the level of cleaning by each stage. Describe, with sketch, gas cleaning by electrostatic precipitator. (8)

14. a) i) Explain the stages in blast furnace operation indicating the activities in each stage. State the principle of different methods practiced for temporary shut down for routine maintenance of the furnace. (8)

ii) What are the operational irregularities generally that occur in blast furnace? Explain the nature, causes and remedial measures of any TWO irregularities. (8)

(OR)

b) i) Explain with suitable diagram the effect of the gas flow and formation various internal zones on iron ore reduction during blast furnace operation. (8)

ii) Name the modern trends in blast furnace iron making. Explain any TWO methods in detail. (8)

15. a) i) Explain the working of low shaft furnace used for iron making. State its advantages and limitations over conventional blast furnace. (8)

ii) Explain with suitable examples the use of electro-thermal processes as alternative route of iron making. (8)

(OR)

b) i) What is sponge iron? What are the different methods of sponge iron production? Explain with sketch the principle of any ONE method. (8)

ii) What are the advantages of producing ferro-alloys? Explain the method of production of Fe-Si. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT403 - Iron Making

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate drum and disc pelletisers used for agglomeration of iron ore fines.
2. How is flux used in blast furnace evaluated? Give examples of fluxes used for ironmaking.
3. What is meant by "indirect reduction"? Give an example.
4. What is a Rist diagram? What is its significance in production of iron?
5. Why is blast furnace constructed with varying cross-sectional area?
6. In which part of the blast furnace, armour plates are used? Why?
7. Give a typical composition of blast furnace slag. List its applications.
8. What is meant by "RAFT"? What is its significance in production of iron?
9. Differentiate iron making by blast furnace and Corex process.
10. List the uses of mathematical modelling in iron making process.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the characteristics of coal that are required for coke making. (8)

ii) State the principle of agglomeration of iron ore fines by sintering. Explain with sketches the formation of various zones in sinter bed during sintering. (8)

(OR)

b) i) What is meant by CRI and CSR? Explain how are CRI and CSR determined? Mention the acceptable range of CRI and CSR for blast furnace iron making. (8)

ii) Explain the importance of burden distribution on the performance blast furnace. (8)

12. a) Explain the physical chemistry of the various reactions that take place inside a blast furnace. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC305 – Analog Communication

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Justify the need for Modulation.
2. Define frequency translation.
3. Differentiate between Direct FM and Indirect FM.
4. List the advantages of FM Super hetrodyne receiver.
5. Classify the types of noise.
6. Recall the key points about noise temperature.
7. Summarize the impact of noise on AM receivers.
8. How can FM threshold reduction be utilized to improve FM receiver performance in noisy environments?
9. Given that a communication system generates 100 messages per second and each message contains 5 bits of information, what is the information rate R in bits per second?
10. What is entropy?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the generation and demodulation of Amplitude modulation with relevant block diagrams. (8)

ii) Illustrate the block diagram of a DSB-SC modulator and demodulator. (8)

(OR)

b) i) Explain the concept of Frequency Division Multiplexing. (8)

ii) Describe the working principle of the AM Super heterodyne receiver with neat block diagrams. (8)

12. a) i) Explain the concepts of phase modulation and frequency modulation. (8)

ii) Describe the characteristics of narrowband FM and wideband FM. (8)

(OR)

b) i) Explain the transmission bandwidth of FM signals using Carson's rule. (8)

ii) Describe the working principle of a Phase-Locked Loop. (8)

13. a) i) Utilize the concept of Noise Equivalent Bandwidth to optimize a receiver's performance. (8)

ii) Apply the Friis formula to calculate the total noise figure of a cascaded system with three stages. (8)

(OR)

b) i) Examine the functions of each component in a receiver model. (8)

ii) Analyse how narrowband noise represented in terms of in-phase and quadrature components. (8)

14. a) i) Analyze the vulnerabilities of FM receivers in noisy environments as illustrated by the FM threshold effect. (8)

ii) Explain the advantages and disadvantages of the capture effect in FM reception? (8)

(OR)

b) i) Make a use of pre-emphasis and de-emphasis in FM to demonstrate how they enhance signal quality in the presence of noise. (8)

ii) Compare the performance of AM and FM receivers. (8)

15. a) i) Find the Channel capacity of the binary of the binary erasure channel shown in the figure.1 p $(x_1) = \alpha$, p $(x_2) = 1 - \alpha$. (8)

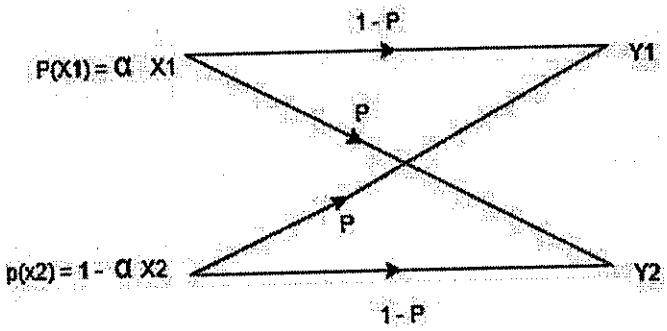


Figure.1.

ii) A source produces one of four possible symbols during each interval having probabilities P $(x_1) = \frac{1}{2}$, P $(x_2) = \frac{1}{4}$, P $(x_3) = \frac{1}{8}$, P $(x_4) = \frac{1}{8}$.obtain the information content of each of these symbols. (8)

(OR)

b) i) Prove that the mutual information of the channel is symmetric I (X; Y) = I (Y; X). (8)

ii) A Discrete memory less source has an alphabet of seven symbols $s_0, s_1, s_2, s_3, s_4, s_5, s_6$ whose Probability of occurrence Given below. Determine the Huffman code. (8)

s_0	s_1	s_2	s_3	s_4	s_5	s_6
0.25	0.25	0.125	0.125	0.125	0.0625	0.0625

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

23PTEC301 – Analog Communication

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare and contrast SSB-SC with DSB-SC.
2. What is the need for modulation?
3. How phase modulated signal is generated using FM?
4. Outline the significances of PLL. List the main components of PLL.
5. Which noise is referred as thermal noise? How thermal noise is related to temperature and bandwidth?
6. List the various types of noise and which signal is termed as noise?
7. Draw the pre-emphasis and de-emphasis circuits.
8. Compare the noise performance of AM and FM receivers.
9. State channel capacity theorem.
10. List the properties of entropy.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With neat sketches, explain the principle of generation and demodulation of AM. (16)

(OR)

b) Explain any one technique of generation of SSB-SC and DSB-SC signal. (16)

12. a) Discuss how FM signals are generated and list the methods of direct FM generation and Indirect FM generation. Explain the Armstrong method of FM generation with diagram. (16)

(OR)

b) Showcase how narrow band FM is generated with necessary diagram and compare narrow band FM and wide band FM. (16)

13. a) Briefly discuss about narrow band noise. Also enumerate the representation of narrow band noise in terms of in-phase and quadrature phase components. (16)

(OR)

b) Enumerate the concept of presence of noise in DSB-SC linear receiver system with the model of DSB-SC receiver. Obtain the expression for average signal power and average noise power. (16)

14. a) Derive the noise performance of AM receiver and hence evaluate the figure of merit. (16)

(OR)

b) Discuss in detail the capture effect and FM threshold effect. Mention the methods used for the improvement of the FM threshold reduction. (16)

15. a) Set of alphabet A is given as {a1, a2, a3, a4, a5}. The probability of the set is, P(a1) = 0.15, P(a2) = 0.04, P(a3) = 0.26, P(a4)= 0.05 and P(a5) = 0.50. (16)

1. Calculate the entropy of the set of alphabet A.
2. Find a Huffman code for this set of alphabet.
3. Find the average length of the code.
4. Calculate the redundancy.

(OR)

b) Applying Shannon-Fano coding procedure for the following message ensemble and find the entropy. Take M= 2. (16)

[X] =[X1 X2 X3 X4 X5 X6 X7]

[P] = [0.4,0.2,0.12,0.08,0.08,0.08,0.04]

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC501 – Digital Communication

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is sampling?
2. Define the probability of error in signal detection.
3. What is Inter Symbol Interference (ISI)?
4. A certain telephone line bandwidth is 3.5 Khz Calculate data rate in bps that can be transmitted if binary signaling with raised cosine pulses and roll-off factor α = 0.25 is employed.
5. Differentiate between coherent and non-coherent modulation techniques.
6. Define Passband transmission.
7. What is syndrome?
8. Define CRC.
9. List the applications of Frequency Hopping Spread Spectrum (FHSS).
10. How the bandwidth efficiency of TDMA system can be improved?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the Gram-Schmidt orthogonalization procedure for constructing an orthogonal basis for a set of signals. (16)

(OR)

b) Explain Delta Modulation in detail with a suitable diagram. Also, explain the Adaptive Delta Modulation and compare its performance with Delta Modulation. (16)

12. a) Determine the Nyquist's criterion for distortionless baseband binary transmission system. (16)

(OR)

b) The binary data 11010011001110 are applied to an input of a duo binary system (16)

(i) Construct duo-binary coded output at the receiver without precoder,

(ii) The level at receiver input produced by the third digit is changed due to noise. Construct a new receiver output.

(iii) Repeat (i) and (ii) assuming the use of precoder in the transmitter.

13. a) Discuss the generation and detection techniques for QPSK modulation. (16)

(OR)

b) What is Differential Phase Shift Keying (DPSK)? Illustrate the modulation and demodulation process for DPSK using diagrams. (16)

14. a) The parity check matrix of a particular (7,4) linear block code is given by (16)

$$[H] = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

i) Find the generator matrix (G).

ii) List all the code vectors.

iii) What is the minimum distance between the code vectors?

iv) How many errors can be detected? How many errors can be corrected?

(OR)

b) Discuss the Viterbi algorithm for the detection of any two message vectors (One Word) from the code vectors that were generated by (111), (101) and (011). (16)

15. a) Explain the concept of direct sequence spread spectrum communication system with coherent binary phase shift keying, Derive an expression for jamming margin. (16)

(OR)

b) Generate PN sequence of (4, 1) four-stage feedback shift register with initial 'state of the shift register is 1111. Verify the balance, run and correlation properties of the maximal length sequence. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC501 – Digital Communication

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State sampling theorem.
2. What is the relation between correlation receiver and matched filter?
3. What is meant by Inter Symbol Interference?
4. Define Duo binary baseband PAM system.
5. What are the drawbacks of binary PSK system?
6. Compare the error probability for BPSK and QPSK.
7. Mention the properties of cyclic code.
8. What is convolutional code? How is it different from block codes?
9. Define Pseudo-Noise sequence.
10. Compare slow and fast FH-SS.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Consider an audio signal consisting of the sinusoidal term given as x (t) =3cos (500 πt). Determine the signal to noise ratio. When this is quantized using 10 bits PCM. How many bits of quantization are needed to achieve a SNR ratio of at least 40 dB? (10)

ii) Write the differences between DPCM, and DM. (6)

(OR)

b) i) What is a matched filter receiver? Derive its frequency response function. (10)

ii) Discuss the Noise considerations in PCM systems? (6)

12. a) i) Elaborate how ISI occurs in base-band binary data transmission system. (8)

ii) Assess the ways the adaptive equalizer can be implemented. (8)

(OR)

b) i) Examine the principle of obtaining eye pattern and mark important observations made from the eye pattern. (8)

ii) Describe in detail about correlative coding to eliminate ISI. (8)

13. a) Describe with diagrams the generation and detection of coherent BFSK. Explain the probability of error for this scheme. (16)

(OR)

b) Explain the carrier and symbol synchronization methods with block diagrams. (16)

14. a) Construct a single error correcting (7, 4) linear block code and the corresponding decoding table. (16)

(OR)

b) Design a convolutional coder of constraint length 6 and rate efficiency 1/2.Draw its tree diagram and trellis diagram. (16)

15. a) Draw and explain the block diagram of transmitter and receiver of Direct – Sequence Spread Spectrum with coherent binary Phase shift Keying. (16)

(OR)

b) What is Frequency Hopping? Explain the different types of frequency hopping with necessary diagrams. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC403 – Digital Communication

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw a basic model of digital communication system.
2. Write an equation to calculate the minimum bandwidth for PCM.
3. The bit rate of a digital communication system is R kbits/s. The modulation used is 32-QAM. Calculate the minimum bandwidth required for ISI free transmission.
4. List any four important factors affecting the eye pattern in base band transmission of digital signals.
5. Draw the PSK waveform for the binary signal 1 0 1 0 1 0 1 1.
6. Compare baseband transmission and pass band transmission.
7. Calculate the number of code words present in the (7,4) linear code.
8. Draw the block diagram for Convolutional encoder.
9. Find the Processing Gain (dB) for a low frequency hopping systemhas 4 bits per symbol and 5 symbols per hop.
10. Differentiate between Slow Frequency Hopping and Fast Frequency Hopping.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Sample a signal and reconstruct the original signal from its samples to avoid signal distortion in reconstruction with necessary derivation, waveforms and diagrams. (16)

(OR)

b) Identify and apply the specific application of pulse modulation technique and brief each with a neat block diagram. (16)

12. a) i) Derive the Nyquist criterian for distortionless baseband binary transmission. (8)

ii) Devise a method to study Inter Symbol Interference in a PCM technique. (8)

(OR)

b) i) Analyze the modified duo binary signaling of a baseband transmission with a necessary mathematical expression. (8)

ii) Evaluate the Baseband M-ary PAM probability of error with suitable block diagram. (8)

13. a) Explain BPSK signal transmission and coherent BPSK reception with suitable block diagram. Derive an expression for the probability of symbol error for the scheme. (16)

(OR)

b) Explain QPSK signal transmission and QPSK reception with suitable block diagram. Derive an expression for the probability of symbol error for the scheme. (16)

14. a) The parity check matrix of a particular (7, 4) linear block code is given by $[H] = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$ (16)

1) Find the generator matrix (G).
2) List all the code vectors.
3) What is the minimum distance code vector?
4) How many errors can be detected? How many errors can be corrected?

(OR)

b) Write down the steps to encode the binary data using Viterbi algorithm and show the path generation for each pattern with any one example. (16)

15. a) A PN sequence is generated using a feedback shift register of length 4. Find the generated output sequence if the initial contents of the shift register are 1 0 0 0. If the chip rate is 10^7 chips/sec, Calculate the chip and PN sequence duration and period of output sequence with neat schematic diagram. (16)

(OR)

b) Derive the probability of error for direct sequence spread spectrum BPSK system, affected by an interfering signal, using the signal space approach. Also obtain jamming margin. Suggest your method to imply the interfering signal. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC502 – Digital Signal Processing

Time : 3 Hours

Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Calculate DFT of the sequence x (n) = $(\frac{1}{4})^n$ for N =16.
2. Obtain the circular convolution of the following sequences x (n) = {1, 2, 1} and h(n) = {1,-2,2}.
3. Distinguish between Butterworth and Chebyshev filter.
4. Write a short note on pre warping.
5. Write the condition for linear phase FIR filter.
6. Distinguish between IIR and FIR filter.
7. What is mean by limit cycle oscillation?
8. What is mean by quantisation step size?
9. Discuss the need for multirate signal processing.
10. What is meant by Decimation?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) State and prove the following properties of the Discrete Fourier Transform (DFT), circular shift, time reversal, circular convolution, and complex conjugate property. (10)

ii) Determine the IDFT of X (K) = {1,-2-j, 0,-2+j}. (6)

(OR)

b) i) Compute an 8-point DFT of x (n) = {2, 1, 2, 1, 2, 1, 2, 1} using DIT-FFT algorithm. (10)

ii) Compute a 4 point IDFT of X (K) = {6,-2-2j, 2,-2+2j} using DIF-FFT algorithm. (6)

12. a) i) Design a digital Chebyshev filter to meet the constraints (12)

$\frac{1}{\sqrt{2}} \leq H(e^{j\omega}) \leq 1$ for $0 \leq \omega \leq 0.2\pi$

$0 \leq H(e^{j\omega}) \leq 0.1$ for $0.5\pi \leq \omega \leq \pi$

Using bilinear transformation and assume T = 1sec.

ii) Obtain the direct form II structure realization for the system (4)
Y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2).

(OR)

b) i) Using bilinear transformation design a digital Butterworth high pass filter, monotonic in passband with cutoff frequency of 1000 Hz and down 10 dB at 350 Hz. The sampling frequency is 5000 Hz. (12)

ii) Obtain the cascade realization for the system (4)
Y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2).

13. a) i) Using a Hamming window technique design a low pass filter with passband gain of unity, cutoff frequency of 1000 Hz and working at a sampling frequency of 5 KHz. The length of the impulse response should be 7. Also plot the frequency response. (12)

ii) Obtain the cascade realisation with minimum number of multipliers (4)
$(1+\frac{1}{2}Z^{-1}+Z^{-2})\,(2+\frac{1}{4}Z^{-1}+2Z^{-2})$

(OR)

b) i) Design an ideal Hilbert transformer having the frequency response (12)

$H(e^{j\omega})$ = j for $-\pi \leq \omega \leq 0$

= -j for $0 \leq \omega \leq \pi$

Using Blackman window for N =11.

ii) Draw the direct form realization of a linear phase FIR filter for N odd and even. (4)

14. a) i) For the given transfer function H(Z) = H1(Z) H2(Z), where (8)
H1(Z) = $\frac{1}{1-0.6z^{-1}}$ and H2(Z) = $\frac{1}{1-0.4\,z^{-1}}$. Determine the output round off noise power. Calculate the value if b = 3 (excluding sign bit).

ii) Find the effect of coefficient quantization on pole location of the given second order IIR system, when it is realized in direct form and in cascade form. Assume a word length of 4 bits through truncation (8)

$H(Z) = \frac{1}{1-0.75Z^{-1}+0.12Z^{-2}}$

(OR)

b) i) What is signal scaling? Find scaling factor S0 to avoid overflow in adder1 of the digital filter with transfer function (8)
$(z) = (0.5 + 0.4Z^{-1})/(1 - 0.312Z^{-1})$.

ii) A digital filter is characterised by the difference equation (8)
$Y(n) = 0.9y(n-1) + x(n)$. With $x(n) = 0$ and initial condition $y(-1) = 12$. Determine the dead band of the filter.

15. a) With a block diagram explain in detail the architecture of TMS320C54X processor. (16)

(OR)

b) Explain various addressing modes of TMS320C54X processor with suitable examples. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC503 – Digital Signal Processing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the advantages and limitations of DSP?
2. How many multiplications and additions are required to compute 32 –point DFT using direct method and radix – 2 FFT?
3. What is Warping effect? How it can be eliminated.
4. Compare digital filters and analog filters.
5. What is Gibb's phenomenon?
6. State the advantages of FIR filters over IIR filters.
7. Compare the fixed point and floating-point arithmetic.
8. Express the fraction 7/8 and -7/8 in sign magnitude, 2's complement and 1'complement form.
9. List at least four features of TMS320C54X processor.
10. Define pipelining. Give its advantages.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Compute an 8-point DFT using DIT- FFT algorithm $x(n) = \{2,2,2,2,3,3,3,3\}$. (10)

ii) Determine the output response y(n) if $h(n) = \{1,3,5,7\}$; $x(n) = \{1,2,3,1\}$ by using (6)

i) Linear convolution

ii) Circular convolution and

iii) Circular convolution with zero padding.

(OR)

b) i) Find the output response of the system for the sequences x (n) = (1,2, -1,2,3, -2, -3, -1,1,1,2, -1) and h(n) = (1,2) using Over-lap save method. (10)

ii) Find the 4-point DFT of the sequence x(n) = cos (nπ/4). (6)

12. a) i) Design a digital Butterworth filter satisfying the constraints given below using bilinear transformations. (10)

$$0.707 \leq |H(\omega)| \leq 1.0;\ 0 \leq \omega \leq \pi/2$$

$$|H(\omega)| \leq 0.2;\ 3\pi/4 \leq \omega \leq \pi.$$

Assume T = 1 sec.

ii) Determine H(z) using impulse invariant method for given transfer function $H(s) = \frac{2}{(S+1)(S+2)}$, Assume T=1 sec. (6)

(OR)

b) i) Design an analog Chebyshev high pass filter satisfying the following specifications. (10)

$$\propto_p = 1dB, \propto_s = 15dB,\ \Omega_p = 0.4\pi,\ \Omega_s = 0.2\pi$$

ii) Obtain the direct form-II realization of the following system function (6)

y(n) = -0.1 y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2).

13. a) Design an ideal low pass filter with frequency response using hamming window. Assume order of the filter N=11. (16)

$$H_d(w) = \begin{cases} 1, & -3\Pi/4 \leq |\omega| \leq 3\Pi/4 \\ 0, & 3\Pi/4 \leq |\omega| \leq \Pi \end{cases}$$

(OR)

b) The desired frequency response of a lowpass filter is given by (16)

$$H_d(w) = \begin{cases} e^{-j3\omega}, & |\omega| \leq \Pi/4 \\ 0, & \Pi/4 \leq |\omega| \leq \Pi \end{cases}$$

Determine the filter coefficients h(n) using Blackman window.

14. a) i) Find the effect of coefficient quantization on pole location of the given second order IIR system, when it is realized in direct form and in cascade form. Assume a word length of 4 bits through truncation. (8)

$H(Z) = \frac{1}{1-0.75Z^{-1}+0.12Z^{-2}}$.

ii) Derive the expression to obtain quantization noise power. (8)

(OR)

b) i) What is signal scaling? Find scaling factor S_0 to avoid overflow in adder1 of the digital filter with transfer function (8)

$$H(z) = \frac{(0.5 + 0.4Z^{-1})}{(1 - 0.312Z^{-1})}$$

ii) For the given transfer function H(Z) = $H_1(Z)$ $H_2(Z)$, where (8)

$H_1(Z) = \frac{1}{1-0.6z^{-1}}$ and H2(Z) = $\frac{1}{1-0.4\,z^{-1}}$. Determine the output roundoff noise power. Calculate the value if b = 3 (excluding sign bit).

15. a) i) With a block diagram explain in detail the architecture of TMS320C54X processor. (8)

ii) Discuss the need for multirate signal processing. Illustrate the decimation by a factor D. (8)

(OR)

b) i) Explain various addressing modes of TMS320C54X processor. (8)

ii) Explain various arithmetic instructions of TMS320C54X processor. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E./M.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC503 – Embedded Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Tabulate any two differences between timer and counter.
2. How microcontrollers are different from microprocessor?
3. Is RS232 a serial or parallel communication protocol? Justify.
4. Draw the CAN 2.0 B frame format with neat sketch.
5. List out the challenges in building embedded system.
6. Differentiate little endian and big endian formats.
7. Define RTOS with example.
8. Compare Preemptive and non-preemptive kernel.
9. Write a function of RFID system and list contribution involved in smart city automation.
10. List out the challenges in building Smart card System with example.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the concept of memory segmentation? List any two advantages. (8)

ii) What is meant by DMA? Explain in detail. (8)

(OR)

b) Demonstrate the timer program in both polling and interrupt driven method. [Hint: use 8051 microcontroller] (16)

12. a) Demonstrate the interfacing concepts of RTC DS-1307 with 89c51/PIC 16/18F microcontroller and display the time and date on 1 line in 16 x 2 LCD display. Write a suitable block diagram for I2 C interfacing with neat sketch. (16)

(OR)

b) i) Explain in detail with neat illustration of the following (8)

1) RS485

2) SPI bus

ii) With suitable illustration elucidate the handshaking mechanism of Memory Read/write bus cycle in CAN bus and explain how CAN bus can be applied for industry automation with neat sketch. (8)

13. a) Draw the schematic representation of embedded design life cycle and analyse the features of the various phases. (16)

(OR)

b) Illustrate the design process of co-design and examine the verification process of co-design. (16)

14. a) Mr.XYZ Company need to design an automatic coffee machine for boys' hostel for smooth functioning during snacks time. Draw and prepare a checklist for the above design application with RTOS. (16)

(OR)

b) Define IPC? Explain briefly about semaphores and Mailbox process and its function in RTOS with suitable example. (16)

15. a) With neat block diagram, show how to design a smart shoe for visually impaired people. Also explains its functionality with neat flow chart. (16)

(OR)

b) Design a microcontroller to control the home appliances using voice, location command. Draw the circuit schematic and flowchart. Write the suitable pseudo code for the same. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov /Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC602 – Embedded Systems

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Embedded Systems.
2. Mention the use of a watchdog timer.
3. Compare RS485 over RS232 and RS422.
4. Mention the use of Inter Integrated Circuit.
5. Define Data Flow Graph.
6. Write about Concurrent Model.
7. Distinguish Process and Threads.
8. Define priority inversion in RTOS.
9. What is RFID?
10. List some Smart card application.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What are the various Hardware units and software tools used in designing an Embedded system? Explain each in detail. (16)

(OR)

b) State various memory management methods used in embedded systems and discuss concept and working of Direct Memory Access (DMA). (16)

12. a) i) List various types of I/O device ports used in embedded systems and explain. (8)

ii) Discuss in brief about RS232 communication protocol. (8)

(OR)

b) i) Discuss in detail about CAN bus. (8)

ii) Describe Serial Peripheral Interface (SPI) protocol in detail. (8)

13. a) Discuss in detail about the objectives and different phases of EDLC. (16)

(OR)

b) Discuss briefly about State Machine Model & Object-Oriented Model. (16)

14. a) i) Explain in detail about multiprocessing and multitasking in RTOS. (8)

ii) Write short notes on Preemptive and non-preemptive scheduling. (8)

(OR)

b) i) Describe the various Inter Process Communication methods with example. (8)

ii) Write short notes on semaphores. (8)

15. a) Discuss in brief about the architecture and functioning of GPS navigation system. (16)

(OR)

b) Discuss in brief about the architecture and functioning of ATM machine. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22ECH101 – VLSI Technology

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What factors should be considered when evaluating epitaxial growth?
2. What are the challenges associated with oxide stress during the oxidation process?
3. Explain the importance of silicon oxidation.
4. What is Lithography?
5. What are the experimental techniques available to measure the diffusion parameters?
6. Give a short note on atomic diffusion mechanism.
7. List all process steps of patterning.
8. What is Annealing? Give its advantages.
9. Differentiate CMOS and NMOS IC technology.
10. Explain the purpose of packaging in VLSI devices.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	What is epitaxy? Explain molecular beam epitaxy with diagram. Also state its advantages and disadvantages.	(8)
		ii)	Explain with neat diagram the crystal growth approach by Czochralski crystal growing process.	(8)
			(OR)	
	b)	i)	Compare wet oxidation and dry oxidation. Why is the growth of wet oxides faster than that of dry oxides?	(8)
		ii)	Describe the process of obtaining electronic grade silicon from silicon dioxide with necessary equations.	(8)
12.	a)	i)	List and compare different types of lithography techniques.	(8)
		ii)	Explain various methods of techniques involved in electron lithography.	(8)

(OR)

b) i) What are the various etching process used in SOI process. Explain about it. (8)

ii) Explain about relative plasma etching technique. (8)

13. a) Explain the following towards plasma assisted deposition, (16)

Deposition variable.

Properties of PD films.

(OR)

b) Derive Flicks one dimensional diffusion equation with necessary expressions. (16)

14. a) Explain ion-implantation technique. Why is ion-implantation preferred over diffusion for impurity doping? Compare ion implantation process with diffusion. (16)

(OR)

b) What are the methods used for physical vapor deposition. Explain in detail with suitable diagrams. (16)

15. a) What is package fabrication technology? Explain about various package fabrication techniques. (16)

(OR)

b) Explain in detail VLSI assembly technology. Describe various process involved in VLSI assembly technology. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22ECH102 – Analog CMOS IC Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Identify the characteristics of high gain amplifier structures.
2. How does ICMR impact the operation of a differential amplifier?
3. Evaluate the impact of the Miller effect on the performance of a high frequency amplifier.
4. How can the statistical characteristics of noise be applied to improve the design of an amplifier?
5. List out the properties of negative feedback circuits.
6. What is the effect of slew rate on the performance of an operational amplifier?
7. Define Barkhausen's criterion.
8. Evaluate the advantages and disadvantages of using a cascode second stage in a two stage op amp design.
9. Give two advantages of using a Widlar current source.
10. What is constant gm biasing and why is it important?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Derive the voltage gain of a source follower amplifier and explain its significance in circuit design. (8)

ii) Describe the role of the active load in a folded cascode amplifier. How does it affect the gain and output impedance? (8)

(OR)

b) i) Design common source amplifier to meet specified gain and bandwidth requirements. (8)

ii) Explain differential amplifier with an active load using MOS transistors. (8)

12. a) i) Clarify the association of poles with nodes in amplifier circuits and what is its significance? (8)

ii) Consider the cascode stages shown in figure.1 where the load resistance is replaced by ideal current source. Neglecting the capacitances associated with M_1 representing Vin and M_1 by a Norton equivalent? Assume $\gamma = 0$. Compute the transfer function. (8)

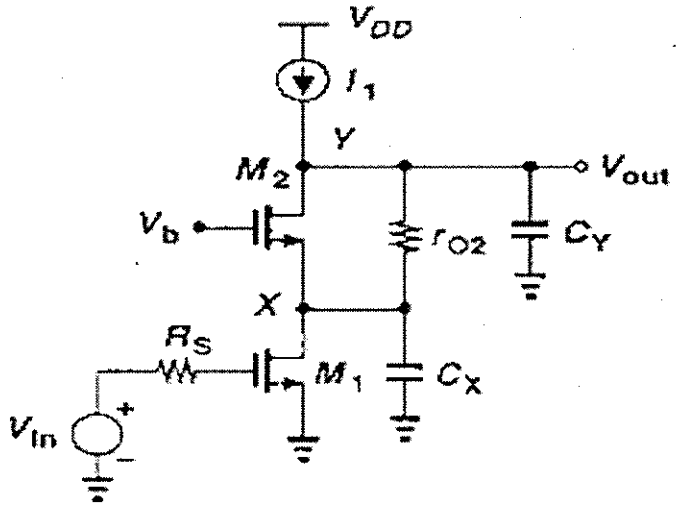


Figure.1.

(OR)

b) i) Analyze the frequency response of a common source amplifier and explain how it relates to the Miller effect. (8)

ii) Explain the methods to minimize noise in single stage amplifiers. (8)

13. a) i) Analyze the performance parameters of operational amplifiers. (8)

ii) Analyze how the gain can be boosted in op amp circuits. (8)

(OR)

b) i) Discuss the working and advantages of a single stage op amp. (8)

ii) Analyze the effects of various noises that exist in op amp. (8)

14. a) i) Explain in detail the concept of phase margin and how it affects stability. (8)

ii) Analyze the slewing characteristics of two stage op amps. (8)

(OR)

b) i) Describe in detail the two stage op amp design with necessary diagrams. (8)

ii) Outline the concept of frequency compensation and its applications in amplifier design. (8)

15. a) i) Distinguish between cascode current source and Wilson current source. (8)

ii) Describe the concept of supply independent biasing. (8)

(OR)

b) i) Summarize the operation of a basic current mirror and analyze its performance. (8)

ii) Describe the operation of PTAT current generation and its importance in circuits. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC601 – VLSI Design

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Threshold voltage of MOSFET.
2. Draw the Stick diagram and layout for CMOS Inverter.
3. What is channel-stop implantation?
4. Explain the twin tub process.
5. Illustrate the purpose of comparators in VLSI.
6. Compare Synchronous and Asynchronous Counters.
7. Examine the need for switch level models.
8. Illustrate the principle of priority encoder.
9. What are the types of gate arrays in ASIC?
10. What are the different methods of programming of PALs?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the CMOS inverter DC characteristics and obtain the relationship for output voltage at different region in the transfer characteristics. (16)

(OR)

b) Write Short Notes on (16)

i) Channel Length Modulation.

ii) Complementary MOS Transistor.

12. a) i) Explain the silicon semiconductor fabrication process. (8)

ii) Explain the latch up prevention techniques. (8)

(OR)

b) i) Explain the Twin tub and SOI Process. (8)

ii) Explain Basic CMOS technology: n-well – P-well. (8)

13. a) Build One/Zero Detectors and Comparators for data path subsystems. (16)

(OR)

b) Distinguish SRAM – DRAM & Read-Only Memory. (16)

14. a) Construct the Multiplexer and latches using transmission Gate. (16)

(OR)

b) Write Short notes on (16)
i) Ripple carry Adder.
ii) D Flip Flop.

15. a) Classify the different types of ASIC with neat diagram. (16)

(OR)

b) i) Justify the needs of CMOS Testing in VLSI Design. (8)

ii) Explain about channel less and structured GA. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC602 – VLSI Design

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is stick diagram? Sketch the stick diagram for 2 input NAND gate.
2. Write the threshold voltage equation for nMOS transistor?
3. List out the advantages of CMOS process.
4. How does trench capacitor acts as circuit element for dynamic storage?
5. List the components of data path.
6. Draw the structure of 6- transistor SRAM cell.
7. How propagation delays are modelled in VHDL?
8. Write the truth table and VHDL code for D flip-flop.
9. Differentiate between FPGH Design an ASIC Design flow.
10. What are the different types of CMOS testing?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the CMOS inverter for 'a' input and 'y' output and derive its DC characteristics for five regions of operations. (16)

(OR)

b) Describe the working of nMOS enhancement transistor and derive the drain current of MOS device in different operating regions. (16)

12. a) i) Describe the various steps involved in the process of Si semiconductor technology. (10)

ii) What is the purpose of second layer of metal interconnect in CMOS process? And detail on the process steps of two metal process. (6)

(OR)

b) i) Detail on p well process in the fabrication of CMOS transistor. (10)

ii) What is Latch up? And detail its prevention techniques. (6)

13. a) i) Describe ripple carry adder and derive the worst case delay with example. (12)

ii) Brief on Wallace tree multiplier (4)

(OR)

b) i) Design 3*3 multiplier to reduce the number of generated partial products by half. (12)

ii) Compare SRAM and DRAM. (4)

14. a) i) Design and write VHDL code for 8:1 multiplexer. (10)

ii) How are blocking assignment different from non-blocking assignments? (6)

(OR)

b) i) Write the VHDL code for 4 bit ripple carry adder. (10)

ii) Explain about function and task in VHDL. (6)

15. a) With neat sketch explain the Programmable ASIC and describe the ASIC design flow. (16)

(OR)

b) Explain the following types of ASIC: (16)

1) Full custom ASIC

2) Semicustom ASIC

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECH206 – Wireless Adhoc and Sensor Networks

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term Basic Service Set (BSS) in WLANs.
2. What is MANET?
3. Differentiate between proactive and reactive routing protocols.
4. What is the hidden terminal problem?
5. Explain energy harvesting in WSN.
6. State the role of the mobile node in WSN.
7. List the importance of node localization.
8. Define time synchronization.
9. What do you mean by a tampering attack?
10. Mention the different phases of TESLA.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the fundamentals of WLANs and describe the IEEE 802.11 architecture in detail. (16)

(OR)

b) Explain in detail about the MACAW - A media access protocol for Wireless LANs with example topology. (16)

12. a) Examine in detail the various algorithms of hybrid routing protocols. (16)

(OR)

b) Analyze in detail about the DREAM and Quorums-based location service. (16)

13. a) i) Explain MAC Protocol for wireless sensor networks. (8)

ii) Explain in detail about IEEE 802.15.4. (8)

(OR)

b) i) Discuss the Sensor network architecture in detail. (8)

ii) Illustrate low-duty cycle protocols and wakeup concepts. (8)

14. a) Discuss wireless sensor network time synchronization. Describe two time synchronization protocols utilized in these networks. (16)

(OR)

b) Discuss the importance of localization of sensor nodes and briefly explain the trilateration method from range-based localization techniques. (16)

15. a) i) Demonstrate Key Distribution and Management in security attacks. (8)

ii) Outline the issues and challenges in security provisioning for wireless sensor networks. (8)

(OR)

b) i) Give an outline of SPINS, the security protocol for sensor networks. (8)

ii) Explain about software-based Anti-tamper techniques. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECH210 – Next Generation Networks

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the role of the internet in mobile computing.
2. Outline some future trends in mobile computing.
3. How does routing in mobile hosts differ from traditional routing?
4. What is the significance of cell fundamentals in wireless networks?
5. In what ways GPRS is better than GSM?
6. Summarize the role of the mobile station in GPRS.
7. Define protocol architecture.
8. How does mobility in wireless LAN affect network performance?
9. Evaluate the advantages and disadvantages of using CDMA compared to GSM.
10. What is the mobile security framework?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the design considerations for mobile computing and explain how these considerations affect the system? (8)

ii) Describe the main security concerns in mobile computing and suggest solutions. (8)

(OR)

b) i) Analyze the three tier architecture of mobile computing and explain the function of each layer. (8)

ii) Discuss the evolution of mobile devices and their impact on mobile computing. (8)

12. a) i) Compare and contrast Bluetooth and RFID technologies. (8)

ii) Explain the architecture of GSM. (8)

(OR)

b) i) Discuss the working of Mobile IP in detail. (8)

ii) Provide a brief explanation of the mobile transport layer. (8)

13. a) Draw and explain the architecture of GPRS. List its advantages and limitations along with the process of billing and changing. (16)

(OR)

b) List and discuss the challenges involved in GPRS network operation and the data services provided by GPRS. (16)

14. a) Discuss about Medium Access Control layer in wireless networks and brief about mobile ad hoc networks and sensor networks. (16)

(OR)

b) Briefly explain about IEEE 802.11a and IEEE 802.11b standards for wireless LAN with necessary diagrams. What are the strengths and weaknesses of each? (16)

15. a) What is the common security issues faced in mobile information security? Suggest techniques to overcome and explain any one algorithm in detail. (16)

(OR)

b) Showcase the basic principle of spread spectrum technology and explain FHSS with necessary sketches. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

23PTEC304 – Microprocessors and Microcontrollers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the flags and its function in 8086 microprocessor.
2. Mention the two modes of operation in 8086.
3. What is the maximum mode configuration in 8086 microprocessor?
4. How does the 8255 PPI facilitate communication between peripherals and the 8086 processor?
5. Mention the function of RST pin in the 8051 microcontroller.
6. How many special function registers are in 8051 microcontroller? List and mention their purpose.
7. What is the purpose of NOP instruction in 8051?
8. How an external interrupt can be enable in 8051 through assembly language and which interrupt has the highest priority?
9. Mention the main characteristics of PIC micro controllers.
10. Compare and contrast RISC and CISC.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With the architecture block diagram, explain in detail the internal architecture of 8086 microprocessor including BIU, EC and various registers. (16)

(OR)

b) Categorize the various addressing modes supported by 8086 microprocessor? Provide examples for each addressing modes. (16)

12. a) Showcase the function and the significance of the 8279 keyboard/display interface with 8086 with block diagram. (16)

(OR)

b) Discuss the concept of interrupt I/O in 8086. How does the processor handle an interrupt request? Compare Interrupt I/O with Programmed I/O and mention the advantages of interrupts. (16)

13. a) Briefly explain the architecture of 8051 microcontroller. (16)

(OR)

b) Enumerate and explain 8051 parallel I/O ports in detail. How are the ports port 0, port 1, port 2 and port 3 are configured. (16)

14. a) With suitable examples, explain the different operating modes of timers. (16)

(OR)

b) How does LCD module is interfaced with 8051 microcontroller? Discuss control and data pins used for the interface purpose. (16)

15. a) Discuss the architecture of PIC microcontroller. Brief about the design, features and explain how these features make them suitable for Embedded Systems. (16)

(OR)

b) Explain the memory architecture in PIC microcontrollers. Discuss about the various memory types in detail. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC403 – Microprocessors and Microcontrollers

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the function of the Accumulator in the 8085 microprocessor.
2. Define stack pointer.
3. Write the role of the **SI** (Source Index) and **DI** (Destination Index) registers in the 8086 microprocessor.
4. What is the function of the INT instruction in 8086 assembly language?
5. Differentiate between Harvard and Von Neumann architecture.
6. Identify two major differences between CISC and RISC processors.
7. What is the role of the SBUF register in 8051 serial communication?
8. Name two types of interrupts in the 8051 microcontroller.
9. Give the need for watchdog timer in PIC.
10. Outline the features of PIC F8XX series microcontrollers.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss in brief about the architecture and memory organization of the 8085 microprocessor. (16)

(OR)

b) Explain the complete process of interfacing memory and I/O devices with the 8086 microprocessor. Include discussions on minimum and maximum mode configurations, bus cycles, and timing diagrams. (16)

12. a) Describe the various types of addressing modes available in the 8086 microprocessor. Provide an example of assembly code for each addressing mode. (16)

(OR)

	b)	Explain briefly the steps involved in interfacing and programming the 8251 USART with the 8086 microprocessor for serial communication.	(16)
13.	a)	Describe the 8051 microcontroller architecture in detail.	(16)
		(OR)	
	b)	Discuss the process of interfacing an LCD display with the 8051 microcontroller. Provide a simple example of an assembly language program that writes "Hello, World!" to the LCD display.	(16)
14.	a)	Brief about the following ADC, DAC and Sensor Interfacing with 8051.	(16)
		(OR)	
	b)	Outline the steps to initialize and use the 8051's serial port for simple data communication between the 8051 microcontroller and a computer.	(16)
15.	a)	Explain the architecture and memory organization of the PIC 16C6X/7X microcontrollers.	(16)
		(OR)	
	b)	Brief about the instruction set and addressing mode in PIC 16C6X/7X.	(16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC402 – Microprocessors and Microcontrollers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What does the term "pipelining" mean?
2. What exactly constitutes an assembler directive? Specify its kinds.
3. Draw the timing diagram of Interrupt acknowledgement on a Minimum mode system.
4. Rephrase the term "key bouncing"
5. Define DPTR.
6. Identify the significance of the GATE bit in the TMOD control register.
7. Define interrupts and their importance in microcontroller programming.
8. How do you control the speed and direction of a DC motor using the 8051 microcontroller?
9. How do PIC microcontrollers typically differs from other microcontroller families in terms of architecture and instruction set?
10. Interpret timers in PIC microcontrollers and what do they do?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw the internal architecture and pin diagram of 8086 microprocessor and discuss each. (16)

(OR)

b) Describe in detail about each addressing mode with an example and identify an example for the following instructions AAA, JNBE, LAHF, MOVS, RCL, SAHF. (16)

12. a) Describe about the 8086 based maximum mode system with a neat diagram. (16)

(OR)

b) Describe the 8255 programmable peripheral interface and Recall its operating modes. (16)

13. a) i) Illustrate the architectural features of 8051 microcontroller with necessary diagram. (10)

ii) Inspect the bit and byte addressable registers in 8051 and also explain register bank switching. (6)

(OR)

b) i) Summarize about the instruction sets of 8051 microcontroller. (10)

ii) Classify the different addressing modes in 8051 microcontroller with an example. (6)

14. a) i) Write an 8051 ALP to create a square wave of 66% duty cycle on bit 3 of port 1. (10)

ii) Examine how to configure Timer 0 and Timer 1 in different modes such as Mode 0, Mode 1, Mode 2, and Mode 3. (6)

(OR)

b) i) Describe how to interface an RTC module with the 8051 microcontroller. (10)

ii) Inspect how to interface analog sensors with the 8051 microcontroller using ADC. (6)

15. a) Construct the typical architecture of PIC microcontrollers and their key components and influence how program memory is accessed and utilized during the execution of a program. (16)

(OR)

b) Analyze the different types of instructions supported by PIC microcontrollers, such as arithmetic, logic, control, and data movement instructions and create typical applications that utilize EEPROM data memory in embedded systems. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC701 – Optical and Microwave Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compute the scattering co-efficients of a matched isolator has insertion loss of 0.5 dB and isolation of 25 dB.
2. In a lossless transmission line of characteristic impedance Z_0, a series reactance jX and two shunt susceptances jB are placed as shown in Figure.1. Find the ABCD parameters for the network.

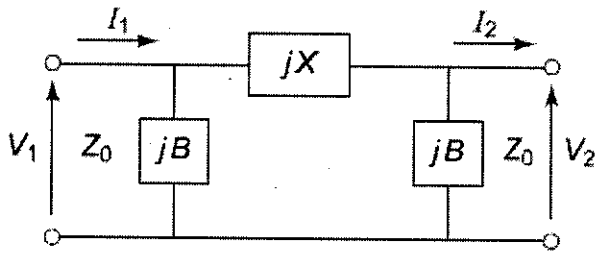


Figure.1

3. Recall Gunn effect.
4. Compare IMPATT and TRAPPAT diode characteristics.
5. Classify microwave linear beam tubes.
6. What is velocity modulation in two cavity klystron amplifier?
7. Mention the merits of optical communication.
8. List the possible losses occur in fibre optic communication.
9. Define Signal to noise ratio.
10. What is sensitivity of optical receiver?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the function of hybrid tee and hybrid ring microwave passive components with suitable diagrams and model their scattering matrix. (16)

(OR)

b) Discuss the working of two hole and hybrid directional couplers and model the S matrix of symmetrical and asymmetrical directional couplers. (16)

12. a) Illustrate the construction of Gunn diode and different modes of operation in detail. (16)

(OR)

b) Elaborate the construction and working of any four avalanche transit time devices with suitable diagrams. (16)

13. a) Explain the mechanism of operation of reflex klystron oscillator and derive the expressions for transit time in the drift space, output power and efficiency. (16)

(OR)

b) Summarize the construction and operation of cylindrical magnetron oscillator and obtain the expressions for Hull cut-off magnetic and voltage equations. (16)

14. a) Elucidate the different reasons of attenuation in optical fiber in detail. Also brief on signal distortions in fiber. (16)

(OR)

b) Describe the design, operation and features of LASER diode and derive its rate equation. (16)

15. a) Discuss the working principle of PIN photo detector and avalanche photo diode in detail. (16)

(OR)

b) Describe the amplification mechanism and architecture of Erbium doped fiber amplifier. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

COMMUNICATION SYSTEMS

22COE61 – Cognitive Radio

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the importance of structuring knowledge for cognition tasks?
2. Outline the key components of cognitive radio architecture.
3. Give the relationship between cognitive radio and SDR.
4. What are the architecture goals of SDR?
5. How does cognitive radio differ from traditional wireless radios?
6. List the primary design rules for cognitive radios.
7. Assess the purpose and functionality of the IEEE 802.22 standard.
8. Highlight the main security vulnerabilities in the IEEE 802.22 standard.
9. Identify the concept of slotted ALOHA.
10. State the primary function of the network layer in cognitive radios.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the different types of cognitive tasks involved in cognitive radios and how they are organized? (8)

ii) Discuss the importance of environmental awareness in cognitive radio systems. (8)

(OR)

b) i) Outline the concept of self-awareness in cognitive radios and its significance in improving performance. (8)

ii) Describe the design considerations when building a cognitive radio network. (8)

12. a) i) Discuss in detail the evolution of SDR architecture. (8)

ii) How do the interfaces in the plug and play module of SDR impact the performance and scalability? (8)

(OR)

b) i) Analyze the characteristics of the top level components in SDR and their interactions. (8)

ii) Assess the advantages and disadvantages of Software Defined Radio and examine how these factors impact its adoption. (8)

13. a) i) Design cognitive radio architecture and highlighting its key components and their interactions. (8)

ii) Examine the importance of architecture maps in designing and implementing cognitive radios. (8)

(OR)

b) i) Analyze the significance of the orient phase in the cognition cycle. (8)

ii) What are the principles and challenges in building cognitive radio architecture on SDR architecture and how do they interact? (8)

14. a) i) Explain the primary functions and objectives of the IEEE 802.22 standard. (8)

ii) Analyze the implications of primary user emulation attacks on the reliability of IEEE 802.22 networks. (8)

(OR)

b) i) Discuss how IEEE 802.22 facilitates efficient utilization of TV band spectrum. (8)

ii) Discuss the potential security threats to radio software in IEEE 802.22 devices and propose mitigation strategies. (8)

15. a) i) How does the multichannel MAC protocol approach collision avoidance and resolution differently compared to traditional MAC protocols? (8)

ii) Investigate the challenges of routing in cognitive radio networks. (8)

(OR)

b) i) Examine how CSMA works in cognitive radio systems and analyze its role in minimizing interference. (8)

ii) Analyze the impact of different flow control mechanisms on the performance of cognitive radio networks. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

COMMUNICATION SYSTEMS

22COE71 – Remote Sensing

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is EMR spectrum?
2. State the features of remote sensing satellites.
3. Summarize the significance of histograms.
4. Define Quantization.
5. What is Radiometric correction in image processing?
6. Define Enhancement.
7. Classify the different types of images.
8. What is meant by object based classification?
9. Explain the specific uses of remote image sensing in the case of weather.
10. What are the two types of remote image sensing technology?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write short notes on Active and Passive Remote Sensing Systems. (8)

ii) Discuss briefly about airborne and space borne platforms. (8)

(OR)

b) Discuss briefly about importance of Remote sensing satellites and its features. (16)

12. a) Illustrate the Merging of different types of remotely sensed data. (16)

(OR)

b) Examine the Image processing system characteristics in details. (16)

13. a) Determine the requirements for Radiometric and Geometric corrections. (16)

(OR)

b) i) Explain the Enhance Low and high frequency details and edges in detail. (8)

ii) Illustrate the concept of Texture transformation. (8)

14. a) Categorize the different image types with suitable examples. (16)

(OR)

b) Analyze the Object based and neural network based pixel models. (16)

15. a) Develop an method to find and analyze the water resource in the Earth using remote sensing. (16)

(OR)

b) Summarize the applications of remote sensing in Wildlife Ecology in detail. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC401 – Analog Circuits

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Barkhausen Criteria?
2. Draw the Electrical equivalent circuit of a crystal.
3. A tuned circuit has a resonant frequency of 4 MHz and a bandwidth of 40 kHz. What is the value of Q factor?
4. State any two applications of blocking oscillator.
5. List the ideal characteristics of OpAmp.
6. Define slew rate.
7. Identify the circuit and write the gain. Shown in figure.1.

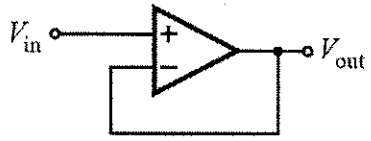


Figure.1

8. For a 2-bit DAC, the analog values corresponding to digital bits 00 and 01 are 0 V and 0.75 V. What is the analog value for digital bits 11?
9. Consider an 8-bit AD converter operating with Vref = 5 V, Calculate its step size and signal-to-noise ratio (SNR).
10. What is the need for voltage regulator ICs?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With the help of a circuit diagram, explain the principle of operation of a Wein bridge oscillator and obtain the frequency of oscillation. (12)

ii) Derive the minimum gain required for oscillation to begin. (4)

(OR)

b) i) Discuss the principle of operation of Colpitt's oscillator and obtain the equation for frequency. (12)

ii) Determine frequency of oscillations for a Colpitts oscillator with L = 10 mH, C1 = 1000 pF, C2 = 10,000 PF. (4)

12. a) i) Discuss the operation of a Class C tuned amplifier and its efficiency. (10)

ii) Outline the application of Class C tuned amplifiers. (6)

(OR)

b) i) Discuss the transistor-based a stable multi vibrator with a neat circuit diagram. (10)

ii) Explain the bistable multi vibrator with a neat circuit diagram. (6)

13. a) i) Elucidate the operation of the current mirror when used for biasing operation. (12)

ii) Draw the internal circuit of Operational amplifier. (4)

(OR)

b) i) Discuss the various modes of operation of differential amplifier. (12)

ii) Derive the expression for CMRR. (4)

14. a) i) Analyze the working of the Op-amp-based integrator and differentiator as a filter circuit and derive the expression for gain. (10)

ii) Calculate the output voltage. Shown in Figure.2. (6)

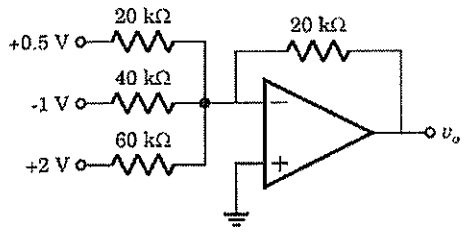


Figure.2

(OR)

b) i) Discuss in detail about the regenerative comparator circuit and its operation. (10)

ii) Plot Vo versus Vi for a)VR = 0 V, b)VR = 5 V. Shown in Figure.3. (6)

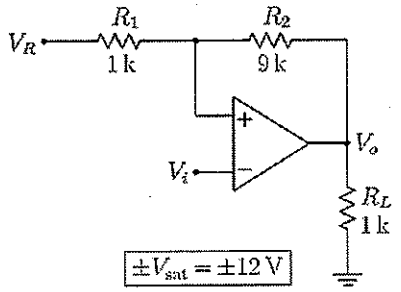


Figure.3

15. a) i) Explain the working principle of successive approximation Analog to Digital converter. (10)

ii) Estimate the digital bits using 3-bit SAR ADC with Vref = 4 Volt for the input voltage of 2.75 Volt. (6)

(OR)

b) i) Explain the internal structure of 555 timer IC. (10)

ii) Determine the frequency of oscillations and duty cycle when the 555 timer is configured in a stable mode with RA = 2 kΩ, RB = 6 kΩ, and C = 0.1μF. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2023 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

23PTEC201 – Analog Circuits

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term gain with feedback.
2. What is the Barkhausen Criterion for oscillations?
3. Compare ideal and practical characteristics of an op-amp.
4. Mention the applications of class C tuned amplifiers.
5. A differential amplifier has a differential voltage gain of 2000 and a common mode gain of 0.2. Find the CMRR in dB.
6. Define slew rate.
7. List any two applications for Inverting amplifier.
8. What is the importance of voltage follower.
9. Draw the pin diagram of 555 timer.
10. Compare the characteristics of R-2R DAC and binary weighted DAC.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the working of an RC phase shift oscillator with a neat circuit diagram and derive the frequency of oscillation and list the application. (16)

(OR)

b) Construct and derive the frequency of oscillation for a Colpitts oscillator and draw the circuit of Hartley and colpitls oscillator. Compare them. (16)

12. a) Explain the construction and operation of a Class C tuned amplifier. (16)

(OR)

b) With neat diagram explain the operation of an astable and monostable multivibrators. (16)

13. a) With a schematic diagram, explain the effect of R_E on CMRR in differential amplifier. (16)

(OR)

b) Draw the circuit diagram of a differential amplifier and make use of the h-parameter model of the bipolar junction transistor to compute the common mode rejection ratio. (16)

14. a) Explain the operation of differentiator and summing amplifier integrator using operational amplifier with relevant waveforms and equations. (16)

(OR)

b) Briefly explain the working principle of Schmitt trigger. (16)

15. a) Explain the operation of dual slope and successive approximation type ADC with neat sketch. (16)

(OR)

b) With neat sketch, explain IC723 general purpose voltage regulator. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2023 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

23PTEC302 – Control Systems

(Ordinary graph sheet, semi log sheet, polar plot to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define transfer function.
2. Distinguish open-loop and closed-loop systems in terms of feedback?
3. What are the standard test signals used for time domain analysis?
4. Define step response of a system.
5. Recall the relationship between the natural frequency and the damping ratio in a second-order system.
6. Define the frequency response of a system.
7. Mention the applications of root locus.
8. What is the role of Nyquist plot in system stability analysis?
9. How can the state equation be solved in linear systems?
10. Mention the conditions for a system to be controllable.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Find the transfer function $\theta(S) / T(S)$ of the following system shown in Figure 1. (16)

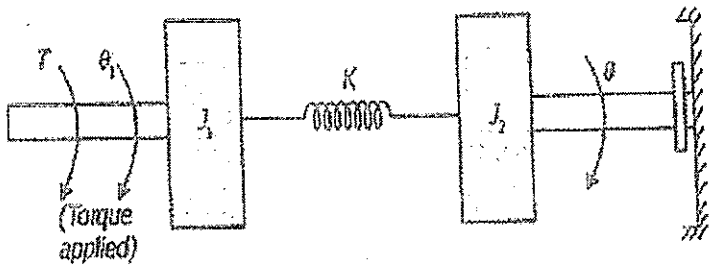


Figure 1.

(OR)

b) Write the differential equations governing the Mechanical system shown in figure 2 given below and determine the transfer function. (16)

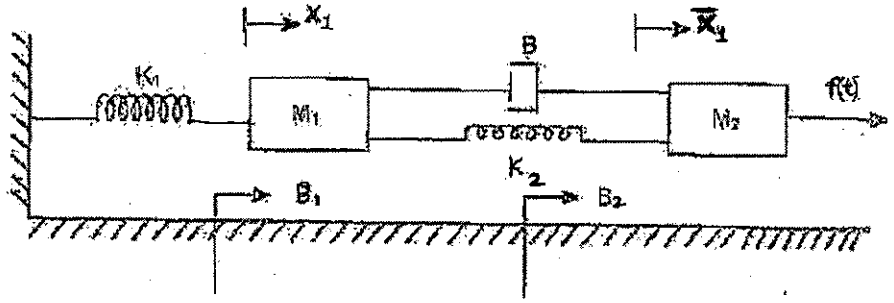


Figure 2.

12. a) Derive the transient response of Underdamped second ordered system when exited with unit step input. (16)

(OR)

b) With a neat diagram, explain the function of PID compensation in detail. (16)

13. a) What is a Lag compensator? Realize the lag compensator with the help of basic electrical components and thus draw its frequency response. (16)

(OR)

b) Sketch the Bode plot for the following transfer function and determine the system gain K for the gain cross over frequency to be 5 rad/sec. (16)

$$G(s) = \frac{Ks^2}{(1+0.2s)(1+0.02s)}$$

14. a) The open loop transfer function of a unity feedback system is given by $G(s) = \frac{K(s+9)}{s(s^2+4s+11)}$. Sketch the root locus of the system. (16)

(OR)

b) Explain the Routh-Hurwitz Criterion in detail. Derive the necessary conditions for stability for a given characteristic equation. (16)

15. a) Write short notes on the following: (16)

a) Controllability and observability

b) State transition matrix

c) Diagonalization

(OR)

b) Consider the following system with differential equation given by $\dddot{y} + 6\ddot{y} + 11\dot{y} + 6y = 6u$. Obtain the state model in diagonal canonical form. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC405 – Antenna and Wave Propagation

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Review the types of an antenna.
2. Relate the Gain and Directivity of an antenna through proper expression.
3. Determine the input impedance of a three-conductor folded dipole antenna.
4. What is meant by frequency independent antenna?
5. Asses the types of Feed widely used for reflector antenna.
6. Define pitch angle of a helical antenna.
7. List the design considerations and the applications of an aperture antenna.
8. Recite the basic principle of slot antenna.
9. How the critical frequency and maximum usable frequency are related?
10. Recall the mechanism of space wave propagation.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain radiation mechanism in single and two wire antennas. (8)

ii) Derive the expression for power received by the antenna using Friss transmission equation. (8)

(OR)

b) i) Discuss in detail about the radiation from a half wave dipole antenna with the required E and H field quantities and diagrams. (8)

ii) Define and explain in detail the terms (8)

- Beam solid angle
- Radiation pattern
- Directivity and Polarization of an antenna

12. a) i) Obtain the expression for the field and the radiation pattern produced by an N element array of infinitesimal with distance of separation $\lambda/2$ and currents of equal magnitude and phase shift 180 degree. Deduce the expression for 4 elements and draw its radiation pattern. (10)

ii) What is binomial array? Draw the pattern of 6 element binomial array. (6)

(OR)

b) i) With necessary illustrations explain the radiation characteristics of multi element log periodic dipole antenna and mention its applications. (10)

ii) Explain the structure of folded Dipole antenna and find the radiation resistance and admittance of an antenna. (6)

13. a) i) With neat diagram explain the principle of parabolic reflector antenna and explain the significance of f over D ratio of parabolic reflector antenna. (10)

ii) Explain the geometry of Rhombic antenna neat sketch. Also discuss its merits and demerits. (6)

(OR)

b) i) Explain the construction and operation of helical antenna with neat sketch. Summaries its importance in wireless application. (10)

ii) Describe the operation of loop antenna and derive the expression for emf induced in an antenna. (6)

14. a) i) Derive the expression for far field components of a rectangular aperture on an infinite ground plane and space. (8)

ii) Formulate the uniform aperture distribution on an infinite ground plane for a circular aperture. (8)

(OR)

b) i) What are the different types of horn structures? Draw the radiation pattern of horn antenna and hence describe the radiation mechanism with neat diagram. (8)

ii) A pyramidal horn antenna having aperture dimensions of a = 4.6 cm and b = 2.2 cm is used at a frequency of 20 GHz. Calculate its gain and HPBW. (8)

15. a) i) Draw the structure of ionosphere and explain the mechanism of ionosphere propagation. (8)

ii) What is meant by fading? Explain the different types of fading. (8)

(OR)

b) i) Explain with the help of suitable sketch, the concept of skip distance and its relation with maximum usable frequency when the earth is flat. (8)

ii) Explain the principle of multi hop propagation. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC401 – Antenna and Wave Propagation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Show the expression for the effective aperture of a Half wave Dipole.
2. Define the radiation resistance of an antenna. What is the importance of this parameter?
3. List out the advantages and disadvantages of binomial array.
4. Distinguish between broad side and End fire array.
5. Mention the parameters to be considered for the design of a helical antenna.
6. How to increase the radiation resistance of a loop antenna?
7. State Huygens principle for Aperture antennas.
8. Describe the radiation pattern and field on the axis of an E - plane Sectorial horn.
9. Draw the various layers of atmospheric structure.
10. Define critical frequency.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive an expression for the power radiated by the current element and calculate the radiation resistance. (16)

(OR)

b) Derive the expression for the far field component of a half wave dipole antenna. (16)

12. a) Discuss and derive the expressions for directivity of the following N element linear array antennas. i) Broad side array ii) End fire array iii) Phased array. (16)

(OR)

b) With necessary illustrations explain the radiation characteristics of Yagi Uda antenna. (16)

13. a) What is the importance of helical antenna? Explain the construction and operation of helical antenna with neat sketch. How does it differ from other antennas? (16)

(OR)

b) Derive the expressions for the radiated field and radiation resistance due to a loop antenna. (16)

14. a) Discuss the construction of the rectangular Horn antenna and draw the measured E- and H-plane field patterns of rectangular horn as a function of flare angle and horn length. (16)

(OR)

b) Explain the structure and operation of the Slot antenna. Also derive the expression of its input impedance. (16)

15. a) i) Explain attenuation characteristics of ground wave propagation and obtain expression for field strength. (8)

ii) Explain the following terms with diagram a) Duct propagation b) Skip distance. (8)

(OR)

b) i) What is space wave propagation? Explain the atmospheric effects in space wave propagation. (8)

ii) Draw a neat sketch and explain the different ionized regions of the ionosphere above the earth's surface. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2023 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

23PTEC202 – Electromagnetic Fields

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State the electric field intensity due to infinite line charge.
2. Calculate the electric potential at a point (4, 3) m due to a charge of 10^{-9} C located at the origin in free space.
3. Define Magnetic dipole moment.
4. Write Lorentz force equation and classify its applications.
5. Determine the capacitance of the parallel plate capacitor composed of tin foil sheets, 25 cm square for plates separated through a glass dielectric 0.5 cm thick with relative permittivity of 6.
6. An inductive coil of 10 mH is carrying a current of 10 A. Analyze the energy stored in the magnetic field.
7. Summarize the differential form of Maxwell's Equation.
8. Develop the expressions in terms of electric and magnetic field intensity vectors for a) instantaneous Poynting vector b)time average Poynting vector
9. Describe the characteristics of uniform plane wave?
10. What is Brewster angle?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Define Coulomb's law and deduce the vector form of force equation between two point charges. (12)

ii) Find the force on charge Q_1 of 20 μC due to the charge Q_2 of value - 300 μC. Where Q_1 is located at (0,1,2) m and Q_2 is located at (0,0,0)m. (4)

(OR)

b) i) Apply Gauss's law to an (12)
1) infinite line charge
2) infinite Sheet of charge.

ii) A metallic sphere of radius 10 cm has a surface charge density of 5 nC/m^2. Calculate the energy stored in the system. (4)

12. a) i) From the Biot-Savart's law, write the expression for magnetic field intensity at a point P and distance R from the infinitely long straight current carrying conductor. (8)

ii) Propose the two basic equations for the analysis of magnetic circuits. (8)

(OR)

b) i) Explain Ampere's circuital law. (8)

ii) Derive the magnetic field intensity H due to coaxial cable using Ampere's law. (8)

13. a) A cylindrical capacitor consists of an inner conductor of radius 'a' & an outer conductor whose inner radius is 'b'. The space between the conductors is filled with a dielectric permittivity ε_r & length of the capacitor is L. Determine the value of the Capacitance. (16)

(OR)

b) Derive a general expression for the magnetic flux density B at any point along the axis of a long Solenoid. Sketch the variation of B from point along the axis. (16)

14. a) State and Derive the time harmonic Maxwell's equations in integral form and point form. Why are Maxwell's equations not completely symmetrical? (16)

(OR)

b) i) Using Ampere's circuital law, derive the magnetic field intensity due to a co-axial cable carrying a steady current I. (12)

ii) Are conduction and displacement currents in phase for time harmonic fields? Justify. (4)

15. a) i) Calculate the polarization of the reflected wave for a right hand circularly polarized plane wave. (12)

ii) Construct the phasor expressions for E and H field intensity vectors of an x-polarized uniform plane wave propagating in the +z direction. (4)

(OR)

b) i) Write short notes on plane waves in lossy and lossless medium. (12)

ii) Express the values of the reflection and transmission coefficients at an interface with a perfectly conducting boundary? (4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC403 – Signals and Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the fundamental period $x(t) = \sin(10t + 1) - 2\cos(5t - 2)$.
2. Give the definition of energy and power signal in continuous time domain.
3. Evaluate the Fourier Transform of $\cos\omega_o t\, u(t)$.
4. Describe the Dirichlet's conditions of Fourier series.
5. Find the Laplace transform of $x(t) = u(t) - u(t-a)$.
6. List any four properties of Laplace transform.
7. Find the Z-transform and ROC of $x(n) = a^n u(-n)$.
8. Differentiate between Laplace transform and Z transform.
9. Find the Fourier transform of $x(n) = (0.5)^n u(n)$.
10. What are the advantage of cascade form of realization over direct form of realization?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Perform the following operations on the signal shown in Figure.1. (10)
    1) x(t-1)
    2) x(2-t)
    3) x(2t)
    4) x(2t+1)
    5) x(t/2)

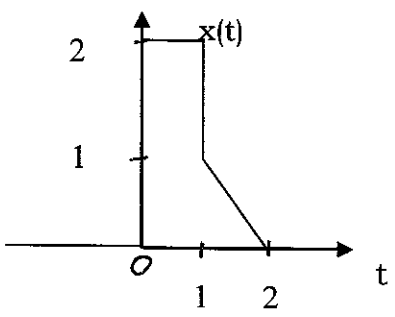


Figure.1

ii) Find the convolution of the signals: $x_1(t) = \cos t\, u(t)$; $x_2(t) = u(t)$ (6)

(OR)

b) i) Check whether the system $y(n) = x^2(n) + \frac{1}{x^2(n-1)}$ are (10)

1) Static or dynamic
2) Linear or non-linear
3) Causal or non-causal
4) Time Invariant or Time variant
5) Stable.

ii) Find whether the signal (6)

$$x(t) = \begin{cases} t-2 & -2 \le t \le 0 \\ 2-t & 0 \le t \le 2 \\ 0 & \text{Otherwise} \end{cases}$$

is energy or power signal. Also find the energy and power of the signal.

12. a) i) Find the Fourier series coefficients of the following signal shown in Figure.2. (8)

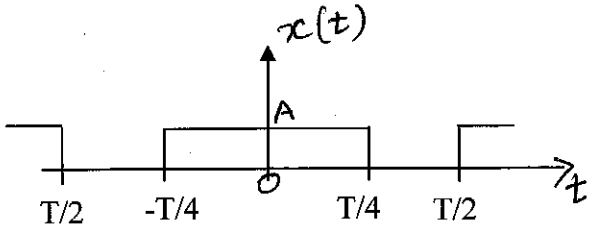


Figure.2

ii) Compute the Fourier transform of the signal (8)

$$x(t) = \begin{cases} 1+\cos(\pi t) & |t|<1 \\ 0 & |t|>1 \end{cases}$$

(OR)

b) i) Find the Fourier transform of the signal (8)

$X(t) = e^{-|t|}$ for $-2 \le t \le 2$

0 otherwise

ii) The input and output of a causal LTI system are related by the differential equation (8)

$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = x(t)$, find the impulse response of the system.

13. a) i) Find the inverse Laplace transform of (10)

$X(s) = \frac{s^2+3s+4}{s^3+5s^2+7s+3}$.

ii) Estimate the initial and final values, if they exist of the signal with Laplace transform, $X(s) = \frac{s+4}{s^2+3s+5}$. (6)

(OR)

b) i) A system is described by the differential equation (10)

$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + x(t); \quad \frac{dy(0)}{dt} = 3, y(0) = 1, x(t) = u(t)$

Find the transfer function and the output signal y(t).

ii) Find the Laplace transform of $x(t) = te^{-2t}\sin 2t\, u(t)$. (6)

14. a) i) Find the inverse Z-transform of (8)

$X(z) = \frac{z^{-1}}{3-z^{-1}+z^{-2}}$; ROC; $|z|>1$.

ii) Determine the Nyquist sampling rate and Nyquist sampling interval for (8)

$x(t) = \text{sinc}(80\Pi t)\ \text{sinc}(120\Pi t)$

(OR)

b) i) Find the z transform of the sequence (8)

$x(n) = \left(\frac{1}{4}\right)^n \cos\left(\frac{\pi}{3}n\right)u(n)$, and sketch the ROC.

ii) State and prove the sampling theorem. How the original signal can be reconstructed from the samples. (8)

15. a) i) A discrete time system is given by the following difference equation (8)

$y(n) - 5y(n-1) = x(n) + 4x(n-1)$, where x(n) is the input and y(n) is the output. Determine the magnitude and phase response.

ii) Realize $H(s) = \frac{s(s+2)}{(s+1)(s+3)(s+4)}$ in Direct form I and Direct form II. (8)

(OR)

b) i) Prove any two properties of Discrete Time Fourier Transform. (8)

ii) Realize the system with transfer function (8)

$H(s) = \frac{4(s^2+4s+3)}{s^3+6.5s^2+11s+4}$, in cascade form.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTECE20 – Medical Electronics

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw a typical cell potential waveform.
2. State the limitations of surface electrodes.
3. Distinguish between air and bone conduction.
4. State the importance of ultrasound in medical field.
5. Mention the diagnostic uses of PET scans.
6. How nuclear medicine differs from radiography?
7. Classify ventilators.
8. Write the working principle of infant incubators.
9. List the basic approaches to protection against shock.
10. What do you mean by mHealth?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With a neat sketch, explain the origin of electrical activity of the heart. Draw a typical ECG waveform and label it. (10)

ii) Give frequency range of various bands for purpose of EEG analysis. (6)

(OR)

b) i) Discuss in detail the electrode-tissue interface for surface electrodes used with electrode jelly. (10)

ii) Give a short note on electrodes used for EMG measurement. (6)

12. a) i) State and explain the working principle of electromagnetic blood flow meter. (8)

ii) Explain the transmission and reflectance method of pulse rate measurement. (8)

(OR)

b) i) Explain any one type of indirect method of blood pressure measurement. (8)

ii) Discuss the ways in which the microprocessors can be applied in patient monitoring. (8)

13. a) Describe the various scanning techniques used in computed tomography. Explain how the progressive developments in scanning techniques have helped to reduce the scanning time? (16)

(OR)

b) With a neat block diagram, explain the principles of Magnetic Resonance Imaging system. List out the biological effects and the advantages of MRI scanner over other imaging systems. (16)

14. a) Explain various types of cardiac pacemakers with their block diagram. (16)

(OR)

b) Explain therapeutic applications of LASER in medical field. (16)

15. a) i) With a neat diagram, explain the operation of automated chemical analyzer. (10)

ii) Explain microshock via ground potential differences. (6)

(OR)

b) i) Describe the working principle of spectrophotometer with a neat sketch. (10)

ii) Write a short note on the type of information to be obtained and transmitted in a telemedicine system. (6)

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Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECM701 – Principles of Management

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the role of Managers.
2. Is Managing, a science or an art?
3. List any four limitations of planning.
4. Explain the term decision and decision making.
5. State the advantages of organization.
6. What are the types of departmentation?
7. Specify the importance of motivation.
8. List out the basic needs in a hierarchy.
9. Give some critical point standards of control.
10. What are the factors affecting productivity?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain Henri Fayol's 14 principles of management. (8)

ii) Describe about the evolution of management thought. (8)

(OR)

b) i) Compare the various managerial attitudes involved in MNC's. (8)

ii) Explain various types of Business Organization. (8)

12. a) i) Define MBO. Describe the benefits and weakness of MBO and ways to overcome them. (8)

ii) What are different types of plans? Explain. (8)

(OR)

b) i) Define strategic planning? What are the steps involved in strategic planning? (8)

ii) Define forecasting. Explain the various forecasting techniques used for decision making process. (8)

13. a) i) What do you understand by organization chart? Explain the basis of the departmentation. (8)

ii) Distinguish between formal and informal organization. (8)

(OR)

b) i) Explain the importance of performance appraisal. (8)

ii) Elaborate any four methods of performance appraisal. (8)

14. a) i) Explain why management by wandering around is considered as effective communication. (8)

ii) What are the barriers to effective communications? (8)

(OR)

b) i) What do you understand by "leadership style"? Describe the different styles of leadership. (8)

ii) Explain any two motivational theories. (8)

15. a) i) Explain any three non-budgetary control techniques with suitable examples. (8)

ii) Distinguish between Globalization and Liberalization. (8)

(OR)

b) i) Explain the term productivity and the means of increasing productivity in an organization. (8)

ii) Elaborate in detail about Total Quality Management principles. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22ECMG501 – Principles of Management

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the stages in the evolution of Management thought?
2. Compare Effectiveness with Efficiency.
3. Define Planning Premises.
4. List any four guidelines for objectives Setting.
5. Relate line with staff authority.
6. Categorize the different types of training.
7. Define Directing.
8. What is horizontal Communication?
9. Define Critical Point Control.
10. Mention the various types of Reports.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Is Management a Science or Art? Justify your answer with neat explanation.	(8)
		ii)	Discuss the various functions of Management.	(8)
			(OR)	
	b)		Briefly explain about the types of Business Organization. Give examples.	(16)
12.	a)	i)	Categorize the different types of Planning with examples.	(8)
		ii)	Mention the advantages and limitations of Planning.	(8)
			(OR)	
	b)		Discuss how decision making under different conditions are made.	(16)
13.	a)		Categorize and explain the various types of Departmentation.	(16)
			(OR)	
	b)	i)	Summarize the external factors affecting Staffing.	(8)

ii) Explain the procedure involved in the Selection process. (8)

14. a) i) Discuss briefly about the types of Leadership Motivation. (8)

ii) Substantiate the necessity of Motivation with a suitable theory. (8)

(OR)

b) "Management by wandering around is considered as effective Communication". Justify the statement. (16)

15. a) i) Analyze Budgetary and Non-Budgetary Control techniques. (8)

ii) Explain in detail the various managerial Control tools. (8)

(OR)

b) i) Organize the techniques for improving Productivity. (8)

ii) Categorize the different types of Reporting. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22ECH205 – 5G Communication Networks

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the need for 5G wireless Networks.
2. How does the 5G standard differ from its predecessors 3G and 4G LTE?
3. State the need for channel modeling to overcome the challenges of 5G technologies.
4. Why is the value of the spectrum so important in ensuring the successful rollout of 5G technologies?
5. How does orthogonal frequency division multiplexing (OFDM) differ from other modulation techniques?
6. Why it is important to understand multiple access schemes in modern tele communication?
7. How does device-to-device communications enhance the user experience in 5G networks?
8. Why efficient resource allocation is vital for the success of multi-operator D2D communications?
9. Why imperfect channel state information (CSI) in a cell might lead to pilot contamination in multi-cell massive MIMO?
10. Why interference management is important in millimeter-wave communications?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe typical 5G use cases across different industries by outlining their basic requirements, and key performance indicators used to measure 5G effectiveness in these applications. (16)

(OR)

b) How the architecture of 5G New Radio (5G NR) and 5G Core Network is designed to support a wider range of applications compared to its predecessors? (16)

12. a) In what ways, mmWave MIMO systems enhances the capabilities of 5G networks, and what specific channel models are most effective for these systems? (16)

(OR)

b) Describe the primary spectrum challenges faced during the transition from 4G to 5G, and how these challenges were addressed in the 5G implementation? (16)

13. a) i) How does the basic requirement for transmission in 5G differ from previous generations of mobile communication technologies? (8)

ii) Analyze the fundamental mechanisms of Universal Filtered Multi-Carrier (UFMC) that enhances spectral efficiency in 5G networks. (8)

(OR)

b) i) Analyze specific scenarios where Filter Bank Multi-Carriers (FBMC) demonstrates superior performance compared to OFDM in 5G environments. (8)

ii) Compare and contrast the multiple access techniques of Orthogonal Frequency Division Multiple Access (OFDMA) and Nonorthogonal Multiple Access (NOMA) in terms of resource allocation. (8)

14. a) i) Describe the transition from 4G D2D standards to 5G impacting the efficiency of mobile broadband communications. (8)

ii) List the primary challenges in implementing radio resource management for mobile broadband D2D communications in a 5G environment. (8)

(OR)

b) i) In what ways, multihop D2D communication can enhance network reliability and coverage in urban areas? (8)

ii) How multi-operator D2D communications can facilitate improved service delivery in densely populated environments? (8)

15. a) How does beamforming enhance the performance of millimeter-wave communication systems compared to traditional techniques? (16)

(OR)

b) Describe the effects of imperfect channel state information (CSI) on the performance of massive MIMO systems, and how can these effects be mitigated? (16)

ECE

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTECE30 – Telecommunication Switching and Networks

Time : 3 Hours

Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Pulse transmission.
2. Compare FDM and TDM.
3. What is Time Division Switching?
4. Tell about No.4 ESS toll switch.
5. What is clock instability in a communication system?
6. Interpret need for Network synchronization.
7. Summarize the applications of VDSL.
8. Recall Local Microwave Distribution Service.
9. Differentiate Loss system and Delay system.
10. Write about Tandem queues.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Elaborate principles and operation of Frequency Division Multiplexing with neat diagrams. (16)

(OR)

b) Determine the architecture of Time Division Multiplex Loops and Rings in detail. (16)

12. a) Identify working of Space Division Switching with a neat diagram and mention its applications. (16)

(OR)

b) Analyze the Components and key elements of the SS7 architecture in brief. (16)

13. a) Examine working principle and components of Phase Locked Loop (PLL) (16)

(OR)

b) What are timing inaccuracies in communication systems, discuss about causes and its effects. (16)

14. a) Discover ISDN Basic Rate Access Architecture in detail. (16)

(OR)

b) Organize the functions of Digital Satellite Services. (16)

15. a) Explain how different holding time distributions impact the performance of a telecommunications system. (16)

(OR)

b) Inspect the impact of finite queues on the performance of a communication network. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

COMMUNICATION SYSTEMS

22COC12 – Advanced Digital Communication Techniques

Time : 3 Hours

Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the purpose of interleaving in coded digital communication systems?
2. What are the advantages of a coded digital communication system?
3. How does a correlator receiver differ from a matched filter receiver?
4. Define "linear prediction" in signal estimation.
5. State the Nyquist criterion for zero ISI and explain its significance.
6. How does ISI affect the performance of digital communication systems?
7. Differentiate between coherent and non-coherent modulation techniques.
8. Define "bit error probability" in the context of digital modulation.
9. Mention two key properties of Reed-Solomon codes.
10. How does the Viterbi algorithm aid in decoding convolutional codes?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the components of a digital communication system with a block diagram. (8)

ii) Analyze the process of orthogonalization in signal representation and discuss its impact on reducing interference in communication systems. (8)

(OR)

b) i) Explain the function of synchronization in I-D systems. (8)

ii) Discuss the need for interleaving and deinterleaving in communication systems and its role in channel memory management. (8)

12. a) i) Explain the concept of Wiener filter and its role in waveform estimation. (6)

ii) Describe how the Maximum Likelihood Estimation technique is implemented in digital communication systems and provide examples of situations where it might encounter limitations (10)

(OR)

b) i) Describe how linear predictive vocoders work. (6)

ii) Evaluate the effectiveness of adaptive filters in noise cancellation, and analyse the challenges involved in their implementation across various communication environments. (10)

13. a) i) Define AWGN channels and discuss their characteristics in digital communication systems. (8)

ii) Describe the design principles and importance of optimum pulse shaping in reducing inter symbol interference (ISI). (8)

(OR)

b) i) Compare zero-forcing equalizers and decision feedback equalizers. (8)

ii) Analyze the fundamentals of equalization techniques in digital communication and evaluate their effectiveness in mitigating channel-induced distortions. (8)

14. a) i) What is the difference in waveforms for BPSK and QPSK modulation schemes? Explain in detail, (8)

ii) Analyze the process of BPSK modulation and evaluate its signal representation using a signal space diagram, discussing its advantages and limitations in communication systems. (8)

(OR)

b) i) Describe M-ary modulation and its application in high data rate communications. (8)

ii) Discuss binary and quaternary modulation schemes in detail. (8)

15. a) i) Explain the structure of convolutional codes and discuss the process of maximum likelihood decoding. (8)

ii) Analyse the effectiveness of Reed-Solomon codes in error correction by comparing their performance in different types of communication channels, such as wireless and optical fiber channels. (8)

(OR)

b) i) Describe the relevance of coding in minimizing power consumption in data storage. (8)

ii) Analyze how different coding techniques impact power consumption in data storage systems, providing examples of specific coding methods that are effective in minimizing energy use. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E./Ph.D Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

COMMUNICATION SYSTEMS/ELECTRONICS AND COMMUNICATION ENGINEERING

22COC11 – Antennas and Radiating Systems

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term "antenna gain."
2. Find the radiation resistance of an infinitesimal dipole whose overall length is $l=\lambda/50$.
3. Given a linear broadside uniform array of 10 isotropic elements, with a separation of $\lambda/4$ between elements. Find the directivity of array.
4. Evaluate the effectiveness of a Chebyshev array in minimizing sidelobe levels.
5. What is the significance of aperture in antennas?
6. Differentiate between an E-plane and H-plane sectoral horn.
7. List the different methods of feeding a microstrip antenna.
8. Identify the limitations of reflector antennas. Name the methods to overcome them.
9. What advantages do MIMO antennas offer over traditional single antenna systems?
10. Give the applications of automotive antennas.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Elaborate the radiation mechanism and how it is utilized in antenna design. (8)

    ii) Analyze the current distribution and radiation pattern of a half wave dipole antenna. (8)

(OR)

    b) i) Derive the Friis transmission equation and briefly explain it. (8)

    ii) Explain the behavior of a circular loop antenna with non uniform current distribution. (8)

12. a) i) Derive array factor of an uniform linear array. Explain significance of array factor. (8)

    ii) Analyze the performance characteristics of a binomial array and its applications. (8)

(OR)

b) i) Outline the operation and radiation pattern of a two element linear array. Derive the array factor expression. (8)

ii) Discuss the design considerations of a planar array and explain its radiation characteristics. (8)

13. a) i) Explain Huygen's field equivalence principle and derive the radiation equations for an aperture antenna. (8)

ii) A pyramidal horn antenna having aperture dimensions of a = 5.2 cm and b = 3.8 cm is used at a frequency of 10 GHz. Calculate its gain and half power beam widths. (8)

(OR)

b) i) A rectangular aperture with a constant field distribution with a = 3 λ and b = 2 λ is mounted on an infinite ground plane. Compute the (8)

a) FNBW in the E-plane

b) HPBW in the E-plane

c) FSLBW in the E-plane and

d) FSLMM in the E-plane.

ii) Explain the working principle of a conical horn antenna and derive its radiation pattern. (8)

14. a) i) Examine the characteristics of a microstrip antenna. (8)

ii) Present the special features of a parabolic reflector antenna. Discuss the role of f/d ratio in the parabolic reflector. (8)

(OR)

b) i) Compare rectangular and circular patch antennas. (8)

ii) Discuss the design and operation of a plane reflector antenna. (8)

15. a) i) Examine the structure and working principles of PIFA. (8)

ii) Describe the different methods used to measure the radiation pattern of antennas. (8)

(OR)

b) i) Present the different types of RFID antennas and their specific applications. (8)

ii) Elaborate the method for measuring antenna impedance and explain its significance in antenna design. (8)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC701 – Mobile Communication

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Which one accelerated the miniaturization of communication equipment? List two examples of such equipment.
2. Define frequency planning.
3. Find the far-field distance for an antenna with maximum dimension of 1000 mm and operating frequency of 800 MHz.
4. Summarize the important three small scale fading effects.
5. Differentiate between AM and FM.
6. Rearrange the following sentence according to the principle of channel coding. "Channel coding improves the mobile communication link performance by reducing the redundant data bits in the transmitted message and channel coding is used by the transmitter to detect or correct the errors".
7. List the types of Vocoders.
8. Classify the multiple access systems in sharing of bandwidth in a mobile communication system.
9. Differentiate between wired and wireless telephone systems.
10. Compare Pre-emphasis and deviation limiter.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe any eight wireless communication system definitions. (8)

ii) Identify various trends in cellular Radio and personal communications. (8)

(OR)

b) i) If a total of 20 MHz of bandwidth is allocated to a particular FDD cellular telephone system which uses two 10 kHz simplex channels to provide full duplex voice and control channels, compute the number of channels available per cell if a system uses a) two-cell reuse, b) three-cell reuse, and c) nine cell reuses. If 1 MHz of the allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each cell for each of the three systems. (8)

ii) Illustrate the process of handoff scenario at cell boundary. (8)

12. a) i) Differentiate between any two outdoor propagation models. (8)

ii) Analyse the factors influencing small scale fading. (8)

(OR)

b) i) Differentiate between any two indoor propagation models. (8)

ii) List the types of small-scale fading. (8)

13. a) i) Describe the continuous phase FSK technique which has modulation index of 0.5. (8)

ii) With neat block diagram, explain the simplified communication system using an adaptive equalizer at the receiver. (8)

(OR)

b) i) Explain the performance of digital modulation in slow, fading channels. (8)

ii) Arrange the various types of equalizer under linear and non- linear groups. (8)

14. a) i) Consider a GSM system, which is a TDMA/FDD system that uses 25 MHz for the forward link and broken into radio channels of 200 kHz. If 1000 simultaneous users use the system, calculate the number of speech channels which are supported as a single radio channel. Assume there is no guard band. (8)

ii) Summarize the selection process to be followed for the selection of speech codes for mobile communication. (4)

iii) Design a simple USDC speech decoder block diagram with three code books. (4)

(OR)

b) i) Explain the process of Linear predictive coding system with neat block diagram. (8)

ii) Summarize the various cellular systems used in worldwide with corresponding multiple access system. (4)

iii) Combine the various bits / fields used in TDMA as a single frame. (4)

15. a) i) Illustrate the operation of Bluetooth communication. (8)

ii) Identify the applications of NIC card. (4)

iii) Differentiate between 3G and 4G. (4)

(OR)

b) i) Describe the basic operations of first, second and third generation wireless networks. (8)

ii) Describe the GSM system services and features. (4)

iii) Differentiate between GSM and GPRS. (4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTECE24 – High Speed Networks

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Frame Relay
2. What is Gigabit Ethernet?
3. Outline the purpose of Queuing analysis in networking.
4. Define Congestion.
5. List the four phases of TCP congestion control.
6. Infer the purpose of ABR traffic management in ATM.
7. Interpret the principle of Fair Queuing (FQ).
8. Recall Random Early Detection algorithm.
9. Rephrase label stacking in MPLS.
10. Show the functions of RTCP.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the ATM protocol architecture with a neat block diagram. (16)

(OR)

b) Elaborate the role of the ATM Adaptation Layer (AAL). Explain its different types. (16)

12. a) Identify the Single-server queuing model in detail. (16)

(OR)

b) Examine congestion control mechanisms in detail. (16)

13. a) Analyze TCP Flow Control in detail. (16)

(OR)

b) i) Illustrate Traffic management framework in detail. (8)

ii) Explain GFR traffic management in ATM. (8)

14. a) Explain any two queuing mechanisms in details with neat stretches. (16)

(OR)

b) Identify the architecture and working principles of Differentiated Services in detail. (16)

15. a) Categorize the characteristics, operation and protocol mechanism of RSVP. (16)

(OR)

b) Construct and discuss the architecture of the Real-Time Transport Protocol. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC201 – Engineering Electromagnetics

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State Coulomb's lab.
2. Define Gauss Law.
3. List any four properties of magnetic field.
4. Write the Lorentz Force equation.
5. Assume to two capacitors each of 10μF are connected in series. Find the resultant capacitance.
6. What is mutual inductance?
7. Tell about displacement current.
8. Illustrate Ampere's Circuital law.
9. Define skin effect.
10. Write about Brewster angle.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Verify whether the vector field E= yz $\overrightarrow{a_x}$ + xz $\overrightarrow{a_y}$ + xy $\overrightarrow{a_z}$ is both solenoidal and irrotational. (8)

ii) Given A = $5\overrightarrow{a_x}$ and B = 4 $\overrightarrow{a_x}$ + t $\overrightarrow{a_y}$. Find t such that angle between A and B is 45^0. (8)

(OR)

b) i) Express vector B in Cartesian and cylindrical systems. Given B = 10/r $\overrightarrow{a_r}$ + r cosθ $\overrightarrow{a_\theta}$ + $\overrightarrow{a_\varphi}$ Then find B at (-3,4,0) and (5, π/2, -2) (8)

ii) Explain in detail line, surface, and volume integral of vector function. (8)

12. a) Using Biot-Savart's law, derive the magnetic field intensity on the axis of a circular loop of radius R carrying a steady current I. (16)

(OR)

b) Estimate the expression for inductance of a toroidal coil carrying current I, with N turns and the radius of toroid 'r'. And Formulate the expression for inductance of a coaxial cable. (16)

13. a) Analyze Capacitance, Electrostatic Energy, and Boundary Conditions for Electric Fields. (16)

(OR)

b) Discuss Inductance, Mutual Inductance and Energy in Magnetic Fields. (16)

14. a) In a region where $\varepsilon r = \mu r = 1$ and $\sigma = 0$. (16)

Let $A = 10^{-3}$ y cos(3*108 t) cos (z) a_z Wb/m and

V = 3*105 y sin (3*108 t) sin (z) V. Find E and H.

(OR)

b) Derive the Maxwell's equation for a time varying are modified for time varying from fundamental laws of electric and magnetic fields. (16)

15. a) Explain the condition under which the magnitude of the reflection coefficient equals that of the transmission coefficient for a uniform wave at normal incidence on an interface between two lossless dielectric medium. (16)

(OR)

b) Evaluate the amplitudes of reflected and transmitted fields (electric and magnetic both) at the interface of two regions, if Ei = 1.5 mV/m in region 1 for which $\varepsilon r1 = 8.5$, $\mu r = 1$ and $\sigma = 0$ and region 2 is a free space. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D. Degree Examinations – Nov/Dec 2024

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22COE62 – Internet of Things

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the challenges associated with the Internet of Things?
2. Mention most important design principles for IoT.
3. Differentiate IoT and M2M.
4. What is the role of SNMP in IoT system management?
5. What is HTTP, and why is it widely used in IoT systems?
6. Define a function in Python and explain its importance in modular IoT programming.
7. Compare public, private and hybrid cloud storage models for IoT use cases.
8. Define a RESTful API and explain its role in IoT systems.
9. What are the common phases of an IoT attack?
10. What is the role of hashing in secure key generation protocols?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain how communication APIs enable seamless data exchange in IoT systems. (8)

ii) Describe the IoT functional blocks and explain their interdependence. (8)

(OR)

b) i) Formulate an Industrial application of IoT system and brief on the various use case of smart and connected cities. (8)

ii) Prepare an IoT strategy for home automation and design the layered architecture for implementing home automation. (8)

12. a) i) Analyze in detail the design methodology used to implement IoT devices, explain the level wise design steps with neat diagram. (8)

ii) Explain how Software defined network simplifies network management and operations. (8)

(OR)

b) i) Describe the structure of a YANG model with an example. (8)

ii) Compare and contrast SNMP and NETCONF in terms of their applicability to IoT system management. (8)

13. a) i) How does XMPP facilitate real-time communication in IoT applications? Provide an example use case. (8)

ii) Discuss how UPnP enhances the plug-and-play functionality in smart home IoT systems? (8)

(OR)

b) i) Design an IoT data processing module in Python that uses dictionaries to store and retrieve sensor data. (8)

ii) Describe the process of interfacing a temperature sensor with Raspberry Pi and retrieving data using Python. (8)

14. a) i) Explain how IoT devices can store and retrieve data in a cloud storage model? (8)

ii) Evaluate the role of WAMP in enabling real-time bidirectional communication for IoT systems. (8)

(OR)

b) i) Discuss the role of Django in building a web interface for IoT data visualization. (8)

ii) Explain the steps involved in setting up an IoT data processing workflow using Apache Oozie. (8)

15. a) i) Discuss the different phases of an IoT attack and how each phase contributes to the overall attack strategy. (8)

ii) Compare and contrast the security requirements for unidirectional and bidirectional data transmission in IoT. (8)

(OR)

b) i) Design a lightweight security protocol for unidirectional data transmission in IoT devices. (8)

ii) Discuss how security access algorithms ensure data integrity during unidirectional data transmission. (8)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D Degree Examinations – Nov/Dec 2024

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22COE12 – Advanced Communication Networks

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the difference between circuit switching, packet switching, virtual switching and datagram?
2. What are the benefits of frame relay?
3. Define peak rate and average rate.
4. What are the goals of Resource Reservation Protocol?
5. List the QoS network performance parameters defined in ATM standards.
6. What is active queue management?
7. List the advantages of controlled prefix algorithms?
8. Mention the IP address properties?
9. Define the source traffic descriptor parameters.
10. What were the fundamental changes made in the differentiated services from the shortcomings of integrated services?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	What is the need for fairness in TCP? Describe the fairness issues in TCP using max-min algorithm.	(10)
		ii)	Write short notes on Asynchronous Transfer mode protocol.	(6)
			(OR)	
	b)	i)	Analyze the performance of TCP congestion control algorithm.	(10)
		ii)	Brief the process of three way hand shaking protocol.	(6)
12.	a)	i)	Explain the operations involved in the process of RSVP.	(10)
		ii)	How Leaky bucket algorithm regulates the incoming traffic?	(6)
			(OR)	
	b)	i)	Elaborate the properties of traffic descriptor.	(6)
		ii)	Explain the different components of Integrated Service Architecture.	(10)

13. a) Explain the following scheduling algorithms (16)

i) FIFO and Priority queues

ii) Weighted Fair queuing

iii) Generalized Processor Sharing

iv) Random Early Detection.

(OR)

b) Explain the open loop and closed loop control mechanism to react to congestion. (16)

14. a) Explain the classical solution method such as binary trie and path compressed trie with the following prefix. (16)

P1 0*

P2 01000*

P3 011*

P4 1*

P5 100*

P6 1100*

P7 1101*

P8 1110*

P9 1111*

Search the best matching prefix for an address beginning with the bit pattern 10110 using binary trie and path compressed trie.

(OR)

b) Describe classful and classless inter-domain routing addressing scheme. What are the difficulties in longest matching prefix search? (16)

15. a) Describe the IPv6 basic header format. What is the difference between IPv4 and Ipv6? (16)

(OR)

b) Describe on protocols, frame work and architecture of Multiprotocol Label Switching. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22ECH201 – High Performance Networks

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the main features of ATM?
2. State the difference between OSI Model and TCP/IP Model.
3. Define delay jitter.
4. What do you mean by soft state in RSVP?
5. What is the use of FEC?
6. How do you access VPN?
7. When queue will be formed in a network?
8. Define traffic policing.
9. What is SNMP?
10. List the types of firewall.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the broadband ISDN Services in detail. (16)

(OR)

b) Explain the management and control architecture in ATM networks and also describe the concept of interworking in ATM networks. (16)

12. a) Explain the different protocols used for real-time interactive applications in detail. (16)

(OR)

b) Elaborate on any one scheduling mechanism available for multimedia networking. (16)

13. a) Discuss in detail about the Remote access VPN, site-to-site VPN and security in VPN. (16)

(OR)

b) Illustrate in detail about the working of overlay networks. (16)

14. a) i) State and explain in detail about Little's theorem. (8)

ii) Explain the Poisson modeling and its failure in detail. (8)

(OR)

b) i) Explain how traffic modeling helps in network management. (8)

ii) Discuss in detail the non poisson arrival model with an example. (8)

15. a) Explain the Simple Network Management Protocol (SNMP) and its role in network management in detail. (16)

(OR)

b) Illustrate the Kerberos key distribution and certification with a neat diagram. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D. Degree Examinations – Nov/Dec 2024

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22COE24 – Cloud Computing Technologies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Parallel Computing and distributed computing.
2. Name the essential characteristics of cloud computing.
3. List the Pros and Cons of Virtualization.
4. Compare Hypervisor and Xen Server.
5. Discuss any three features of IaaS.
6. Define short notes on Community cloud.
7. What are the security challenges in cloud computing?
8. Point out the layers in security architecture design.
9. Outline the main services that are offered by AWS.
10. Identify the development technologies currently supported by Google AppEngine.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe in detail about Reference Models and services in cloud computing. (10)

ii) Illustrate in detail about different Benefits and Disadvantages of cloud computing. (6)

(OR)

b) i) Demonstrate in detail about trends towards distributed systems. (10)

ii) Illustrate in detail about parallel and distributed programming models. (6)

12. a) i) Explain the following Technology with examples. (10)

1) Para virtualization

2) Full virtualization

ii) Express in detail about the overview of virtualization technology. (6)

(OR)

b) i) Analyze the pros and cons of virtualization in detail. (10)

ii) Discuss the architecture of Hyper-V. Discuss its use in cloud computing. (6)

13. a) i) Illustrate in detail about the Conceptual Reference Model of cloud Computing. (8)

ii) Discuss in detail about PaaS with example. (8)

(OR)

b) i) List and discuss the principles for designing public cloud, private cloud and Hybrid cloud. (8)

ii) Briefly discuss the architectural design challenges of the cloud. (8)

14. a) Evaluate the baseline Identity and access Management (IAM) factors to be practiced by the stakeholders of cloud services and common key privacy issues likely to happen in the environment. (16)

(OR)

b) Discuss in detail about the security architecture of cloud. Illustrate the application security in detail. (16)

15. a) Describe the following in detail. (16)

1) Google Cloud Infrastructure

2) GAE Architecture

(OR)

b) Summarize the various emerging cloud software environment and explain briefly about anyone of the cloud Applications. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECH110 – VLSI for CAD Design

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Sketch and visualize the three design domains in Gajski's Y-chart.
2. What are standard cells in VLSI design and also compare its advantages over full custom design in VLSI?
3. Apply prims algorithm for the following Figure.1 and obtain the minimum spanning tree.

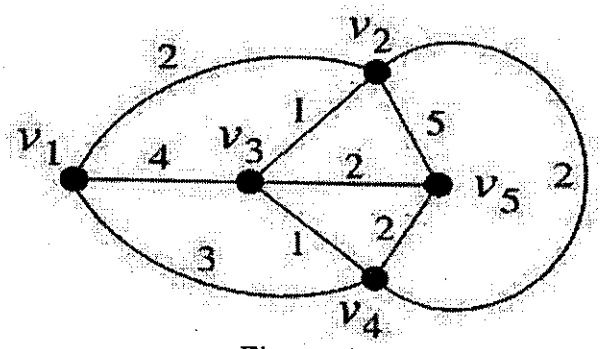


Figure.1

4. Define tractable and intractable problems.
5. Write the condition for maximum distance constraint.
6. Write the template for circuit representation using data structure definitions.
7. What is floorplan sizing?
8. Differentiate between Area and Channel Routing.
9. Mention the suitability of compiler-driver simulation in the context of synchronous circuits.
10. What is a Binary Decision Diagram?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the VLSI Design Methodologies and explain the review of VLSI design automation tools. (16)

(OR)

b) Briefly mention the most relevant tools used in VLSI design automation. (16)

12. a) Explain the steps in Depth First search and Breadth First Search algorithms using an example graph. Compare their Complexities and give their applications in VLSI design automation tools. (16)

(OR)

b) Explain the concepts of linear programming with suitable expressions. (16)

13. a) Explain the bellman ford algorithm for constraint graph compaction. (16)

(OR)

b) Discuss about the Kernighan-Lin partitioning algorithm along with pseudo code. Also apply the algorithm to partition the following graph in Figure.2 (16)

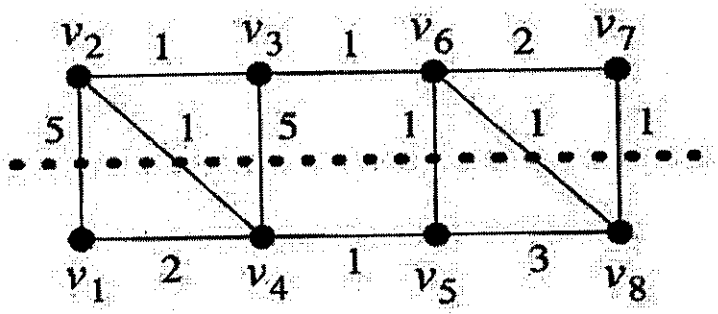


Figure.2

14. a) Given a floorplan consisting of four-leaf cells A, B, C, and D with the following dimensions: (16)

1) A: 2 x 2
2) B: 1 x 3
3) C: 1 x 4
4) D: 2 x 4

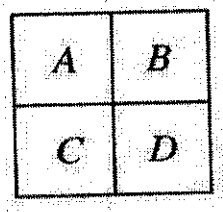


Figure.3

1) Determine the shape functions of these cells.
2) Apply the sizing algorithm using a given slicing tree to compute the optimal shape of the circuit.
3) Repeat the computation using another slicing tree.
4) Compare the results obtained from both slicing trees in terms of circuit shape and efficiency.

(OR)

b) Explain Rectilinear Steiner tree algorithm with necessary pseudo codes. (16)

15. a) Explain the principles and implementation of ROBDD in detail. (16)

(OR)

b) Explain the hardware models used for high level synthesis by considering a synchronous system as an example. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D. Degree Examinations – Nov/Dec 2024

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22COE72 – Wavelet Signal Processing

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Express the Gaussian function with unit amplitude.
2. Write the advantages of wavelet analysis.
3. How to construct a Haar wavelet from the MRA?
4. How many steps are there in fast wavelet algorithm? What are they?
5. What do you mean by compactly supported wavelets?
6. Write the uses of wavelet packets.
7. Define frame and its coefficients.
8. What do you mean by noise and how it can be suppressed?
9. State the uses of wavelets in image processing.
10. What is pyramidal representation of images?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the limitations and challenges of standard Fourier analysis. (8)

ii) Define windowed Fourier transform and with suitable illustrations show how it can be used to give information about signals simultaneously in time and frequency domains. (8)

(OR)

b) i) Define continuous wavelet transform. Discuss its important properties. (8)

ii) Compare continuous wavelet transform with windowed Fourier transform. (8)

12. a) State Balian-Low theorem. For a general $g \in L^2(R)$, prove that the theorem gives conditions that g must satisfy if the system $\{g_{m,n} : m,n \in Z\}$ is an orthonormal basis. (16)

(OR)

b) Describe the construction of orthonormal wavelets from a multiresolution analysis. (16)

13. a) Construct Franklin and spline wavelets on real time. (16)

(OR)

b) Explain the iterative method of reconstruction using suitable examples. (16)

14. a) Write in detail the signal processing applications using wavelets. Give comments on its noise suppression. (16)

(OR)

b) Explain the algorithm for reconstruction of signals from corrupted frame representation. (16)

15. a) Describe the Burt-Adelson pyramidal decomposition scheme. (16)

(OR)

b) Explain image reconstruction from its two-dimensional dyadic wavelet transform. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22ECPE81 – Multimedia Compression and Communication Techniques

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the need for compression?
2. What are the different compression methods?
3. List out some of the audio compression standards.
4. State the principle of code excited LPC.
5. Differentiate PCM and DPCM.
6. What is the significance of H.261?
7. Define Bit rate.
8. Write a note on application Q_oS.
9. What is meant by Circuit switched and packet switched network?
10. Explain in brief about Interactive television.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss in detail about lossless and lossy compression. (16)

(OR)

b) A source emits letters from an alphabet = {a1, a2, a3, a4, a5} with probabilities P (a1) = 0.15, P (a2) = 0.04, P (a3) = 0.26, P (a4) = 0.05, and P (a5) = 0.50. (16)

a) Calculate the entropy of this source.

b) Find a Huffman code for this source.

c) Find the average length of the code in (b) and its redundancy.

12. a) Explain the concept of Perceptual Coding with necessary diagrams. (16)

(OR)

b) Discuss the encoder and decoder schematic of linear predictive coding with its vocal tract excitation parameters. (16)

13. a) Design the ITU-T H.263 encoder with neat sketch and explain its Motion Compensation Algorithms. (16)

(OR)

b) Draw and describe the simplified block diagram representing the basic strategy and frame structures used in all three layers of MPEG coding algorithms. (16)

14. a) Discuss the different types of communication networks that are used to provide multimedia communication service. (16)

(OR)

b) Discuss in detail the various service architectures to QoS support for multimedia applications over the Internet with diagrams. (16)

15. a) Discuss in detail about the TCP/IP Reference model. (16)

(OR)

b) Justify that the role of a SIP registrar is different from that of a home agent in Mobile IP. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ECOE06 – Basics of Internet of Things

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write in short about IEEE 802.3 protocol.
2. What is mean by Publish – Subscribe communication model?
3. List out the differences between M2M and IoT.
4. What are the limitations in the conventional network architecture and how it can be rectified in software define networking?
5. Define actuator.
6. Give some examples for IoT communication technologies.
7. State the use of pass statement in Python.
8. What are the building blocks of an IoT device?
9. Specify the working of smart lighting IoT system in auto and manual mode.
10. Mention the need of smart irrigation IoT system.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) How IoT protocols are organized as layers? Explain different IoT protocols with layer diagram. (16)

(OR)

b) What are the levels of IoT system and discuss each level with neat diagram? (16)

12. a) What is the need of NFV (Network Function Virtualization)? Explain the NFV architecture and discuss how it can be used with a conventional home network? (16)

(OR)

b) List out the steps involved in the IoT system design methodology. Explain each step in detail with necessary diagrams. (16)

13. a) Explain ZigBee architecture with neat sketch. (16)

(OR)

b) Explain the working of RFID and discuss how it will be useful for IoT applications. (16)

14. a) i) Explain how arguments are passed to a function in Python with small program. (8)

ii) Define class and write a python program for implementing simple inheritance. (8)

(OR)

b) i) How Raspberry Pi is used for developing IoT projects? Explain the components of Raspberry Pi Board with neat diagram. (8)

ii) Explain how Raspberry Pi is used to interact with LED and a Switch with python code. (8)

15. a) Explain the deployment of sensors for the smart parking IoT system with necessary python codes. (16)

(OR)

b) Explain the deployment design of the weather monitoring IoT system with sample python code. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECPE706 – Advanced Radiating System

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State reciprocity theorem.
2. What are the numerical techniques available to analyse an antenna? Give its significance.
3. Outline the principle of Babinet used in slot antenna.
4. Summarize the significance of F/D ratio in reflector antenna.
5. Write down the features of binomial array.
6. Why is the phased array called as the scanning array?
7. Why microstrip antennas are preferred for space applications?
8. Generalize the most commonly preferred substrate material for microstrip antenna. Mention their features.
9. Summarize the characteristics of near field and far field.
10. Express the Antenna factor and method to measure the antenna factor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe all the non-adaptive and adaptive base station antennas of mobile communication with neat diagrams. (8)

    ii) Examine the performance of Balanced to Unbalanced Transformer in wave propagation. (8)

(OR)

    b) i) Derive the electric and magnetic field radiated by loop antenna. (8)

    ii) Derive the expressions for field quantities of half wave dipole antenna. (8)

12. a) i) Predict the rectangular aperture and derive the expressions for its uniform distribution on an infinite ground plane and space. (8)

    ii) Analyze the working and design methodology of a Slot antenna. (8)

(OR)

b) i) Explore the design and construction principles of a parabolic reflector antenna. (8)

ii) Write short notes on Field equivalence principle, uniform aperture distribution on slot antenna and aperture blockage. (8)

13. a) i) Analyze the radiation mechanisms of broad side antenna array and End fire antenna array with neat sketches. (8)

ii) Discuss how analog and digital beam forming is achieved with an antenna array with a neat diagram. (8)

(OR)

b) i) Explain the concept of Dolph-Tschebyscheff distribution for linear array? (8)

ii) Explain the principle of phased array antenna with a neat diagram. (8)

14. a) i) Outline the working of rectangular patch antenna and derive the expression for resonant frequency. (8)

ii) Design a rectangular microstrip antenna using a substrate with dielectric constant of 2.2, h = 0.1588 cm so as to resonate at 1GHz. (8)

(OR)

b) i) Illustrate in detail the various feed techniques for microstrip antenna with neat diagrams. (8)

ii) Interpret the input impedance of a rectangular & circular patch antenna with appropriate expression. (8)

15. a) i) Describe the compact antenna test ranges and near field ranges with neat diagrams. (8)

ii) Explain impedance measurement bridge method for low frequency and slotted line method for high frequency. (8)

(OR)

b) i) With Schematic diagram explain both direct and indirect method of measuring gain of the antenna. (8)

ii) Review the features of anechoic chambers and Absorbing materials used for Antenna measurements. Explain the design aspect of anechoic chamber. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18ECOE05 – Basics of Embedded Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Tell the challenges in building an embedded system.
2. List few examples of small scale embedded systems.
3. Write the difference between polling and interrupt.
4. Define interrupt latency.
5. Compare the key characteristics of RS 232 and RS 485 serial interfaces.
6. Draw the Ethernet frame format.
7. State the difference between priority inheritance protocol and priority ceiling protocol.
8. List few commercial RTOS used nowadays.
9. What is host testing?
10. Write the advantages of ROM emulator.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Describe the fundamental components of embedded systems in detail.	(8)
		ii)	Give an account on recent trends in embedded systems.	(8)
			(OR)	
	b)	i)	Explain about embedded design life cycle.	(8)
		ii)	Write short notes on Hardware Software Partitioning.	(8)
12.	a)	i)	Explain the various types of memories present in an embedded system.	(8)
		ii)	With neat sketches, explain the working of Direct Memory Access (DMA).	(8)
			(OR)	
	b)	i)	Elucidate on the types of interrupts available in embedded systems.	(8)
		ii)	How to handle interrupt routines with an ISR? Explain.	(8)

13. a) i) Draw the structure and electrical interface of I^2C bus and explain about the data transmission using I^2C format. (8)

ii) Elaborate the architecture of CAN with necessary sketches. (8)

(OR)

b) i) Explain the IEEE 802.11 in detail. (8)

ii) Write short notes on Bluetooth wireless communication. (8)

14. a) Explain any two RTOS task scheduling algorithms. (16)

(OR)

b) Illustrate the various inter process communication mechanisms available in RTOS with suitable example. (16)

15. a) i) Elaborate on validation types and methods in embedded systems. (8)

ii) Write short notes on Logic analyzer and In circuit emulator. (8)

(OR)

b) Write short notes of

(i) RFED systems, (8)

(ii) GPS navigation system. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES

22EN101 – Communicative English

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 5 = 50 Marks)

Answer ALL Questions

1. Look at the following messages, notices, adverts and choose the option closest in meaning to the given statement.

1) A night with Euphoria! No Tickets left for Sunday Concert! Entry not before 8 p.m.!

a) One must book tickets in advance for Sunday performance.
b) All tickets for Sunday concert were already sold.
c) There is no need of tickets for Sunday concert.

2) Distributors required for nationwide marketing. Some experience in food retail an advantage. Refrigeration van provided.

a) Distributor must be ready to drive across the nation.
b) Prior knowledge of food distribution is expected, but not necessary.
c) Distributor should have license to drive refrigeration vehicle.

3) Your pet animal must be kept under control.

a) You can let your pet animal roam in your house.
b) You must tie your pet to a post.
c) You must tame your pet animal properly.

4) John, Samson phoned. There's a football match tomorrow morning. Put everything in your sports bag before you go to bed. I've washed everything for you. - Mary

a) John should get his football things ready this evening.
b) Samson will phone John back about the time of the match.
c) Mary will accompany John to the football match.

5) Dear colleagues,

The date of your Bangalore trip has been postponed to Monday from Friday. Please inform the project manager, if you want to go.

a) The project manager can't go on the trip on Monday.
b) Employees will not be able to visit Bangalore at the weekend.
c) The trip to Bangalore will take place on Monday.

2. Identify the part of speech of the underlined words.

1) Employees will receive their travel expenses <u>tomorrow.</u>
2) He <u>has made</u> an excellent contribution to the department.
3) She felt very <u>nervous</u> before the job interview.
4) <u>Although</u> the airline is usually rather expensive, the customer service is better.
5) The company did not provide all the facilities <u>that</u> we expected.

3. Replace each underlined word with a synonym from the options given below.

1) The special TV report <u>disrupted</u> regular programmes in the firm.
   a) satisfied
   b) complemented
   c) complimented
   d) interrupted

2) Laws have been passed against racial <u>discrimination</u> in the country.
   a) tolerance
   b) intolerance
   c) discernment
   d) fanaticism

3) The company has <u>achieved</u> great success in the USA.
   a) accomplished
   b) acquired
   c) designated
   d) deliberated

4) When the leadership changed, his position in the organization became <u>precarious</u>.
   a) secure
   b) exalted
   c) uncertain
   d) unimportant

5) You should be careful when you are packing these plates because they are <u>fragile.</u>
   a) delicate
   b) important
   c) intelligible
   d) unimportant

4. Fill in the blanks with suitable auxiliary verbs.

1) _____ you finish the work I had given you yesterday?
2) Tom ____ writing an e-mail to a client at the moment.
3) When we were in college, we _____ performed this activity.
4) The documents for the loan proposal _____ being checked by the banking officials.
5) They _____ been making English videos for 5 years.

5. Read the following statements and match the statements with the terms given below.

1) Web server software that enables a computer to host one or more websites that can be accessed over the internet using a web browser.
2) A network security system that monitors and controls incoming and outgoing network traffic based on predetermined security rules.
3) A computer program frequently used by internet services in order to verify that the user is actually a human rather than a machine.
4) A regularly updated website organized by an individual or small group who are writing in an informal or conversational style.
5) A small text file created by a website that is stored in the user's computer either temporarily or permanently in storage.

a) Blog
b) Cookie
c) Firewall
d) Apache
e) Captcha

6. Correct the following sentences by eliminating redundancies:
   1) As road traffic increases, elevated highways are built to solve the problem of traffic jam.
   2) The companies merged together last year.
   3) He returned back to my room after the meeting was over.
   4) Please repeat again what you said.
   5) It is absolutely essential to include vanilla in the recipe alongside other ingredients.

7. Write any five compound words by using words given below.
   Shop, Board, Boat, Snow, Sail, Cat, Work, Man, Wild, Key

8. Rewrite the following sentences into negatives forms:
   1) The new product is very difficult from the old one.
   2) The applicant added his contact number on the CV.
   3) I have been watching TV for an hour.
   4) Are you going to talk to Project manager?
   5) He accepts the invitation to attend the business conference.

9. Expand the following abbreviations and acronyms.
   1) RAM
   2) CAM
   3) ROM
   4) SIM
   5) GSM

10. Choose the correct option which expresses the meaning of the idiom underlined in the following sentences.
    1) The repairs to my car cost me an arm and a leg, but at least it is running smoothly again.

    A) an excessive amount of money
    B) a fair price
    C) a small sum of money
    D) nothing at all

    2) The teacher asked us to talk about the pros and cons of industrial development.

    A) Odds and ends
    B) advantages and disadvantages
    C) Ups and downs
    D) Wears and tears

    3) My sister and my brother only get to see each other once in a blue moon since she lives across the country.

    A) frequently
    B) every day
    C) occasionally
    D) rarely

4) The extremists were fishing in troubled waters during the political uncertainty in the country.

A) To borrow money
B) To steal belongings
C) To get benefit in bad situation
D) To extend a helping hand

5) The people of the village painted the town red on the evening of festival.

A) To white wash buildings
B) To paint the walls in red colour
C) To renovate the buildings
D) To celebrate noisily in public places

Part B (5 x 10 = 50 Marks)

Answer ALL Questions

11. a) Read the following passages carefully and choose the best answer from options given below: (10)

As my train was not due to leave for another hour, I had plenty of time to spare. After buying some magazines to read on the journey, I made my way to the luggage office to collect the heavy suitcase I had left there three days before. There were only a few people waiting, and I took out my wallet to find the receipt for my case. The receipt did not seem to be where I had left it. I emptied the contents of the wallet, and the railway tickets, money scraps of paper, and photographs tumbled out of it; but no matter how hard I searched the receipt was nowhere to be found.

I explained the situation sorrowfully to the assistant. The man looked at me suspiciously as if to say he had heard this type of story many times and asked me to describe the case. I told him that it was an old brown looking object no different from the many suitcases I could see on the shelves. The assistant then gave me a form and told me to make a list of the contents of the case. If they were correct, he said, I could take the case away. I tried to remember all the articles I had hurriedly packed and wrote them down. After I had done this, I went to look among the shelves. There were hundreds of cases there and for one dreaded moment it occurred to me that if someone had picked the receipt up, he could easily have claimed the case already. Fortunately, this had not happened, for after a time, I found the case lying on its side high up in the corner. After examining the articles inside, the assistant gave me the case. I took out my wallet to pay him. I pulled out a ten-shilling note and out slipped my lost receipt

with it! I could not help blushing. The assistant nodded his head knowingly as if to say that he had often seen this happen too!

1) The writer had plenty of time to spare because _____

A) He had arrived three days before

B) He had arrived an hour earlier

C) He had to collect his luggage

D) He needed to buy magazines

2) The writer needed the receipt _____

A) To claim his suitcase

B) To pay at the luggage office

C) To prove that he had paid at the luggage office

D) To prove that he had bought the suitcase

3) The writer felt foolish because _____

A) he could not find his receipt

B) he hadn't really lost his receipt at all

C) he had to fill in a form

D) the assistant eyed him suspiciously

4) There weren't _____ people waiting at the luggage room.

A) very much

B) a great deal of

C) lots of

D) very many

5 In the above passage "wrote them down" means _____

A) copied them

B) signed them

C) made a note of them

D) pointed at them

6) The writer found the receipt _____

A) On the high shelf near the cases

B) Among the contents of his suitcase

C) Nestled with the money in his wallet

D) Trapped between the photographs in his wallet

7) The writer took out his wallet first time to _____

A) buy some magazines

B) look for the receipt

C) fill out the form given by the assistant

D) pay the assistant

8) The assistant asked the writer to make a list of the contents to _____

A) ascertain his ownership of the case

B) test his memory

C) charge him extra money

D) embarrass the writer

9) 'I explained the situation sorrowfully to the assistant' means _____

A) the writer found the situation tragic

B) he explained the situation to the assistant who was very sorrowful

C) with great distress the writer explained his unfortunate situation to the assistant

D) The assistant found the situation tragic

10) In this passage 'blushing' means _____

A) embarrassed

B) embraced

C) embarked

D) embalmed

(OR)

b) Write a dialogue between two students who are planning to go internship training for 15 days in an industry (10 sentences). (10)

12. a) Write a set of ten recommendations to maintain desktop computer in good working condition. (10)

(OR)

b) Prepare a checklist containing ten items to save electricity in your home. (10)

13. a) Write ten instructions that are to be followed by the citizens of India in order to preserve our culture and tradition. (10)

(OR)

b) Write an essay describing various types of cybercrime and suitable measures to prevent it. (10)

14. a) Your college celebrated 'Annual Sports Day' last week in your college campus. You are the sports secretary of your college. Write a report to your Physical Director on this event. (10)

(OR)

b) You are going to participate in a conference on 'Machine Learning' to be organized at IIT, Madras. Write an E-mail to the organizing secretary enquiring details of the conference. (10)

15. a) Read the advertisement given below. Apply for the job advertised with a cover letter and resume. (10)

WANTED

A leading organization in solar energy invites energetic, committed candidates for the following posts

MECHANICAL ENGINEER	Senior Engineer Preferably Mechanical Engineering with 7-10 years of experience - capable of installing machinery / new type fabrication - and to lead a team of engineers www.cottonjobs.in *Proficiency in English language *Knowledge in Autocad / Solid works is preferable *Freshers in Diploma / B.E. Mechanical may also apply
ELECTRICAL ENGINEER (Asst.)	Engineering / Diploma Graduates in Electrical Engineering (BE / DEEE) with 1-5 years experience * Proficiency in English * Freshers in Diploma / B.E. Electrical may also apply

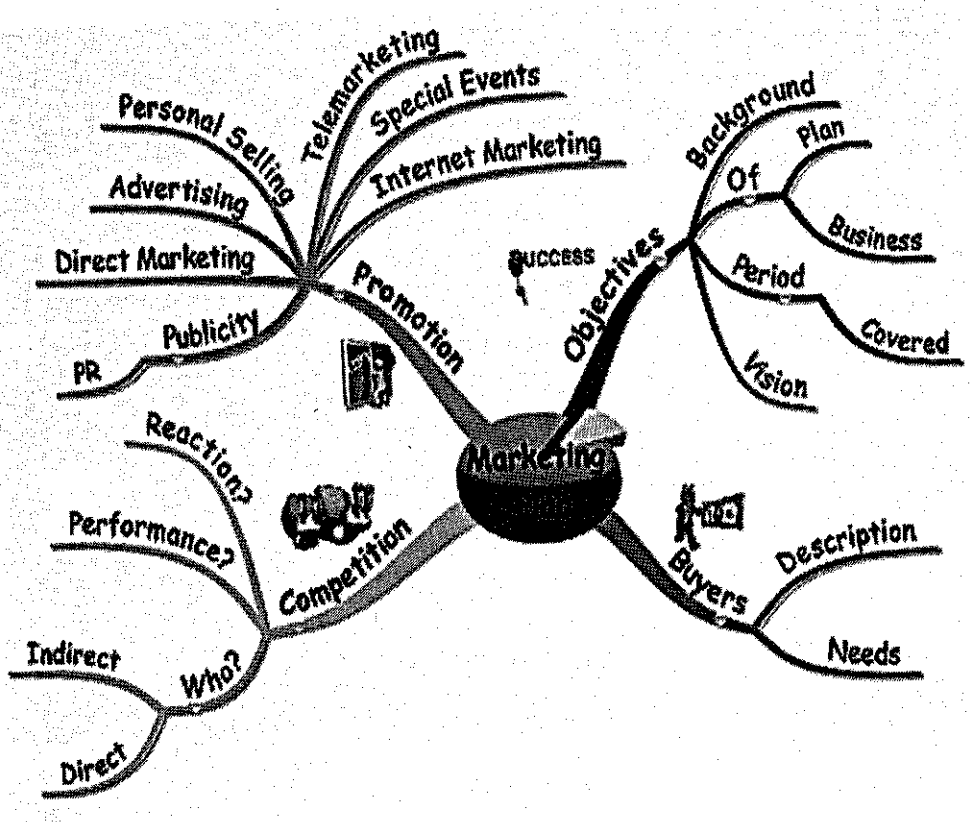
Experience in Site Installation, Maintenance work is must for both vacancies.
Email your CV to : careersunbest@gmail.com

SUNBEST

SUN BEST, www.cottonjobs.in
5, Power House Street,
NRT Nagar, THENI - 625531.
Contact : 8870001060, 04546-255272

(OR)

b) Read the points given in the mind map and write an essay of 200 wordson' Marketing Plan'. (10)



Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E./Ph.D. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

COMMUNICATION SYSTEMS /ELECTRONICS AND COMMUNICATION ENGINEERING

22COE23 – Satellite Communication and Navigation Systems

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the orbital elements.
2. How frequency reuse is achieved in satellite communication?
3. Distinguish single access mode from multiple access mode of operation.
4. What is VSAT? Write short notes.
5. When the available bandwidth is 500 MHz, how many transponders each of 24 MHz can be accommodated?
6. Compare DBS TV and conventional TV.
7. List the applications of GPS.
8. How does NAVSTAR GPS work?
9. Categorize the GPS signals.
10. State the uses of RINEX data.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) State Kepler's three laws of planetary motion. Discuss their importance in satellite communications. (8)

ii) What are look angles and derive the expressions for azimuth and elevation angles. (8)

(OR)

b) i) Explain the attitude control system with the help of neat labelled diagram. (8)

ii) Calculate the system noise temperature for a simplified earth station receiver. (8)

12. a) Discuss about FDMA and draw the frequency plan for two C-band transponders using FDMA. Give the consequence of intermodulation products on the two C-band carriers. (16)

(OR)

b) Draw and explain the TDMA frame structure. State the use of reference burst, preamble and guard times in TDMA. (16)

13. a) With neat block diagrams, explain a typical digital earth station (Transmitters and Receivers). (16)

(OR)

b) With evolution history of DBS system, explain the various blocks and application. (16)

14. a) Discuss the mathematical concept of trilateration and explain the working principle of Global Positioning Systems. (16)

(OR)

b) Explain how to determine the receiver position in 3D or X-Y-Z plane of global navigation satellite systems. (16)

15. a) What are the three segments of Global Positioning Systems? Explain them in detail. (16)

(OR)

b) Draw the GPS data format and show how the C/A code is generated using G1 and G2 generators. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E./Ph.D. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

COMMUNICATION SYSTEMS/ELECTRONICS AND COMMUNICATION ENGINEERING

22COE11 – Multimedia Compression Techniques

Time : 3 Hours | Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. List the types of Modeling with an example.
2. Outline the overview of Information theory.
3. How to generate a binary code in Arithmetic coding?
4. Define Static Dictionary.
5. Identify the significance of sub band coding in speech compression.
6. What is the purpose of Filter banks?
7. List the application of Image Compression.
8. If the original image is 256 × 256 pixels, 8 bits/pixel, it would occupy 65,536 bytes. After compression it occupies 6554 bytes. Calculate the compression ratio.
9. Distinguish between Motion compensation and Motion Estimation.
10. What is redundancy in video compression?

(5 x 16 = 80 Marks)

Part B

Answer ALL Questions

11. a) i) Compare and contrast lossy and lossless compression. (8)

ii) Evaluate the importance of Algorithmic Information theory in coding. (8)

(OR)

b) i) Obtain the Huffman code for the text "GOOD MORNING". (8)

ii) Describe the step involved in non-binary Huffman coding. (8)

12. a) i) Examine the functions of adaptive arithmetic coding with an example. (8)

ii) Encode and decode the following sequence using the LZ77 algorithm "cabracadabrarrarrad". Assume a window size of 13 with look-ahead buffer size of 6 and search buffer of size 7. (8)

(OR)

b) i) Compare and Contrast Huffman and Arithmetic coding. (8)

ii) Estimate the performance measurement of vector quantizer. (8)

13. a) i) Explain with the of block diagram of ADPCM encoder and decoder. (10)

ii) Summarize the G.722 audio compression with neat diagram. (6)

(OR)

b) i) Explain with neat sketch for the different types of layers is MPEG audio coding. (10)

ii) Describe the process of speech compression in MPEG advanced audio coding. (6)

14. a) i) List the properties of Discrete cosine transform and Discrete sine transform. (8)

ii) Examine the function of Walsh Hadamard transform with an example. (8)

(OR)

b) i) Discuss the design principle of JPEG standard with its transform computational features, quantization and coding schemes. (8)

ii) Explain any one method of Wavelet based image compression. (8)

15. a) i) Illustrate the different types of frames in video compression and explain briefly. (8)

ii) Describe the H.264 video compression standard with neat diagram. (8)

(OR)

b) i) Summarize the MPEG 4 synchronization and its delivery of streaming data in detail. (8)

ii) Explain the ITU-T H.263 encoder and its Motion Compensation Algorithms with neat sketch. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18EC308 – Basic Electronics Engineering

Time : 3 Hours | Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. What is Zener breakdown?
2. List the applications of LEDs.
3. What is early effect in BJT?
4. Compare positive and negative feedback of Amplifier.
5. Convert the hexadecimal number F3A7C2 to binary and octal.
6. What are universal logic gates?
7. List four characteristics of an ideal op-amp.
8. How many resistors are required in a 12-bit weighted resistor DAC?
9. Distinguish between analog and digital signals.
10. State the advantages of optical fibre communication.

(5 x 16 = 80 Marks)

Part B

Answer ALL Questions

11. a) i) Give the classification of semiconductors and explain each category. (8)

ii) Discuss about the VI characteristics of PN junction diode and its temperature dependence. (8)

(OR)

b) i) Explain the construction and operation of a photo diode. (8)

ii) Explain the operation of a full-wave rectifier with capacitor filter. (8)

12. a) i) Draw and explain the input and output characteristics of NPN transistor in CE configuration. (10)

ii) Compare the CE, CB and CC configurations of BJT. (6)

(OR)

b) i) Discuss the effects of negative feedback on amplifier characteristics. (8)

ii) Draw the block diagram of a voltage series feedback amplifier and derive for its input and output impedance. (8)

13. a) What is meant by combinational logic? Design and explain the operation of half adder and full adder. (16)

(OR)

b) Explain the operation of JK flip-flop with its logic diagram and characteristic table. Derive the T flip-flop from JK flip-flop. (16)

14. a) With suitable diagrams, explain the applications of an Op-amp as a summer, subtractor, integrator and differentiator with necessary equations. (16)

(OR)

b) i) Explain the working of successive approximation ADC with a neat circuit. (10)

ii) Calculate the values of the LSB, MSB and full-scale output for an 8-bit DAC for the 0 to 10 V range. (6)

15. a) Explain the principle of Amplitude and Frequency modulations with necessary waveforms and equations. (16)

(OR)

b) Draw the block diagram of satellite communication and explain each and every block. Mention the advantages, disadvantages and applications of satellite communication. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester(Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINGEERING

18ECH108 – VLSI For Wireless Communication

Time : 3 Hours | Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. What are the key differences between classical channels and wireless channels?
2. Define path loss in a wireless channel.
3. What is the significance of noise figure in receiver design?
4. Describe the concept of noise figure and its significance in LNA design.
5. What is the purpose of balancing mixer in wireless communication?
6. Give the difference between a Gilbert cell mixer and a switching mixer.
7. State the principle of operation of a phase-locked loop (PLL).
8. Differentiate between LC oscillators and ring oscillators in terms of their frequency stability.
9. Mention the role of a Quadrature Local Oscillator generator in a transmitter.
10. How does pre-distortion help to improve the linearity of a power amplifier?

(5 x 16 = 80 Marks)

Part B

Answer ALL Questions

11. a) Apply the principles of Quadrature Phase Shift Keying (QPSK) to show how it improves bandwidth efficiency in wireless systems compared to BPSK. (16)

(OR)

b) Describe the characteristics of a wireless channel, including path loss and fading and explain their impact on signal transmission in wireless communication systems. (16)

12. a) Explain in detail about the impedance matching with illustrations. (16)

(OR)

b) Explain how the imaginary and real components of impedance are matched in narrowband Low Noise Amplifier (LNA) impedance matching. (16)

13. a) Illustrate the Gilbert Mixer distortion in high frequency case. (16)

(OR)

b) Explain the design of switching and sampling mixers and analyze their distortion and noise characteristics in a wireless communication system. (16)

14. a) How the ring oscillator operates and explains it with an example circuit? (16)

(OR)

b) Construct the architecture of DECT with relevant diagrams. (16)

15. a) Describe the function and importance of a quadrature local oscillator generator in a transmitter system. What are the common techniques used to generate quadrature signals? (16)

(OR)

b) What are the important design factors to consider when creating power amplifiers for transmitters? How do these factors influence the amplifier's efficiency and linearity? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECPE604 – Wireless Communication

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down the equation for the average large-scale path loss as a function of the distance between the transmitter and receiver.
2. Write the merits and demerits of Okumara's model.
3. What Do you mean by channel distribution information (CDI)?
4. Distinguish between narrowband fading and wideband fading.
5. In US AMPS, 12.5 MHz spectrum is allocated to each cellular operator. The channel between each operator is 30 KHz with the guard band of 10 KHZ. Find the number of channels allocated to cellular operators.
6. Mention some merits of MFSK.
7. Differentiate micro and macro diversity.
8. What is meant by spatial multiplexing?
9. What are the various speech codec available for mobile communication?
10. What are the relative advantages of using vocoders over LPC in real-time speech communication systems?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the two-ray ground reflection model and derive the expression for path loss. (8)

ii) Explain various types of empirical path loss models to predict the path loss of urban, sub urban and rural areas. (8)

(OR)

b) i) How the received signal strength is predicted using the free space propagation model? Explain. (8)

ii) Discuss shadow fading and derive its corresponding mathematical model. (8)

12. a) i) Explain in detail fast fading and slow fading in a wireless channel. (8)

ii) Derive the Shannon channel capacity and the channel outage probability for a flat fading channel, assuming channel side information is available only at the receiver. (8)

(OR)

b) i) Derive an expression for ergodic channel capacity of flat fading channel assuming the transmitter and receiver have instantaneous CSI. (8)

ii) Derive the expression for the channel capacity of frequency-selective fading channels for both time-invariant and time-variant channels. (8)

13. a) i) Briefly explain the concept of Frequency Division Multiple access. Discuss the nonlinear effects in FDMA. (8)

ii) Summarize the features of various multiple access technique used in wireless mobile communication. (8)

(OR)

b) i) Explain the channel capacity of TDMA in cellular system in detail. (8)

ii) Explain spread spectrum multiple access techniques. (8)

14. a) What is Maximum Ratio Combining, and how does it improve the signal-to-noise ratio in a diversity system? Compare and contrast Maximum Ratio Combining and Equal Gain Combining. (16)

(OR)

b) What is the principle behind Maximum Likelihood detection in communication systems? Explain how the V-BLAST receiver works to detect the transmitted signals in the presence of interference from multiple transmit antennas. (16)

15. a) i) What is a vocoder, and how does it work to encode and decode speech signals? (10)

ii) Explain the basic principle behind Linear Predictive Coders. (6)

(OR)

b) i) Describe the basic structure of a DECT network and the roles of the base station, handset, and switching system. (10)

ii) What are the main differences between CT2 and DECT? (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ECOE03 – Microcontroller and its Applications

Time : 3 Hours | Maximum Marks : 100

Part A | (10 x 2 = 20 Marks)

Answer ALL Questions

1. Which of the 8051 ports need pull-up register to functions as an I/O port?
2. What is the value of the bits 4-7 of R0 after the following set of instructions are executed?

   MOV @R0, #04H

   MOV A, #11H

   XCHD A, @R0
3. What is the difference between the RET and RETI instructions?
4. What will be the output when the address of the memory location whose contents will be present in the Accumulator after the following set of instructions are executed?

   MOV DPTR, #2004H

   MOV A, #4

   MOVC A, @A + DPTR
5. What is the result of the following code and where is it kept?

   MOV R4,#25H

   MOV A,#1FH

   ADD A,R4
6. Differentiate between RISC and CISC machine.
7. Which mode of the timer is used baud rate programming? Also for XTAL=11.0592MHz, find the TH1 value for 9600 baud.
8. At reset, all the microcontroller parallel ports are configured as input port, why?
9. Why do a driver circuit is placed between the microcontroller and the stepper motor?
10. Give the state of RS,R/W and E when sending a command code to the LCD.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Dwell on the architecture of 89C51 microcontroller with neat diagram. (8)

ii) Indicate the type of addressing mode for the following instruction (8)

1) MOV A,@R0
2) MOVC A,@A+DPTR
3) MOV R0,40H
4) MOV R6,DPL

(OR)

b) Design an 8051 based system with 8 K bytes of program ROM, 8 K bytes of date ROM and 8 K bytes of Data RAM. (16)

12. a) i) With an example, explain briefly about addressing mode of 8051 microcontroller. (8)

ii) Demonstrate any five 8051 arithmetic instruction with suitable examples. (8)

(OR)

b) i) Tabulate any three differences between CISC and RISC machine with examples. (6)

ii) Which of the following instruction is (are) illegal? Also give reasons for your answer (10)

1) ADD A,#255H
2) MOV A,DPTR
3) ADD R7,A
4) MOV R1,#50H

13. a) i) Write an assembly language program to blink 8-LEDs connected to port 0 of 8051 microcontroller with one second delay. (10)

ii) Demonstrate any five 8051 JUMP instruction with suitable examples. (6)

(OR)

b) Write an 8051 ALP to count the number of students entering the class room and display it in port 2 of 8051 microcontroller. (16)

14. a) Generate a square wave with an ON time 3 ms and OFF time of on pin 1.0. Assume XTAL of 22 MHz use timer 1 mode 1 configuration. Shown in figure.1. (16)

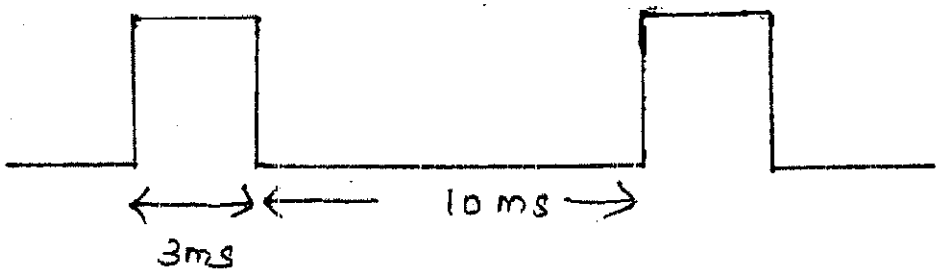


Figure.1

(OR)

b) Write an ALP to transfer the message "" HELLO" to serial #1. Set the baud rate at 9600, 8 bit data and 1 stop bit. (16)

15. a) With a suitable diagram illustrate how LCD can be interfaced with 8051 microcontroller. Also write an ALP to display word "ALL THE BEST". (16)

(OR)

b) With a neat diagram, show and explain how DC motor can be interfaced with 8051 microcontroller DC motor is connected with Port-1 and switch (SW) is connected with P2.7. Write an ALP to monitor the status of switch and perform the following (16)

1) If SW=0, the DC motor move clock wise
2) If SW=1, the DC motor move counter clockwise

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECPE703 – Internet of Things

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is M2M communication?
2. List few global game changers towards the implication of IoT.
3. Illustrate simplified global value chain.
4. State four design objectives of IoT architecture.
5. Compare LAN and WAN.
6. Define Infrastructure as a Service (IaaS) in cloud computing.
7. Distinguish between reference model and reference architecture.
8. List the technical design constraints when implementing M2M and IoT solutions in the real world.
9. What is M2M SOA-based device integration?
10. Write the purpose of a Building Automation System (BAS).

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the generic M2M System Solution with a neat diagram. (4)

ii) Summarize the Megatrends, Capabilities and implications of IoT. (12)

(OR)

b) i) Discuss the potential benefits of an IoT oriented approach over M2M by considering a Health band as the real-world use case example. (12)

ii) Compare the main characteristics of M2M and IoT. (4)

12. a) Discuss the five fundamental roles within I-GVC that companies and other factors are forming around in IoT industrial structure by considering retail as an example. (16)

(OR)

b) Explain the functional layers and capabilities of an IoT solution with a neat diagram. (16)

13. a) Identify the key characteristics of M2M data. Also discuss the various stages in the M2M data management from cradle to grave. (16)

(OR)

b) Explain how cloud of things acts as an enabler for new value-added services and applications with a neat diagram. (16)

14. a) Explain the ETSI M2M high-level architecture and its service capabilities with neat illustrations. (16)

(OR)

b) Explain the various functional groups from the functional view of the IoT reference architecture. (16)

15. a) Describe SOCRADES Integration Architecture (SIA) enables the coupling of industrial machines at shop floor and enterprise systems with a neat diagram. (16)

(OR)

b) Discuss the case study of commercial building automation in the future and derive the value chain. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22ECOE05 – Basics of Embedded Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define an embedded system.
2. List the various programming languages in embedded systems.
3. Recall the types of memory and its uses.
4. Compare Interrupt and polling.
5. Compare serial and parallel communication.
6. Write the UART message format for data transmission.
7. Interpret the classifications of scheduling algorithms in RTOS.
8. Define Mutex.
9. List the software tools needed at the host.
10. Compare emulator and simulator.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Outline the challenges in embedded systems with real time examples.	(8)
		ii)	Illustrate the recent trends associated with embedded systems and list the real time applications.	(8)
			(OR)	
	b)	i)	Interpret the importance of embedded design life cycle with a neat sketch.	(8)
		ii)	With a neat sketch, explain in detail about Hardware/ Software partitioning.	(8)
12.	a)	i)	Illustrate the memory access procedures and the types of memory used in embedded systems.	(8)
		ii)	Interpret the working of Direct Memory Access (DMA) in embedded systems with neat sketch.	(8)
			(OR)	
	b)	i)	Explain in detail about the interrupt and its types with real time examples.	(8)

ii) Illustrate the methodology used in Programmable Interrupt Controllers. (8)

13. a) Explain the functions of a typical parallel I/O interface and handshaking signals involved in parallel communication with a neat diagram. (16)

(OR)

b) With neat sketches and data word format, briefly explain the architecture, working and how the data transfer takes place between master nodes and host nodes of distributed control area network using the CAN bus? (16)

14. a) i) Apply the following set of processes with a length of CPU arrival and burst time given in milliseconds. (8)

Process	**Arrival Time**	**Burst Time**
P1	0	8
P2	5	2
P3	1	7
P4	6	3
P5	8	5

Sketch the Gantt chart with respect to execution of these processes using the round robin scheduling algorithm with the time quantum of 3ms and also calculate the waiting time and turnaround time of each process.

ii) Find the average waiting time for the following set of processes, using Shortest Job First scheduling algorithm. (8)

Process	Burst Time
P1	4
P2	11
P3	5
P4	3

(OR)

b) i) Explain in detail about inter task communication with neat sketch. (8)

ii) Outline the importance of Semaphore in Real Time Operating Systems. (8)

15. a) Explain the steps involved in loading the final executable file from host to target system. (16)

(OR)

b) Explain in detail about RFID systems with neat sketch; also list the advantages and disadvantages in using it. (16)

Register Number :

Mech

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTMEE29 – Safety Engineering

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term 'worker' used in factories act.
2. Enlist the main objectives of the factories act 1948.
3. List the few sources of Biomedical waste.
4. Mention the effects of water pollution.
5. List out the duties of Authorities as per chemicals. Rules 1989.
6. Define safety reports.
7. List out the objectives of Indian Boilers act.
8. How explosives are categorized under the explosive's rules, 1983?
9. Define occupational health.
10. Why are ANSI standards required?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Analyse the duties of powers of inspectors as per factories act 1948. (12)

ii) Give the procedure of appointment of inspectors under factories act 1948. (4)

(OR)

b) i) Analyze the provisions of the factories act 1948, relating to the health of the workers. (12)

ii) State the rules regarding the powers of the inspectors of factories for medical examinations of young persons. (4)

12. a) i) Analyze the functions of Central & State Pollution Control Boards. (12)

ii) Explain the stages of water recycling. (4)

(OR)

b) i) Write a report about the air-pollution issues in Delhi with the causes and the remedial measures to reduce it. (12)

ii) Summarize the ill effects of Noise pollution on human health. (4)

13. a) i) Analyze the safety features for isolated storage and handling of chemicals? (12)

ii) What is safety data sheet? Explain with an example. (4)

(OR)

b) i) Analyze the concept of off-site emergency plans. (12)

ii) List the duties of the authorities as per MSIHC rules. (4)

14. a) i) Analyze the ways with which motor vehicle rules helps in the Industrial safety. (12)

ii) List the steps in the renewal of certification of a boiler. (4)

(OR)

b) i) Analyze the provisions of the workmen's compensation Act, 1923 relating to the liability of the employer in case of a workman suffering from occupational disease. (12)

ii) Discuss the disposal process for Hazardous and other wastes. (4)

15. a) i) Explain the impact of government responsibilities in occupational safety. (12)

ii) Give the salient features of Health and safety regulations of HASAWA 1974. (4)

(OR)

b) i) Examine how the OSHA Standard differ from other safety standards. (12)

ii) Explain the rights of workers under OSHA law. (4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22ME404 – Hydraulics and Pneumatics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Pascal's Law.
2. State the effects of high viscosity hydraulic fluids in the fluid power system.
3. Mention the types of cylinder mountings.
4. Interpret the functions of pressure control valve.
5. Define servo control system.
6. Indicate the purpose of using fail safe circuit in any hydraulic system.
7. Give the standard graphical symbol for FRL unit.
8. Classify the logical circuits.
9. What is meant by interlock contacts?
10. List the causes for a noisy operation in a pump.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the construction and working principle of unbalanced vane pump with a neat sketch. (10)

ii) Explain any six properties of hydraulic fluids. (6)

(OR)

b) i) Describe the construction and working principle of radial piston pump with neat sketch. (10)

ii) What are the advantages, disadvantages and applications of the gear pump? (6)

12. a) i) Explain with neat sketch about spring loaded pressure relief valve. (8)

ii) Explain the construction and working principle of rotary spool valve used in the hydraulic systems. (8)

(OR)

b) i) Explain with neat sketch any two types of flow control valve used in the hydraulic systems. (8)

ii) Explain the flapper servo valve with neat sketch. (8)

13. a) Illustrate the construction and working of pressure intensifier, by considering the industrial application. (16)

(OR)

b) Draw and explain hydraulic circuit to show synchronization of two double acting cylinders. (16)

14. a) i) Explain with a neat diagram working principle of a quick exhaust valve. (8)

ii) With a neat sketch explain how following functions are generated in pneumatic system. i) AND function ii) OR function. (8)

(OR)

b) i) Design a pneumatic cascade circuit for the following sequence of operation: A+ B+B-C+C-A- . (8)

ii) Develop the travel-step diagram for the above sequence of operation. (8)

15. a) Design a circuit using the hydraulic components for the surface grinding operation. (16)

(OR)

b) Design and develop a hydraulic circuit for material handling in a fork lift applications. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING

22THC13 – Advanced Heat Transfer

(Use of HMT data Book is permitted)

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare mechanism of conduction and radiation heat transfer.
2. Write the significance of effectiveness of fin.
3. Comment about the use of analogy in heat and mass transfer studies.
4. Give the significance of Reynolds–Colburn analogy.
5. Comment about excess temperature and its significance.
6. Why rate of heat transfer is higher in phase change heat transfer than single phase?
7. Name the numerical methods used in heat transfer.
8. Write the advantages of numerical method in solving two dimensional conduction problems.
9. In a flow involving both heat and mass transfer the convection coefficient was 20 W/ m^2K. Lewis number is 0.85. cp = 1005 J/kgK. Density is 1.2 kg/m^3. The value of mass transfer coefficient is-_____.
10. Compare convective heat transfer and convective mass transfer.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Aluminum pin fins of parabolic profile with blunt tips are attached on a plane wall with surface temperature of 200°C. Each fin has a length of 20 mm and a base diameter of 5 mm. The fins are exposed to an ambient air condition of 25°C and the convection heat transfer coefficient is 50 $W/m^2.K$. If the thermal conductivity of the fins is 240 $W/m^2.K$, determine the efficiency, heat transfer rate, and effectiveness of each fin. (16)

(OR)

b) A furnace of 2 m x 1.5 m x 1.5 m size contains gases at 1500 K while the walls are at 500 K. The gas contains 18 % of CO_2 and 12 % of water vapour by volume. Determine the heat exchange from the gases to the walls. The total pressure is 2 atm. Assume black surface. (16)

12. a) Air at 20°C flows through an 8 cm dia pipe with a velocity of 9 m/s, The pipe wall is at 80°C. The length of the pipe is 1 m. Determine the exit temperature of air. (16)

(OR)

b) Air at – 10°C flows over a flat surface at 10°C with a free stream velocity of 80 m/s. The length of the plate is 3.1 m. Determine the location at which the flow turns turbulent. Also determine the local and average value of convection coefficient assuming that the flow is turbulent although. Compare the value of local heat transfer coefficient calculated using the equation obtained by analogy. (16)

13. a) Discuss about the physical phenomenon of pool boiling with sketch. (16)

(OR)

b) Determine the area required in parallel flow heat exchanger to cool oil from 60°C to 30°C using water available at 20°C. The outlet temperature of the water is 26°C. The rate of flow of oil is 10 kg/s. The specific heat of the oil is 2200 J/kg K. The overall heat transfer coefficient U = 300 W/m^2 K. Compare the area required for a counter flow exchanger. (16)

14. a) A slab 0.24 m thick initially at 80°C has both surfaces suddenly lowered to 20°C and surfaces maintained at the level. Thermal diffusivity = 1.5×10^{-6} m^2/s. Using numerical method estimate the temperature at locations from 30 cm, 60 cm, 90 cm,120 cm and 150 cm from lower end of the slab at the end 30 minutes. (16)

(OR)

b) A semi infinite slab with a thermal diffusivity of 1.67×10^{-6} m^2/s initially at 100°C has its surface suddenly raised to 200°C and maintained at the level. Taking a time interval of 120 seconds and nodal thickness of 2 cm, write down the nodal equation and solve for the temperatures at the nodes upto 6 time intervals. (16)

15. a) i) A tank contains a mixture of CO_2 and N_2 in the mole proportions of 0.2 and 0.8 at 1 bar and 290 K. It is connected by a duct of sectional area 0.1 m^2 to another tank containing a mixture of CO_2 and N_2 in the molal proportion of 0.8 and 0.2. The duct is 0.5 m long. Determine the diffusion of CO_2 and N_2. D = 0.16 × 10–4 m^2/s. (10)

ii) Discuss about concentration boundary layer. (6)

(OR)

b) A counter flow, concentric tube heat exchanger is used to cool the lubricating oil for a large industrial gas turbine engine. The flow rate of cooling water through the inner tube (ID = 25 mm) is 0.2 kg/s, while the flow rate of oil through the outer annulus (OD = 45 mm) is 0.1 kg/s. The oil and water enter at temperatures of 100 and 30°C, respectively. How long must the tube be made if the outlet temperature of the oil is to be 60°C? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22MEH101 – Hydrogen and Fuel cell Technologies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State any four properties of hydrogen.
2. What is biophotolysis?
3. What are the challenges in hydrogen liquefaction?
4. What is physisorption?
5. Distinguish between fuel cell and battery.
6. What are fuel cells?
7. List out applications of Molten Carbonate Fuel Cells.
8. What is Proton exchange membrane fuel cell?
9. What are the key factors affecting the cost of fuel cell systems?
10. What are the potential future trends in fuel cell research and development?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Describe producing hydrogen by Catalytic steam reforming of methane.	(16)
		(OR)	
	b)	Describe Water electrolysis process for production of Hydrogen.	(16)
12.	a)	Describe compressed gas storage system for hydrogen	(16)
		(OR)	
	b)	Describe Liquid hydrogen storage system.	(16)
13.	a)	Explain fuel cells with working principal and IV Characteristics.	(16)
		(OR)	
	b)	Explain use of Fuel Cells in Automobile sector.	(16)
14.	a)	Describe the mechanism involved in AFC processes.	(16)
		(OR)	
	b)	Describe the working principle of solid oxide fuel cell.	(16)

15. a) Analyze the economic and environmental impacts of large-scale fuel cell power plants. (16)

(OR)

b) Discuss the types of fuel cells suitable for stationary power generation and their advantages over conventional power plants (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22MEH209 – Design of Pressure Vessels

(Use of approved data book is Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the stresses developed in a pressure vessel.
2. Point out common failure theories used for pressure vessel design.
3. Point out the codes used for the design of pressure vessels.
4. What are the different types of nozzles used in pressure vessels?
5. What is the purpose of support lugs?
6. What do you understand by saddle supports?
7. List the effect of buckling of cylinders under external pressure.
8. Identify the need for lightweight pressure vessels.
9. List the different types of pipe joints used in common practice.
10. What is the flexibility factor in piping design?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Based on general membrane stress theory, derive the expression for stresses in a cylindrical vessel under internal pressure. (6)

ii) A thick cylinder of internal and external radii 300 mm and 500 mm respectively is subjected to a gradually increasing internal pressure. Determine the value of pressure when i) material of the cylinder first commences to yield ii) Material yield up to the middle of the cylinder, and iii) Cylinder material suffers complete collapse. Yield strength 600 MN/m^2. (10)

(OR)

b) i) Explain the wind and seismic load considerations in the design of the pressure vessel. (6)

ii) A cast iron cylinder of internal diameter 200 mm and thickness 50 mm is subjected to a pressure of 5 N/mm^2. Calculate the tangential and radial stresses at the inner, middle (radius = 125 mm) and outer surfaces. (10)

12. a) i) Explain different types of pressure vessel supports with suitable sketches. (6)

ii) Design reinforcement for the nozzle opening in a cylindrical shell using the following data. The outside diameter of the shell = 2.2 m, Max. Working pressure = 2.95 N/mm^2, shell wall thickness = 45 mm, corrosion allowance 3 mm, allowable stress (shell and nozzle) = 106 N/mm^2. The outside diameter of the nozzle is 220 mm, the nozzle wall thickness is 20 mm, the length of the nozzle above the surface is 100 mm, No protrusion of the nozzle inside the shell, Allowable stress is 94 N/mm^2 (pad), and Mili-tolerance is 12.5 %. (10)

(OR)

b) i) Write a note on the ASME code equations for various closure heads used in a pressure vessel. (6)

ii) Determine the stresses at the hemispherical head–cylindrical joint of a vessel for the conditions of; radius 1300 mm, internal pressure 2 MPa, thickness for both head and vessel is same and is 25 mm, Poisson's ratio 0.3; and sketch the stress variation near the joint in the cylindrical portion. (10)

13. a) i) A horizontal vessel 6 m long with hemispherical heads and 2 m diameter is subjected to 2.5 MPa pressure. It is supported on two saddles of 120° separated by 4 m. The vessel carries an operating weight of 60 tonnes. Allowable stress (shell and support) 110 MPa. Design the vessel and supports. (10)

ii) Explain different types of pressure vessel supports with suitable sketches. (6)

(OR)

b) i) Design a tall vertical pressure vessel with skirt support for the following data. Shell inside diameter = 1.8 m, shell overall height = 45 m, skirt height = 3 m, wind load top section – 4000 N/m (32-48 m), middle section = 3000 N/m (16-32 m), bottom section 2000 N/m (0-16 m). Approximate dead weight section 2 = 40 tonnes, section 3 = 70 tonnes, bottom of the vessel = 115 tonnes, base = 125 tonnes, design pressure 2 MPa, Design temperature = 50°C. Allowable stress (shell, skirt) = 100 MPa. (10)

ii) Explain the design aspect of the base plate of a pressure vessel. (6)

14. a) i) Analyze the design of circumferential stiffeners. (8)

ii) Explain the theories suggested for the analysis of thick cylinders. (8)

(OR)

b) i) Analyze the design of pressure vessels for undersea exploration, offshore drilling and mineral mining. (8)

ii) Explain the design procedure for pressure vessels subjected to higher external pressure. (8)

15. a) i) Explain about Piping supports. (8)

ii) Analyze various piping codes and standards. (8)

(OR)

b) i) Explain NPS for pipe and give differences between Pipe and Tube. (8)

ii) Analyze the piping layout and estimation of piping stress. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES

22ME101 – Engineering Graphics and Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the assumptions made in orthographic projection.
2. What is apparent length and inclination of a line?
3. What is a solid?
4. Differentiate between a frustum and a truncated solid.
5. How can you get the true shape of a section?
6. What will be the development of the lateral surface of a cone?
7. Distinguish between isometric view and isometric projection.
8. List the uses of pictorial drawings.
9. What is perspective projection?
10. What is the vanishing point?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The plan of a line AB is 80 mm long and makes 35° with XY. Its elevation makes 45° with XY and the line intersects XY at A. Identify and find its true length and inclinations to HP and VP. (16)

(OR)

b) A circular plate of negligible thickness and 50 mm diameter is vertical and inclined at 45° to VP. Draw its projections when the center of the circular lamina is 40 mm above HP and 60 mm in front of VP. (16)

12. a) A square pyramid of base side 30 mm, axis height 60 mm is resting on HP on one of its base corners with its axis inclined at 45° to HP and parallel to VP. Draw its projections when the base sides containing the resting corners are equally inclined to HP. (16)

(OR)

b) A cone with a base diameter of 50 mm and axis height of 65 mm is resting on HP on one of its generators with its axis parallel to VP. Draw its projections. (16)

13. a) A cube of side 30 mm rests on HP on its end with the vertical faces equally inclined to VP. It is cut by a plane perpendicular to VP and inclined at 30° to HP meeting the axis at 25 mm above the base. Draw the front view and sectional top view. (16)

(OR)

b) A pentagonal pyramid side of the base 30 mm and height 52 mm stands with this base of HP and an edge of the base is parallel to VP and nearer to it. It is cut by a plane perpendicular to VP inclined at 40° to HP and passing through a point on the axis 32 mm above the base. Draw the development of the lateral surface of the truncated pyramid. (16)

14. a) A cylinder of base diameter 50 mm and height 60 mm rests on its base on HP. It is cut by a plane perpendicular to VP and inclined at 50° to HP. The cutting plane meets the axis at a distance of 15 mm from the top surface. Draw the isometric projection of the truncated cylinder. (16)

(OR)

b) Draw the three orthographic views for the following Figure.1. (16)

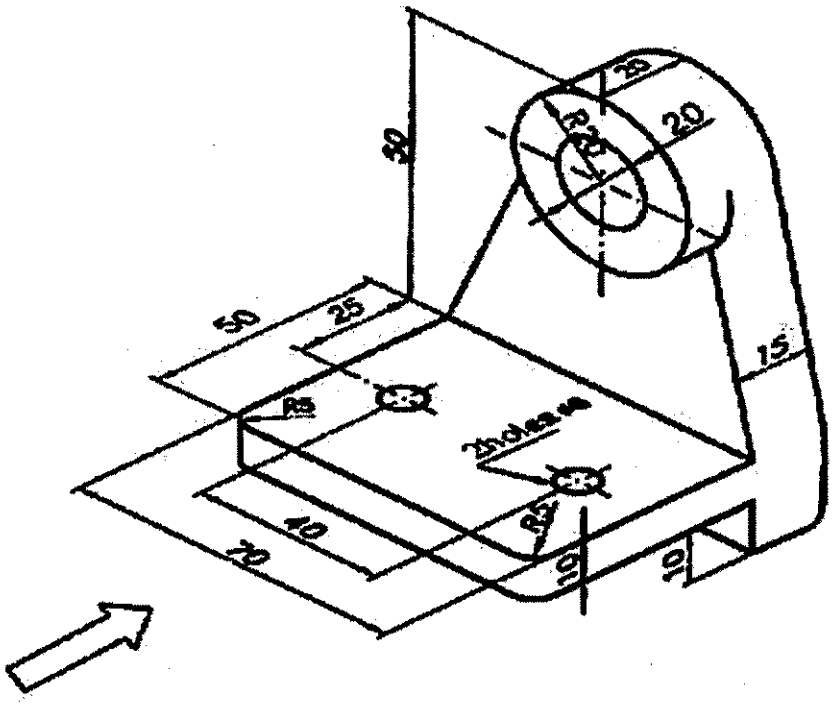


Figure.1.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22MEH104 – Alternate Fuels for IC Engines

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define alternative fuels and provide examples.
2. What are the properties of natural gas as a fuel?
3. Explain the concept of dual-fuel systems.
4. Analyze the benefits of pilot injection systems.
5. List the benefits of using methanol as a fuel.
6. What are the two methods of producing ethanol?
7. What are the environmental impacts of biodiesel?
8. List benefit of using biodiesel in CI engines.
9. What is a concern when storing fuels?
10. What is biogas?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Describe the need for alternative fuels and their impact on energy sustainability.	(8)
		ii)	Discuss the environmental benefits and drawbacks of biodiesel.	(8)
			(OR)	
	b)	i)	Explain the properties and combustion characteristics of LPG in IC engines.	(8)
		ii)	Compare the efficiency of hydrogen and natural gas as IC engine fuels.	(8)
12.	a)	i)	Compare the emission characteristics of synthetic fuels to conventional fuels.	(8)
		ii)	Discuss the role of ethers as fuel additives in reducing emissions.	(8)
			(OR)	

	b)	i)	Assess the performance characteristics of synthetic fuels in diesel engines.	(8)
		ii)	Explain the operation of dual-fuel systems and their impact on IC engines.	(8)
13.	a)	i)	Explain the impact of alcohol fuels on engine emissions.	(8)
		ii)	Discuss the production process of ethanol and its advantages as a fuel.	(8)
			(OR)	
	b)	i)	Compare the performance of alcohol fuels with gasoline in IC engines.	(8)
		ii)	Explain the challenges and limitations of using alcohol fuels in engines.	(8)
14.	a)	i)	Describe the challenges of using biodiesel in CI engines.	(8)
		ii)	Design the process of transesterification and brief its importance.	(8)
			(OR)	
	b)	i)	Compare biodiesel blends with conventional diesel in terms of emissions.	(8)
		ii)	Define the emission characteristics of biodiesel in diesel engines.	(8)
15.	a)		Explain the combustion characteristics of natural gas in IC engines.	(16)
			(OR)	
	b)		Analyze the long-term feasibility of hydrogen as a primary fuel in IC engines.	(16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22MEH105 – Advanced Energy Storage Technologies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the advantages of combining multiple energy storage Technologies?
2. Which energy storage technology is best suited for long-term storage?
3. What is a packed bed storage unit?
4. Name the main types of thermal storage systems.
5. Define the terms anode and cathode in a battery.
6. Why do lithium-ion batteries pose a higher fire risk compared to other types?
7. What are the major challenges in liquid hydrogen storage?
8. What are the primary methods of hydrogen storage?
9. What is the principle behind energy storage in a flywheel?
10. Mention one advantage and one disadvantage of compressed air energy storage.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Compare the performance based on cost of different energy storage technologies. (16)

(OR)

b) Describe the necessity of energy storage. Explain with an example. (16)

12. a) Describe the working principle of a simple water storage system. (16)

(OR)

b) Explain the principles of energy storage in phase change modelling - based systems. (16)

13. a) Compare the advantages and limitations of nickel-cadmium (NiCd) and nickel-metal hydride (NiMH) batteries. (16)

(OR)

b) Compare the energy density and power density of lead-acid, nickel-cadmium and lithium-ion batteries. (16)

14. a) Discuss the key risks associated with hydrogen storage and the methods used to mitigate them. (16)

(OR)

b) Explain the challenges of compressing and storing biogas for transportation applications. (16)

15. a) Explain the working of a compressed air energy storage system with a detailed schematic diagram. (16)

(OR)

b) Describe the working principle of a super capacitor with a detailed diagram. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22MEH202 – Advanced Fluid Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by Mass efflux?
2. Explain the meaning of operations "divergence" and "curl".
3. What are the effects of viscosity over flow of fluid?
4. What are the characteristics of creeping flow?
5. Enumerate the dynamic properties of Lubricant films.
6. Name the mechanical devices that operates based on the concept of thin film lubrication.
7. Explain the term Eddy viscosity.
8. What is the relevance of Prandtl's mixing length in Turbulence analysis?
9. What is meant by chocking condition?
10. What are the characteristics of Oblique shock?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Given the Eulerian velocity vector field. (16)

$$V = 3ti + xzj + ty^2k$$

Find the total acceleration of a particle.

(OR)

b) The stream function in a two dimensional flow is (16)

$$\psi = 6x - 4y + 7xy$$

Verify whether the flow is irrotational. Estimate the acceleration of a fluid element and the direction of stream line at (1,-1)

12. a) Starting with the continuity and Navier-Stokes equation, formulate the following parallel flow problems (16)

1) Couette Flow

2) Flow through concentric circular annulus.

(OR)

b) A fluid of kinematic viscosity 20×10^{-6} m^2/s and density 800 kg/m^3 is contained between two parallel plates 15 cm apart. The lower plate is fixed. A positive pressure gradient of 12.5 N/m^3 exists in the direction of motion of the upper plate. Determine the force required to move the upper plate at an uniform speed of 4.5 m/s, if the plate surface cross section is 60 x 130 cm. (16)

13. a) Explain the Millikan's oil drop experiment to demonstrate Stokes flow past a sphere. (16)

(OR)

b) Write detailed notes on Lubrication Approximation over Navier Stokes equation. (16)

14. a) Water at $30°C$ and atmospheric pressure flows through a smooth pipe of 50 mm inner diameter. The flow is fully developed and at the rate of 2 lit/s. Determine (16)

1) Friction factor

2) Pressure drop over a length of 5 m

3) Thickness of laminar sub layer

(OR)

b) Stating the assumptions made, derive the expression for Turbulent boundary layer on a flat plate. (16)

15. a) Air at 1.5 bar, $30°C$ enters a constant area pipe 5 cm diameter with a velocity of 35 m/s. During the flow through the pipe, heat is added to the air stream by a chemical reaction. Neglecting the frictional effects and taking the values of Cp and Cv for that of air, determine (16)

1) Maximum heat that can be added

2) Exit Mach number, if 50% of maximum permissible heat is added.

(OR)

b) A pitot static tube is used to monitor the velocity of an air stream. At the location of insertion of the probe, the static pressure is 1.5 bar and $35°C$. Calculate the reading of a mercury manometer connected differentially across the static and total pressure openings of the probe, if the air stream velocity is (i) 60 m/s (ii) 200 m/s (iii) 500 m/s taking into consideration of compressibility characteristics of flow. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22MEH302 – Advanced Materials Technology

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Griffith's theory and its importance in understanding fracture mechanics.
2. Illustrate the process of fatigue crack initiation.
3. Define diffusion coating and give an example.
4. List two benefits of thermal spraying.
5. What is the purpose of stress relieving in metals?
6. Mention the benefits of Martempering over conventional quenching.
7. List two properties of shape memory alloys.
8. What are the uses of refractory materials in industries?
9. Name two applications of Ti-based alloys in gas turbines.
10. Analyze the benefits of nickel-based alloys in marine environments.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the different modes of crack initiation and propagation with suitable diagrams. (16)

(OR)

b) Analyze the mechanisms and impact of hydrogen embrittlement on high-strength steels. (16)

12. a) Describe the different types of surface coatings and their applications in industrial processes. (16)

(OR)

b) Discuss the impact of advanced ceramic coatings in reducing wear and corrosion in marine environments. (16)

13. a) Explain the classification and heat treatment methods for aluminum and its alloys. (16)

(OR)

b) Compare the heat treatment processes of titanium and nickel alloys for aerospace applications. (16)

14. a) Explain the manufacturing and uses of refractory ceramics in high-temperature applications. (16)

(OR)

b) Describe the properties and industrial applications of superalloys like Hastelloy and Inconel. (16)

15. a) Explain the importance of Maraging steel and cryogenic steels in advanced engineering applications. (16)

(OR)

b) Analyze the role of Al7075 and Al6061 in the aerospace and automotive industries. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22MEH310 – Smart Mobility and Intelligent Vehicles

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Give an example of intelligent vehicles.
2. What do you mean by powertrain electronics?
3. Express your views on the basics of radar technology.
4. Mention the use of sensor data fusion.
5. What are the roles of an autonomous vehicle?
6. Mention the need of sensors in automobiles give two examples.
7. Define modulation.
8. What do you mean by IOT?
9. Give an example of security issue problems related to Autonomous vehicles.
10. Highlight your views on connected car technology.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Distinguish between automated and intelligent vehicles. (12)

ii) Give the special features for an autogear car. (4)

(OR)

b) i) Discuss the following in detail: (12)

1) Body of automobile
2) Chassis of automobile
3) Powertrain electronics

ii) Write short notes on connected vehicles. (4)

12. a) i) Discuss in detail about LIDAR sensor technology. (8)

ii) How do you integrate sensor data to on-board control systems? (8)

(OR)

	b)	i)	Highlight your views on ultrasonic SONAR systems.	(8)
		ii)	Express the need of camera technology for smart mobility.	(8)
13.	a)	i)	Discuss in detail about the basic control system theory applied to automobiles.	(8)
		ii)	Express your views about the operations of ECUs.	(8)
			(OR)	
	b)	i)	Explain the role of surroundings sensing systems and autonomy.	(8)
		ii)	Write short notes on wireless data networks and autonomy.	(8)
14.	a)	i)	Illustrate with neat diagram about wireless systems.	(8)
		ii)	Write short notes on on-board vehicle networks.	(8)
			(OR)	
	b)	i)	Write in detail about transmission systems.	(8)
		ii)	Explain, how are the receiver systems functioning in vehicles?	(8)
15.	a)	i)	Discuss in detail about the issues faced by the autonomous vehicles.	(12)
		ii)	Express your views on navigation related to vehicle technology.	(4)
			(OR)	
	b)	i)	Illustrate in detail about vehicle to vehicle technology.	(12)
		ii)	Highlight about the applications of vehicle to vehicle technology.	(4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22CM101– Basic Civil and Mechanical Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write short notes on Hooke's law.
2. State the required properties of good quality sand.
3. Give any two objectives of foundation
4. Name list the different types of roof.
5. How boilers are classified?
6. What is the working principle of impulse turbine?
7. Compare petrol engine and diesel engine.
8. What are the applications of IC engines?
9. Define the term "Ton of Refrigeration".
10. Name any four refrigerants.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain the necessary qualities of a good stone.	(8)
		ii)	State the various properties and uses of steel.	(8)
			(OR)	
	b)	i)	Explain with neat sketch about manufacturing of Portland cement.	(8)
		ii)	Brief notes for the uses of bricks.	(8)
12.	a)		Distinguish between brick masonry and stone masonry.	(16)
			(OR)	
	b)		List out the classification of surveying. Explain briefly.	(16)
13.	a)		With a neat sketch explain the construction, working of Babcock and Wilcox boiler. Also, discuss its advantages and disadvantages.	(16)
			(OR)	
	b)		With a neat sketch explain the principle and working of single acting reciprocating pump. Compare it with centrifugal pump.	(16)

14. a) With a neat sketch explain the principle and working of two stroke petrol engines. (16)

(OR)

b) With a neat sketch explain the various components and functions of an I.C. Engine in detail. Also, classify IC engines. (16)

15. a) Explain the vapour compression refrigeration system with neat sketch. Compare it with vapour absorption system. (16)

(OR)

b) Discuss in detail the working of split type air-conditioner with a neat sketch. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING

22THE23 – Optimization Techniques in Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term optimization and mention its significance.
2. Write down the design constraints for optimization.
3. Why decision tree is more significant in an optimization problem?
4. State game theory.
5. What do you understand about canonical form of LP problem?
6. Define simplex criterion.
7. Write short notes on KKT conditions.
8. Define quadratic programming.
9. Write down the important features of simulated annealing.
10. Define ant colony optimization.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the design restrictions and design vector concepts which are applied in optimization. (16)

(OR)

b) Explain the surface and multi-level optimization in detail. (16)

12. a) Elaborate the multi objective optimization with suitable examples. (16)

(OR)

b) Explain in detail about analytic hierarchy process. (16)

13. a) Use Simplex method to solve the following LPP. (16)

Maximize $Z = 4x_1 + 10x_2$

Subject to

$2x_1 + x_2 \leq 50$

$2x_1 + 5x_2 \leq 100$

$2x_1 + 3x_2 \leq 90$

and $x_1, x_2 \geq 0$.

(OR)

b) What are the assumptions used while solving LP models? Explain in detail about elementary operations in graphical method for two variable optimization problem. (16)

14. a) Elaborate constrained optimization and convex programming with suitable examples. (16)

(OR)

b) Explain Geometric and non-convex programming with suitable examples. (16)

15. a) Explain in detail about neural network based optimization. (16)

(OR)

b) Explain with suitable statistics about particle swarm optimization. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDE25 – Design for Manufacturing, Assembly

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the advantages of applying DFMA during product design.
2. Distinguish between conceptual design and embodiment design.
3. Differentiate any two machining processes in the context of DFMA.
4. List the general design rules for machining.
5. Classify joining processes.
6. List the factors to be considered in each joining process design stage.
7. Differentiate between open and closed die forging design.
8. State the need of trimming cycle in casting.
9. Define DFA index.
10. Differentiate between the design guidelines of part handling and insertion of parts.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Apply iterative nature of design process for any one product and optimize the process using either linear or nonlinear technique. (16)

(OR)

b) Apply the process selection chart for any product manufacturing by selecting suitable materials and explain in details. (16)

12. a) Design manufacturing features to avoid in rotational parts that require special drill to machine radial hole and to machine internal recess then discuss the features in details. (16)

(OR)

b) Apply redesigning concept for ease machining of components with suitable example and explain how it is economic in details. . (16)

13. a) Design weld length for strength and stability for any one application and explain how it prevents any tendency of the welded elements to rotate when subjected to mechanical loads. (16)

(OR)

b) Analyze the pre and post treatment of welds in details and explain how to help the thermal stress management and strength improvement. (16)

14. a) Design sand casting for any one component by considering different typical gating system and explain how casting tolerances considered in the design. (16)

(OR)

b) Design the forging sequence of a connecting rod by considering mass distribution stages and blocker cross-sections in details. (16)

15. a) Analyze any two design of power saw for assembly in terms of number of parts and assembly time then conclude which one is best as per design for assembly. (16)

(OR)

b) Analyze the various stages of total life cycle materials management of design for environment in details with necessary diagram. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT404 – Iron Making

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Give two most commonly used iron ores with chemical formula.
2. List the characteristics of coal required for coke making.
3. Describe the condition required for the iron making process.
4. Analyze why the term "Dead man zone" is used in a blast furnace.
5. Mention the parts or zones of a blast furnace.
6. List the ancillary equipment used for charging in a blast furnace.
7. Define the concept of scaffolding.
8. Expand RAFT.
9. Give the limitation of electro-thermal process of sponge iron production.
10. Define Ferro-alloy.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the theory, principle and practice of pelletizing in agglomeration with neat sketches. (16)

(OR)

b) Draw a precise diagram of blast furnace with neatly labelled and analyze the problems associated with Indian raw materials their impact on burden preparation and blast furnace performance. (16)

12. a) With neat sketches briefly explain the reactions involved in C-O, Fe-C-O and Fe-H-O equilibria. (16)

(OR)

b) Discuss the thermodynamics and kinetics of direct and indirect reduction of iron ores. (16)

13. a) Illustrate and explain the gas cleaning equipments with neat sketches. (16)

(OR)

	b)	Create a design improvement plan for a blast furnace to enhance its efficiency and reduce emissions.	(16)
14.	a)	Analyze the common irregularities in blast furnace operations and suggest remedies.	(16)
		(OR)	
	b)	Evaluate the effectiveness of various compositional control techniques for metal and slag in a blast furnace.	(16)
15.	a)	Discuss any two coal-based sponge iron production processes with diagram, including their applications in India.	(16)
		(OR)	
	b)	Explain the production processes for Fe-Si and Fe-Cr in Ferro alloy furnaces.	(16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EC304 – Transmission Lines and Waveguides

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the relationship between characteristic impedance and propagation constant?
2. Define reflection loss.
3. What is known as a standing wave?
4. Write the expressions for the input impedance of open and short circuited dissipation less line.
5. Define TEM wave.
6. What is degenerate mode in rectangular waveguide?
7. Write the applications of cavity resonators.
8. Why rectangular waveguides are preferred over circular waveguide?
9. Give the characteristic impedance of the Coplanar Strip line.
10. Define slot line.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the general transmission line equation for the voltage and current at any point on a line. (16)

(OR)

b) i) Derive expression for the attenuation and phase constant of transmission line in constant R,L,G and C. (8)

ii) Simplify the expression for input impedance and transfer impedance of transmission lines. (8)

12. a) i) Derive an expression for the input impedance of dissipation less line. (10)

ii) Mention the parameters of open wire line and coaxial cable at RF. (6)

(OR)

b) A 30 m long lossless transmission line with characteristic impedance of 50 ohm is terminated by a load impedance ZL = 60 + j40 ohm. The operating wavelength is 90 m. Find the reflection coefficient, SWR and input impedance using Smith Chart. (16)

13. a) Derive the expressions for the field components of TM and TE waves between parallel plates propagating in Z direction. (16)

(OR)

b) i) Derive the relation among phase velocity, group velocity & free space velocity. (10)

ii) Write the expression for the wave impedance and guide wavelength for TEM mode? (6)

14. a) Derive the expressions for the field components of TM and TE waves in rectangular cavity resonator. (16)

(OR)

b) i) Write the brief note on excitation of modes in circular wave guides. (8)

ii) Mention the applications of cavity resonators? (8)

15. a) Derive the Characteristic Impedance, Attenuation loss, strip line inductance, strip line capacitance and Shunt conductance of the Parallel strip line. (16)

(OR)

b) What are the losses in micro strip lines? Explain them with relevant equations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22ES301 – Mechanics Of Solids

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Hooke's Law.
2. Distinguish between Bulk Modulus and Young's Modulus.
3. List out the types of loads acting on a beam.
4. Sketch the SFD and Bending moment diagram for a cantilever beam carrying a point load at its free end.
5. State the assumption made in the theory of simple bending.
6. Determine the moment of resistance for the beam subjected to a bending stress of 15 N/mm^2 and section modulus is 1500 cm^3.
7. Describe the limitations of thin cylinders when applied to pressure vessels.
8. Determine the force in member UT in the given Figure.1

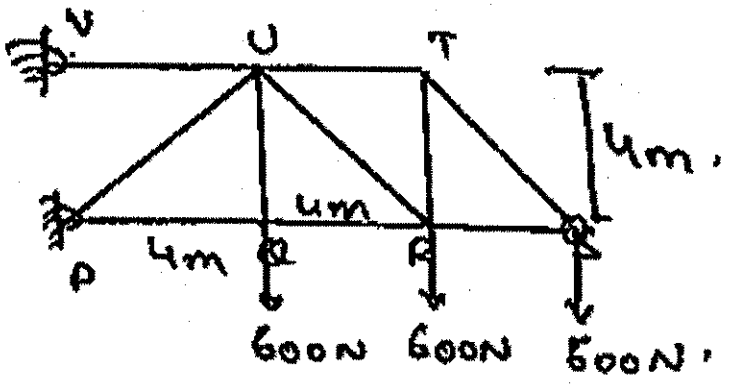


Figure.1

9. Write the expression for power transmitted by a shaft.
10. A bar of cross-sectional area 900 mm^2 is subjected to a tensile load of 100 kN applied at each end. Determine the normal stress on a plane inclined at 35° to the direction of loading.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A mild steel specimen of 15 mm diameter with a gauge length of 100 mm is tested to destruction. It has an extension of 0.23 mm under a load of 90 kN and the load at elastic limit is 109 kN. The maximum load is 180 kN. The total extension at fracture is 46 mm and diameter at neck is 18 mm. Determine (i) The stress at elastic limit (ii) Young's modulus (iii) Percentage elongation (iv) Percentage reduction in area (v) Ultimate tensile stress. (16)

(OR)

b) A compound bar is made of a central steel plate 50 mm wide and 20 mm thick to which copper plates 40 mm wide and 5 mm thick are connected rigidly on each side. The length of the bar at normal temperature is 1m. If the temperature is raised by $90^{\circ}C$, determine the stresses in each metal and change in length. Assume the value of E for steel = 2.1 x 10^5 N/mm^2, for copper = 1 x 10^5 N/mm^2. Coefficient of thermal expansion for steel and copper 14 x 10^{-6} per $^{\circ}C$ and 15 x 10^{-6} per $^{\circ}C$. (16)

12. a) Sketch the shear force and bending moment diagram for the overhanging beam and identify the point of contra flexure for the beam shown in Figure.2 (16)

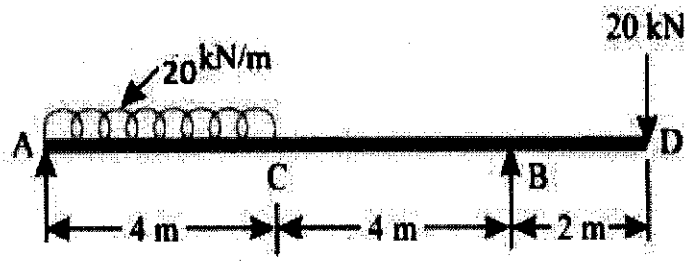


Figure.2

(OR)

b) A cantilever of length 3 m carries a uniformly distributed load of 4 kN/ m run over a length of 2 m from the free end. Draw the shear force and bending moment diagrams for the cantilever beam. (16)

13. a) A rectangular wooden plank is required to cover the open trench which has a width of 5 m. The plank is supported on both sides and it must carry a load of 7 x 10^6 N. The maximum permissible stress is limited to 10 MN/m^2. Determine the breadth and depth of the wooden plank by assuming the breadth of plank as 3 times of depth. (16)

(OR)

b) For the proposed railway track, the steel rail section has been designed with the flange of 40 cm x 2 cm and web of 2 cm x 40 cm. Calculate the maximum shearing stress developed in the rail section and label the shear stress distribution of the section if the shear force acting on the section is 15 kN. (16)

14. a) Determine the forces in the members FE, FD, CD of the truss shown in Figure.3 by method of sections. (16)

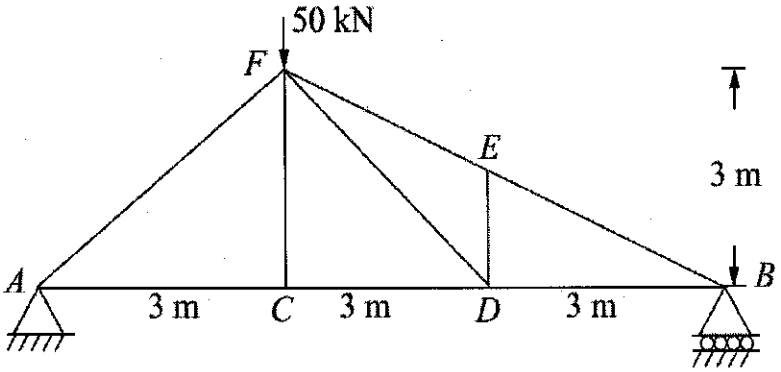


Figure.3

(OR)

b) A thin cylindrical drum 800 mm in diameter and 3 m long has a shell thickness of 10 mm. If the drum is subjected to an internal pressure of 2.5 N/mm^2, determine i) Hoop stress ii) Longitudinal stress iii) Change in diameter iv) Change in length v) Change in volume Assume E = 2 X 10^5 N/mm^2, Poisson's ratio as 0.25. (16)

15. a) To improve engine transmission, a solid shaft will be replaced with a hollow shaft of better-quality steel resulting in an increase in the allowable stress of 25 %. To keep the existing bearings, the new shaft will have the same outside diameter as the existing, solid shaft. Determine: (i) The bore diameter of the hollow shaft in terms of outside diameter (ii) The weight savings in percentage, assuming that the steel densities of both shafts are identical. (16)

(OR)

b) Determine the principal stresses for the given stress tensor. (16)

$$\left[\tau_{ij}\right] = \begin{pmatrix} 45 & -15 & 28.28 \\ -15 & 25 & 28.28 \\ 28.28 & 28.28 & 30 \end{pmatrix} MPa$$

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDE61 – Integrated Product and Processes Development

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the challenges of product development.
2. What type of development process would you expect to find in an established company successful at developing residential air-conditioning units?
3. Distinguish between mission statement and customer needs.
4. List the questions addressed by product planning activity.
5. Differentiate between the target specifications and the final specifications.
6. List the five steps of concept generation method.
7. Differentiate between the concept screening and concept testing.
8. State the factors leading to relatively smaller or larger survey sample sizes.
9. List the types of modularity.
10. Differentiate between the differentiation plan and commonality plan.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Sketch the organization flow of a consulting firm that develops new products for clients on a project-by-project basis. Assume that the individuals in the firm represent all of the different functions required to develop a new product. Explain this organization most likely be aligned with functions, be aligned by projects, or be a hybrid in details. (16)

(OR)

b) Apply the different front-end activities comprising the concept development phase for any product and explain in detail. (16)

12. a) Create a product–technology roadmap illustrating the availability of technologies for a class of products you understand well and explain the application of technology in detail. (16)

(OR)

b) With the customer needs, create a innovative product and explain how the needs are utilized to develop new product in detail with example of that product. (16)

13. a) Devise a metric and a corresponding test for the customer need that a "roofing material last many years" and then discuss it in detail. (16)

(OR)

b) Generate few concepts for the subproblem "prevent fraying of end of rope" as part of a system for cutting lengths of nylon rope from a spool and explain the concept. (16)

14. a) Devise few new and revised concepts for the syringe and explain the selection process analysis in details with necessary sketches. (16)

(OR)

b) Apply seven-step method for testing the scooter concepts with necessary sketches and explain it in details. (16)

15. a) List all functional elements for Deskjet printer and explain how the product architecture used in this Deskjet printer in details? (16)

(OR)

b) Analyze early system level design activities and secondary systems in details for any one product with necessary diagram. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING

22THE65 – Analysis of Thermal Power Cycles

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What do you know about a deaerator?
2. Write two merits of a float-type steam trap.
3. What do you understand by cogeneration?
4. If the thermal efficiency exceeds 100%, share your views on this and suggest its practical feasibility.
5. What is the effect of constant specific heats in the air standard cycle on thermal efficiency compared to a real engine?
6. Identify four challenges associated with current fuel-air cycles.
7. What are the limitations of the Brayton cycle?
8. Write the purpose of intercooling in Brayton cycle.
9. List four ideal properties for a refrigerant.
10. Identify the limitations of GAX cycle.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A thermal power plant operating on an ideal Rankine cycle has a mass flow rate of 10 kg/s through it. Water is fed to the boiler at 50 bars and leaves the condenser as saturated liquid at 0.1 bar. The mass flow rate of cooling water through the condenser is 500 kg/s. The cooling water enters the condenser at 30°C and leaves at 40°C. Calculate the temperature at which steam enters the turbine, the thermal efficiency of the power plant and the power output of the turbine. (16)

(OR)

b) A steam power plant operates on a reheat-regenerative Rankine cycle. Steam enters the high-pressure turbine at 15 MPa and 550°C and expands to 2 MPa. It is then reheated to 500°C and expands in the low-pressure turbine to 10 kPa. The feed-water is heated in two closed feed-water heaters, one operating at 1 MPa and the other at 0.5 MPa. The condenser operates at 10 kPa, and the pump efficiency is 85%. Determine the work output of the turbines, the work input to the pumps and heat transfer rates through the feed-water heaters. Also, plot the T-s diagram of the cycle, showing all relevant points. (16)

12. a) A gas turbine plant with a capacity of 800 kW takes in air at 1.02 bar and 15°C. The pressure ratio of the cycle is 6, and the maximum temperature is limited to 700°C. A regenerator with 75% effectiveness is added to the plant to increase its overall efficiency. The pressure drop in the combustion chamber is 0.15 bar, and there is also a 0.15 bar pressure drop in the regenerator. Assuming the isentropic efficiency of the compressor is 80% and that of the turbine is 85%, determine the thermal efficiency of the plant. Neglect the mass of the fuel. (16)

(OR)

b) A power plant operates on a combined Brayton and Rankine cycles. The Brayton cycle uses air as the working fluid with a pressure ratio of 8. The air enters the compressor at 300 K and exits the turbine at 800 K. The Rankine cycle uses water as the working fluid, with the boiler operating at 3 MPa and the condenser at 10 kPa. The steam enters the Rankine turbine at 450°C. The mass flow rate of air in the Brayton cycle is 5 kg/s, and the power plant aims to produce a total power output of 60 MW with the help of the T-s diagram. Determine the overall thermal efficiency of the combined cycle and the mass flow rate of steam in the Rankine cycle to achieve the desired power output. (16)

13. a) Consider an Otto cycle operating with air as the working fluid. The compression ratio of the engine is 10 and the initial conditions before compression are: 100 kPa and 300 K. The specific heats of air are variable and can be approximated as follows: (16)

$$C_p = 1005 + 0.1(T-300)\ \text{kJ/kg.K}$$

$$C_v = 718 + 0.1(T-300)\ \text{kJ/kg.K}$$

Using these relations, calculate the thermal efficiency of the Otto cycle

and the work output of the cycle if the mass of air is 0.5 kg and examine the obtained results.

(OR)

b) Analyze how the variable specific heats of the working fluid affect the thermal efficiency of the Atkinson cycle with the help of suitable diagrams. Additionally, elaborate on the advantages of the Atkinson cycle regarding efficiency compared to traditional Otto and Diesel cycles. (16)

14. a) Two open cycle gas turbines are designed for the same power output. Turbine A has a maximum temperature of 1400°C, while Turbine B operates at a maximum temperature of 1000°C. Compare the efficiencies of both turbines, assuming the same pressure ratio of 6:1 for both. Analyze the performance of gas turbines at higher temperatures in terms of emissions and fuel consumption. (16)

(OR)

b) In a thermal power plant utilizing a regenerative Rankine cycle, analyze the effects of increasing the feed-water temperature by 20°C on overall efficiency and steam generation. Additionally, discuss the thermodynamic principles involved in how regeneration works and the potential drawbacks of this temperature increase. (16)

15. a) An NH_3 refrigeration plant has a capacity of 20 tons of refrigeration. The condensation and evaporation temperatures are 35°C and -20°C, respectively. The refrigerant is dry and saturated at the entry to the compressor, and there is no undercooling of the liquid refrigerant. If the actual COP is 0.7 times the theoretical COP, determine the mass flow rate of the refrigerant. Additionally, calculate the power required to drive the compressor, which runs at 240 rpm, under the condition that the stroke length is equivalent to the bore diameter, with a volumetric efficiency of 80% and a single-acting design. (16)

(OR)

b) Explain the working of a water–lithium bromide absorption refrigeration system with a neat sketch, and identify its limitations based on your insights. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME302 – Applied Hydraulics and Pneumatics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between hydraulics and pneumatics.
2. Mention the factors influencing the volumetric efficiency of hydraulic pump.
3. Differentiate between linear actuator and rotary actuator.
4. Point out the purpose of tandem centre.
5. Define the term "capacity of accumulator"
6. List any four applications of intensifier.
7. Indicate the functions of a lubricator.
8. Define Programmable Logic Control (PLC).
9. Mention the common defects occurring in the hydraulic system.
10. Point out the properties that are subjected to change service life of the oil.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the applications of fluid power systems. (8)

ii) Explain the components of hydraulic and pneumatic systems. (8)

(OR)

b) List and explain the design criteria of Linear and Rotary pump in the hydraulic systems. (16)

12. a) Design the hydraulic drilling circuit using sequence valve and explain with neat sketch. (16)

(OR)

b) List the components used in the hydraulic systems and sketch the ANSI symbol of all the components in the hydraulic systems. (16)

13. a) Design and explain the working of a regenerative circuit. (16)

(OR)

b) Design and explain a hydraulic circuit for the robot arm applications. (16)

14. a) Design a pneumatic circuit using cascade method for the sequence A+ A- B+ B- and explain its working principle. (16)

(OR)

b) Explain the ladder logic diagram with a suitable example. (16)

15. a) Describe the causes of the contamination occurring in the hydraulic system. (16)

(OR)

b) Narrate a case study of low cost automation using the hydraulic and pneumatic system. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22ME503 – Metrology and Quality Control

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define metrology.
2. How do you measure uncertainty?
3. State the principles of calibration.
4. Differentiate between slip gauge and feeler gauge.
5. What is sine bar?
6. When do you go for CMM measurement?
7. List the terminologies used in surface finish measurement.
8. Draw the BIS symbol for surface roughness.
9. What is six sigma?
10. A mall dataset contains 200 people with different age groups and their spending score. Which plot/chart can be used for counting the spending score?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the three stages of generalized measurement system. (8)

ii) Analyse the desirable static characteristics of measuring instruments. (8)

(OR)

b) i) Explain the factors to be considered while selecting an instrument. (8)

ii) Evaluate the sources of errors in measuring instruments with suitable examples. (8)

12. a) i) Discuss about the calibration of micrometer. (8)

ii) The surface plate used in a measuring instrument produce error in the flatness. How do you calibrate the surface plate? (8)

(OR)

b) i) Describe the significances of ISO 9000 quality standards. (8)

ii) Differentiate between electrical and optical comparators. (8)

13. a) i) What is the use of optical protractor? Explain in detail. (8)

ii) For measuring the effective diameter of a metric external screw thread of 2.0 mm pitch, a 30.500 mm diameter cylindrical standard and 1.155 mm diameter wires were used. The micrometer readings over the standard and wires were 13.3768 and 12.2428 mm, respectively. If the pitch error in the bolt threads was 0.05 mm, what was the virtual effective diameter of the bolt? (8)

(OR)

b) i) Explain the principles of laser interferometer. (8)

ii) Inspect the straightness and roundness deviations with suitable examples. (8)

14. a) i) Discuss the measurement techniques used for measuring the surface finish. (8)

ii) How do you measure the surface finish using optical measuring instrument? (8)

(OR)

b) i) Compare Single sampling and Double sampling plan. (8)

ii) Differentiate between P chart and nP chart. (8)

15. a) i) Sketch a box plot and identify the quartiles and outliers with suitable example. (8)

ii) Investigate the importance of regression and multi variate analysis. (8)

(OR)

b) i) What is ANOVA? Explain in detail. (8)

ii) Analyze the significances of cause-and-effect diagram. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22ME403 – Metal Cutting and Machine Tools

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the various parts of single point cutting tool.
2. Write the factors that affect the tool life.
3. What are the advantages of using a collect chuck?
4. Mention any two differences between shaper and planer.
5. Define broaching.
6. What is meant by grade and structure of a grinding wheel?
7. What is the difference between up milling and down milling?
8. What is indexing in gear manufacturing?
9. Which is an unconventional machining process?
10. What is the basic principle of rapid prototyping?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)		Discuss the mechanism of chip formation and various types of chips produced during metal machining with neat diagram.	(16)
			(OR)	
	b)	i)	Explain various tool materials in metal cutting.	(6)
		ii)	Describe the forms of wears on the cutting tool with neat sketches.	(10)
12.	a)	i)	Discuss the main parts of a turret lathe with neat sketch.	(8)
		ii)	Write down the difference between a capstan and a turret lathe.	(8)
			(OR)	
	b)	i)	Explain the principle of operation of a shaper with a neat sketch.	(8)
		ii)	Explain the different types of table drive and feed mechanisms in a planning machine.	(8)
13.	a)	i)	Sketch and explain the working principle of an upright drilling machine.	(10)
		ii)	Discuss the various types of broaches.	(6)

(OR)

b) i) Explain the construction and working principles of a continuous broaching machine. (8)

ii) Discuss the various bonding materials used for making grinding wheels. (8)

14. a) i) Describe the various types of milling operations. (8)

ii) Explain the principle of operation of gear hobbing operation. (8)

(OR)

b) i) Explain the gear shaping process. (6)

ii) List out various methods used for gear finishing and explain any four methods. (10)

15. a) With a neat sketch, explain the principle and process parameters of Electric discharge machining. (16)

(OR)

b) i) Describe the principle of working of stereo lithography system. (8)

ii) Write a short note on fusion deposition modeling. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME502 – Solar and Wind Energy Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is concentration ratio?
2. List the various types of solar energy collectors.
3. Define Solar azimuth angle.
4. What is solar radiation data?
5. Classify different types of solar cells.
6. State the Photovoltaic effect.
7. Draw the block diagram of Wind power plant.
8. Define tip speed ratio (TSR).
9. Deduce the grid integration issues of WPPs.
10. Write about the availability of conventional energy sources in the world.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the construction and working of solar flat plate collectors. Discuss the thermal analysis of flat plate collector? (16)

(OR)

b) Data for a flat plate collector used for heating are given below: Location and latitude: Coimbatore 11000'N Date and time: March 22, 14:30 - 15:30 (LST) Average intensity of solar radiation (annual): 560 W/m^2 Collector tilt: 26^0, No. of glass covers :2, Heat removal factor for collector: 0.82, Transmittance of glass :0.88, Absorptance of the plate: 0.93, Top loss coefficient for collector: 7.95 W/m^{2}C, Collector fluid temperature: 25^{0}C Ambient Temperature: 25^{0}C Calculate: i) Solar altitude angle ii) Incident angle iii) Collector efficiency. (16)

12. a) Demonstrate the different power conditioning equipment used in solar power systems with neat sketch. (16)

(OR)

b) Identify the maximum power point tracking in solar system and explain step by step with the help of an algorithm. (16)

13. a) Summarize the maximum power point tracking in the Solar Photo voltaic system and discuss the advantages and disadvantages. (16)

(OR)

b) Evaluate the series and parallel connection of Solar Photovoltaic system with neat sketch. (16)

14. a) Sketch the diagram of a HAWT and explain the functions of its main components. (16)

(OR)

b) With the help of a diagram, discuss the power versus wind speed characteristics of a wind turbine. (16)

15. a) Generalize the most favorable sites for installing of wind turbines and Summarize the environmental impact due to installation of Wind power plant. (16)

(OR)

b) Explain in details about the various components present in the wind power plant with neat sketch and Summarize the Grid integration issues of WPPs. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME301 – Engineering Metrology and Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List few objectives of metrology and measurements.
2. Distinguish between direct and indirect measurements.
3. List the important considerations for the design of linear measurement instruments.
4. State the principle of red shift method.
5. Differentiate between two- and three-wire methods.
6. Distinguish between skidless and skid-type instruments.
7. List the advantages and limitations of laser interferometry.
8. State the condition for the need of digital devices.
9. Enlist the desirable characteristics of grid materials.
10. Compare the different temperature scales.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Compare various characteristics of line and end standards. (8)

ii) Discuss at least eight static characteristics of an instrument. (8)

(OR)

b) i) Explain about random errors and it's correction method. (8)

ii) Discuss the dynamics characteristics of an instrument. (8)

12. a) i) Discuss the guidelines to be followed for the proper use of a vernier caliper and list its applications. (8)

ii) The barrel scale of a vernier micrometer has graduations in millimetres, with each division measuring 1mm. The thimble scale has 100 equal divisions, and one complete rotation of the thimble moves it by one division over the barrel scale. If 10 divisions on the vernier scale attached to the micrometer correspond to 11 divisions on the thimble, calculate the least count of the instrument. (8)

(OR)

b) i) Discuss the functional requirements and working principle of a comparator. (8)

ii) Angle gauge block sets have Six blocks of 1°, 3°, 5°, 15°, 30°, and 45°, Five blocks of 1', 3', 5', 20' and 30' and Five blocks of 1", 3", 5", 20" and 30". Using the set how to measure the angle 20°40'10". (8)

13. a) i) Write a detailed note on the Gleason gear tester. (8)

ii) With the help of an illustration, explain the following terms: roughness, waviness, lay and flaws. (8)

(OR)

b) i) With the help of a sketch, discuss screw thread terminologies. (8)

ii) With the help of a neat sketch, explain the working principle of the Tomlinson surface meter. (8)

14. a) i) With the help of a simple sketch, explain how optical squares are made use of in testing the squareness of machine parts. (8)

ii) Briefly discuss the three basic types of commands in programming of CMMs. (8)

(OR)

b) i) Explain the measurement methodology involved in the use of optical flats. (8)

ii) Compare the pros and cons of the five different configurations of a CMM. (8)

15. a) i) Explain, with a neat sketch, determination of force using a load cell. (8)

ii) With a neat sketch, discuss static pressure measurement. (8)

(OR)

b) i) Explain the different thermocouple materials and its working principle. (8)

ii) With a neat sketch, discuss flow velocity measurement. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME501 – Industrial Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Enlist the main weakness of the Delphi method.
2. Write the factors affecting the EOQ.
3. Mention the basic principles of engineering economics.
4. Name the five elements of Kaizen.
5. Compare the pull and push method.
6. Recall the Process of Rapid manufacturing.
7. Recite the importance of aggregate supply in the supply chain.
8. Differentiate MRP-I and MRP-II.
9. What are the main objectives of scheduling?
10. Write briefly about FMS.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain the exponential smoothing technique that will be best for data with a trend but no seasonality.	(8)
		ii)	Explain the four components of Time series analysis.	(8)
			(OR)	
	b)	i)	Explain the measurement of error can be used to detect forecast bias.	(8)
		ii)	Explain the primary purpose of the EOQ Model.	(8)
12.	a)		Explain elaborately the seven steps in engineering economics analysis.	(16)
			(OR)	
	b)		Describe the detailed procedure for the role of poka-yoke in TQM implementation.	(16)
13.	a)	i)	With suitable example explain the SMED.	(8)
		ii)	Explain in detail the six sigma concepts.	(8)
			(OR)	

	b)	i)	Explain how the BPR help industry to improve the operations and performance?	(8)
		ii)	Explain in detail the concurrent engineering.	(8)
14.	a)	i)	Master Production schedule is to drive the entire production system. Identify the MPS function.	(8)
		ii)	Explain the supply chain management and the strategies.	(8)
			(OR)	
	b)	i)	Enlist various functional modules of ERP. Give a brief account of any one module.	(8)
		ii)	Demonstrate in detail the any two types of capacity planning.	(8)
15.	a)	i)	Explain the Following i) Batch Production and ii) Job shop Production	(8)
		ii)	Explain any two methods of resource allocation.	(8)
			(OR)	
	b)	i)	Explain the various steps involved in Scheduling.	(8)
		ii)	With Suitable sketch explain in detail the layout of FMS.	(8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING

22THC12 – Advanced Fluid Dynamics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define fully developed flow.
2. Compare Couette and Creeping flow.
3. The diameters of a pipe at the sections 1-1and 2-2 are 200 mm and 300 mm respectively. If the velocity of water flowing through the pipe at section 1-1 is 4 m/s, find the discharge through the pipe.
4. What is the significance of governing equation in fluid dynamics?
5. For 2-D steady incompressible fluid flow, the stream function is given by $\psi = \ln (x^2 + y^2)$ (x and y are the space coordinates, u and v are the x and y components of the velocity vector field). Find whether the flow is rotational or irrotational.
6. Write down the generalized form of Reynolds Transport Theorem for any extensive property β of a system.
7. Mention the causes of boundary layer separation.
8. Determine the direction and amount of flow per meter width between two parallel plates when one is moving relative to the other with a velocity of 3 m/s in the negative direction, if $\partial p/\partial x = -100 \times 10^6$ N/m^3 and $\mu = 0.4$ poise and distance between the plates is 1 mm.
9. Compare hydrodynamic and Thermal boundary layers.
10. Draw the curve for boundary layer over a flat plate and mention the laminar sub layer in it.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A liquid of viscosity of 0.9 poise is filled between two horizontal plates 10 mm apart. If the upper plate is moving at 1 m/s with respect to the lower plate which is stationary and the pressure difference between two sections 60 m apart is 60 kN/m^2, determine: (16)

1) The velocity distribution,
2) The discharge per unit width and
3) The shear stress on the upper plate.

(OR)

b) Explain fully developed flow and derive the equation for pressure drop in a pipe. (16)

12. a) Derive the Navier-Stokes equations for incompressible flow. (16)

(OR)

b) Derive the Bernoulli's equation for fluid flow and also explain its applications in fluid flow. (16)

13. a) Derive Reynolds transport theorem for fluid flow. (16)

(OR)

b) Explain in detail about stream function and velocity potential function with examples. (16)

14. a) A plate 450 mm x 150 mm has been placed longitudinally in a stream of crude oil (specific gravity 0.925 and kinematic viscosity of 0.9 stoke) which flows with velocity of 6 m/s. Calculate: (16)

1) The friction drag on the plate
2) Thickness of the boundary layer at the trailing edge and
3) Shear stress at the trailing edge.

(OR)

b) Enumerate and explain the solution methodology for boundary layer equations. (16)

15. a) A smooth pipe of 80 mm diameter and 1000 m long is carrying water at the rate of 8 liters/sec. If the kinematic viscosity of water is 0·015 stokes and the value of co-efficient of friction 'f' is given by the relation $f = \frac{0.0791}{Re^{1/4}}$, where Re is Reynolds number, calculate: (16)

1) Loss of head
2) Wall shearing stress
3) Centre-line velocity
4) Velocity and shear stress at 20 mm from the pipe wall, and
5) Thickness of laminar sub layer.

(OR)

b) Derive the Prandtl's mixing length theory and velocity distribution equation. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING

22THC11 – Advanced Thermodynamics

(Use of Standard Steam Table is Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. A heat engine receives heat from a source at 1200 K at a rate of 500 kJ/s and rejects the waste heat to a medium at 300 K. The power output of the heat engine is 180 kW. Determine the irreversibility rate for this process.
2. Interpret the term Joule – Thomson coefficient.
3. What is meant by compressibility factor?
4. State Gibbs phase rule for non-reactive components.
5. Mathematically express equilibrium constant as a function of partial pressure for a reacting gas mixture.
6. What is adiabatic flame temperature? Give its importance.
7. What is partition function?
8. Differentiate between Fermi-Diarc and Bose-Einstein statistics.
9. What do you understand through Onsager's reciprocity relations in Irreversible thermodynamics?
10. Can the efficiency of a thermoelectric generator operating between two junctions at T_H and T_L be higher than the corresponding Carnot efficiency? Why?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Summarize the second law efficiency for a closed system and for a steady state control volume. (6)

ii) Carbon dioxide (CO_2) is compressed adiabatically in a piston cylinder from 10 bars and 300K to 50 bars and 450 K. The fluid is modelled as (a) an ideal gas and (b) a real gas. For the two models, find (1) the availability change and (2) the irreversibility in kJ/kg and (3) the second law effectiveness. (10)

(OR)

b) i) Illustrate the Joule-Thomson effect with schematic. (6)

ii) Prove the relation $C_p - C_V = \frac{Tv\beta^2}{K_T}$, where β is the coefficient of volumetric expansion and K_T is isothermal compressibility. (10)

12. a) Predict the pressure of nitrogen gas at T = 175 K and v = 0.00375 m^3/kg on the basis of (16)
(a) the ideal gas equation of state,
(b) the van der Waals equation of state,
(c) the Beattie-Bridgeman equation of state and
(d) the Benedict-Webb-Rubin equation of state.
Compare the values obtained to experimentally determined value of 10,000 kPa.

(OR)

b) Air is a mixture of N_2, O_2 and small amounts of other gases and it can be approximated as 79% N_2 and 21% O_2 on a mole basis. During a steady flow process air is cooled from 220 K to 160 K at a constant pressure of 10 MPa. Determine the heat transfer during this process per kmol of air, using, (16)
(a) the ideal gas approximation,
(b) Kay's rule and
(c) Amagat's law.

13. a) Gaseous propane is burned with 400% theoretical air. Both the fuel and air are supplied at 1 atmosphere and 25°C. Compute the maximum possible work output if the combustion takes place isothermally. (16)
(i) Assuming all products are at 1 atm pressure.
(ii) Using the actual partial pressures of the products.

(OR)

b) Ethylene gas and air both at 25°C enter a steady flow combustion chamber. Analyze the adiabatic flame temperature if 50% excess air is used and the combustion is complete. (16)

14. a) Show that the number of microstates associated with a given macrostate in Bose-Einstein statistics is, (16)

$$\Omega_{B-E} = \prod_j \frac{(g_i + N_j - 1)!}{(g_i - 1)! N_j!}$$

(OR)

b) Derive an expression for the local entropy generation rate for the coupled one-dimensional flow of heat energy and electric current. (16)

15. a) i) Examine the phenomenological law. Give an example of coupled flow system. (12)

ii) Discuss the meaning of flux and force as applied to irreversible thermodynamics. (4)

(OR)

b) i) Explain briefly about the thermoelectric generator with a neat diagram. (12)

ii) Discuss about the Onsager's reciprocity relation. (4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDC11 – Concepts of Engineering Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare codes and standards.
2. What is the need for technological forecasting?
3. What are ethical conflicts?
4. List the characteristics of environmentally responsible design.
5. What is embodiment design? Give its significance.
6. Point out the uses of models in engineering design.
7. What are material performance indices? Give their significance.
8. List a few guidelines in design for castings.
9. Distinguish between parameter design and tolerance design.
10. Define the terms risk, reliability, and safety.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Analyze the morphology of the design.	(8)
		ii)	Point out the considerations for a good design.	(8)
			(OR)	
	b)	i)	Analyze the role of concurrent engineering in the product life cycle.	(8)
		ii)	Describe the total life cycle of a product. How products can achieve their performance requirements?	(8)
12.	a)	i)	Explain the concept of QFD with an example.	(8)
		ii)	Enumerate the ways to collect customer requirements.	(8)
			(OR)	
	b)	i)	Discuss the human factors in design.	(8)
		ii)	Elucidate environment-responsible design.	(8)
13.	a)	i)	Analyze the process of establishing product architecture.	(8)
		ii)	Enumerate the concept of TRIAZ.	(8)
			(OR)	

b) i) Analyze the need and uses of models in engineering design. (8)

ii) Discuss the concept of configuration design with an example. (8)

14. a) i) Discuss the design guidelines for forgings. (8)

ii) Analyze the factors to be considered for deciding on the selection of the manufacturing process. (8)

(OR)

b) i) Discuss the design guidelines for metal forming. (8)

ii) Analyze the selection of materials in conceptual, embodiment, and detail design. (8)

15. a) i) A complex engineering design can be described by a reliability block diagram as shown in Figure.1. In subsystem A, two components must operate for the subsystem to function successfully. Subsystem C has true parallel reliability. Calculate the reliability of each subsystem and the overall system reliability. (8)

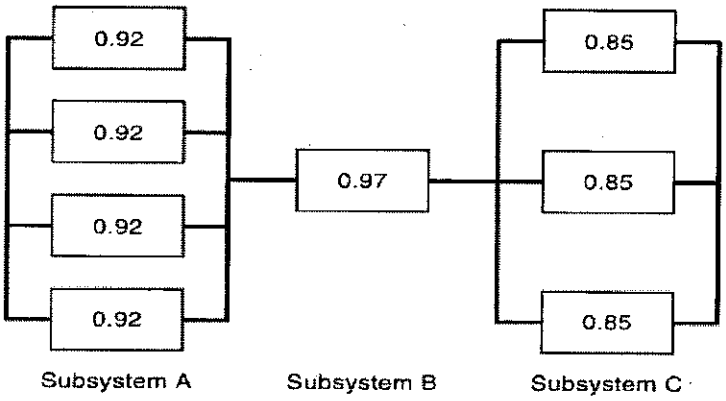


Figure.1

ii) Explain the steps in FMEA. (8)

(OR)

b) i) What is the Taguchi quality loss function? A power supply for an electronic product must deliver a nominal output voltage of 115 volts. When the output voltage varies from the nominal by more than 20 volts, the customer will experience degraded performance or the product will be damaged and repairs will be necessary at an average cost of Rs.1000. What is the loss if the product is shipped with a power supply having an output of 110 volts? (8)

ii) Discuss the technique of optimization with an example problem. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING

22THE54 – Waste to Energy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Expand and define MSW.
2. Discuss the functions of an incinerator.
3. List out the applications of charcoal in various domains.
4. Define Syngas and give its uses.
5. What is a gasifier and what is its purpose?
6. Discuss equilibrium considerations of a gasifier.
7. Describe Biomass stoves.
8. Mention the various types of Combustors.
9. List out the properties of Biogas.
10. Classify the Biomass resources.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in detail the classification of various types and resources of waste. (16)

(OR)

b) Discuss various types of digesters for waste management in detail. (16)

12. a) i) Explain with neat sketch the process of pyrolysis in detail. (12)

ii) Write short notes on the uses of charcoal. (4)

(OR)

b) i) Explain the manufacturing processes of pyrolytic oils briefly. (12)

ii) Mention the primary applications of syngas in various engineering fields. (4)

13. a) Draw the gasifier engine arrangement for the production of electric power and explain the methodology. (16)

(OR)

b) Draw and explain in detail the functioning of (i) fluidized bed gasifier (ii) downdraft gasifier (16)

14. a) Explain the design, construction, and operation of fluidized bed combustor in detail. (16)

(OR)

b) Explain the operation of the fixed bed combustor with a neat sketch. (16)

15. a) i) Explain the design and constructional features of biogas plant technology with a neat sketch. (12)

ii) Discuss the classification of biomass resources. (4)

(OR)

b) i) Explain the following in detail (i) bio-chemical conversion and (ii) anaerobic digestion (12)

ii) Write short notes on thermochemical biomass conversion process. (4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEH310 – Smart Mobility and Intelligent Vehicles

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write a short note on Powertrain electronics.
2. What are the key features of intelligent vehicles?
3. Explain the principle of operation of ultrasonic sonar system.
4. State the use of sensor data fusion of autonomous vehicles.
5. What is the basic control system theory applied to automobiles?
6. Illustrate the concept of vehicle autonomy.
7. Write the concept of demodulation in wireless receiver system.
8. Discuss the basic of computer networking.
9. Describe about connected car.
10. What is the role of GPS in connected car technology?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the history and evolution of automotive electronics with suitable examples. (12)

ii) Describe the importance and components of body of electronics vehicles. (4)

(OR)

b) i) Explain the challenges faced in the development and implementation of automated and connected vehicles. (12)

ii) Identify the major safety features of intelligent vehicles. (4)

12. a) Explain the working principle of radar Technology and its applications. (16)

(OR)

b) Describe the significance of night vision technology in enhancing the safety of autonomous vehicles. Discuss its functioning and applications. (16)

13. a) i) Explain the operations of ECUs in modern vehicles. (12)

ii) Discuss the basic theory of cyber – physical system. (4)

(OR)

b) i) Explain the role of wireless data networks in enabling autonomy in connected vehicles. (12)

ii) Identify the role of surroundings sensing systems. (4)

14. a) Describe the transmission systems in wireless communication focusing on modulation and encoding techniques. (16)

(OR)

b) Discuss and explain the Internet of Things (IOT) and its integration with connected vehicles. (16)

15. a) Explain in detail the Vehicle-to-Vehicle (V2V) communication protocol and its applications in improving traffic safety and efficiency. (16)

(OR)

b) Explain the development of driverless cars and the role of various technologies such as LIDAR, GPS and AI. What are the challenges in making these vehicles road-ready? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEH105 – Advanced Energy Storage Technologies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How do you classify the energy storage devices?
2. Why is manganese dioxide used in batteries?
3. What is the thermal energy storage model?
4. Write down the expected problems if the pressure level is low in the pressurized water storage system.
5. Suggest four ideal and feasible materials for the anode of batteries.
6. When do you prefer Nickel-Cadmium batteries?
7. Identify four problems associated with the storage of hydrogen.
8. What are the safety issues of biogas?
9. Write the principle of super capacitor.
10. Can compressed air be used for energy storage? Justify.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Elaborate on the importance of energy storage in the future energy supply and identify the expected potential challenges associated with it.	(16)
		(OR)	
	b)	Conduct a comparative study of the four currently available energy storage systems and comment on their suitability.	(16)
12.	a)	Sketch and explain the working of a rock-bed thermal energy storage system. State their benefits and applications.	(16)
		(OR)	
	b)	Discuss your methodology for applying phase-change energy storage in the air-conditioning system and describe their features.	(16)

13. a) Explain seven factors that can measure the performance of batteries with the help of commercially available batteries. (16)

(OR)

b) Sketch and explain the working of the lithium-ion battery with the help of chemical equations, and compare its performance with that of the lead-acid battery. (16)

14. a) Discuss your understanding of liquid hydrogen and analyze how it is stored, highlighting the safety issues involved. (16)

(OR)

b) Elaborate on seven essential requirements to be considered in the storage of highly flammable chemicals. (16)

15. a) Analyze how flywheels are used as energy storage devices in the automotive industry and share your views on their performance improvements. (16)

(OR)

b) Examine the suitability of the hybrid storage concept in the present energy storage scenario with proper justification using appropriate examples. Predict its future. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEH101 – Hydrogen and Fuel Cell Technologies

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List out chemical properties of hydrogen.
2. What is biophotolysis?
3. What cryo liquefaction?
4. What are the different types of compressed storage system?
5. Sketch the IV characteristics of fuel cells?
6. What is a fuel cell? How does it differ from a battery?
7. State the applications of Alkaline Fuell Cells.
8. Why are solid oxide fuel cells (SOFCs) considered to be highly efficient?
9. What are the key factors affecting the cost of fuel cell systems?
10. What are the potential future trends in fuel cell research and development?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Describe Steam reforming process for production of Hydrogen.	(16)
		(OR)	
	b)	Explain Thermochemical water splitting processes.	(16)
12.	a)	Describe multi staging and intercooling processes employed in the compression of hydrogen.	(16)
		(OR)	
	b)	Describe Liquid hydrogen storage system in detail.	(16)
13.	a)	Explain fuel cells with working principle and IV Characteristics.	(16)
		(OR)	
	b)	Explain the future trends in fuel cells.	(16)
14.	a)	Describe the working principle of Phosphoric Acid Fuel cell.	(16)
		(OR)	
	b)	Describe the working principle of Molten Carbonate Fuel Cell.	(16)

15. a) Analyze the economic and environmental impacts of large-scale fuel cell power plants. (16)

(OR)

b) Discuss the types of fuel cells suitable for stationary power generation and their advantages over conventional power plants. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEH203 – Fundamentals of Bio-Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the applications of Biomechanics?
2. Define Kinetics and Kinematics in mechanics.
3. Differentiate apparent and relative viscosity.
4. Define steady flow and turbulent flow in bio fluids.
5. Describe the movements available in the elbow.
6. What is the role of menisci in a knee joint?
7. What are the typical anthropometric measurements?
8. What are equipments used for Gait cycle?
9. What is mean by applied physiology in workplace?
10. What are the advantages of computer-aided ergonomics design?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss on the fundamental concepts in biomechanics. (10)

ii) Explain the mechanical testing of biomaterials. (6)

(OR)

b) i) Describe the various mechanical properties and discuss a method to test them. (10)

ii) Explain the resolution of forces for two and three dimensions. (6)

12. a) i) Explain the physical and chemical properties of blood. (6)

ii) Briefly explain about the Flow/Rheological properties of blood. (10)

(OR)

b) i) Explain the various types of flow and give examples for each type with respect to fluid dynamics in human body. (6)

ii) Derive the Hagen –Poiseuilles equation. (10)

13. a) i) What is viscoelasticity? Explain the three viscoelastic models in detail. (8)

ii) Explain the mechanical properties of soft tissues such as ligament, tendons and cartilages. (8)

(OR)

b) i) Explain bone fracture mechanics in detail. (8)

ii) Discuss the implants for bone fracture treatment. (8)

14. a) i) Elaborate the bio-mechanics of elbow and knee. (8)

ii) Explain bio-mechanics of shoulder and hip. (8)

(OR)

b) i) Explain the various stages of human locomotion. (8)

ii) What is gait analysis? Give an account of gait analysis with various stages. (8)

15. a) Discuss how finite element analysis, support to design of ergonomics with biomechanics principles. (16)

(OR)

b) Discuss the various ergonomics factors to be considered for designing of computer workstation. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME701 – Mechatronics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is hysteresis?
2. List the parameters to be considered for designing an intelligent mechatronic system.
3. State the purpose of control system.
4. How do you define pneumatic system?
5. What are the factors to be considered for selecting solenoids?
6. How can AI improve the design process in mechatronics?
7. Write the ladder logic for the following conditions. Turn on a light, 30s after switch X1 has turned ON.
8. Compare the PLC and general purpose computer.
9. What are the various movements of robot?
10. List out various sensors used in engine management system.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Identify and discuss the sensor, signal conditioner and display elements in the measurement systems of a bourdon pressure gauge. (8)

ii) Explain the difference between open loop and closed loop control system. (8)

(OR)

b) i) Describe the working principle of LVDT with neat sketch. (8)

ii) Compare and contrast the control system for the domestic central heating system involving a bimetallic thermostat and that involving a microprocessor? (8)

12. a) i) Derive a mathematical differential equation for governing a system of electric motor. (8)

ii) Describe the construction and operation of bladder type air-accumulator with the help of a diagram. (8)

(OR)

b) i) Draw block diagrams of hydraulic and pneumatic systems and explain them. (8)

ii) A hot object with capacitance C and temperature T, cools in a large room at temperature Ta. If the thermal system has a resistance R, derive an equation describing how the temperature of the hot object changes with time and give an electrical analogue of the system. (8)

13. a) i) Describe the construction and working principle of DC Servomotor with neat diagram. (8)

ii) Explain the operation of a variable reluctance stepper motor with a neat diagram. (8)

(OR)

b) i) Explain the components of a PID controller and evaluate its effectiveness in industrial applications. (8)

ii) Analyze the architecture of a neural network and evaluate its applications in real-world scenarios. (8)

14. a) i) Draw the architecture of PLC with neat sketch and explain the functions of its elements. (8)

ii) Draw the ladder rungs to represent the following: a motor is switched on by pressing a spring – return push button start switch and the motor remains on until another spring – return push button stop switch is pressed. (8)

(OR)

b) i) Explain how a PLC can be used to handle an analogue input. (8)

ii) Discuss about the temperature control system using PLC. (8)

15. a) i) Analyze the stages of Mechatronics design process. (6)

ii) Discuss the possible design solutions for a pick and place robot? (10)

(OR)

b) i) Compare analog and digital data acquisition systems. (6)

ii) Design a mechatronics system for a bottling system where bottles are segregated by defect at the crown of the bottle when moving on a conveyor system? (10)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2018 Regulations)

COMPUTER AIDED DESIGN

18CDC21 – Finite Element Methods in Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Why polynomial type of interpolation functions are mostly used in FEM?
2. Write down the difference between the initial value problem and boundary value problem.
3. Write the shape function and displacement function for a 1Dimension two noded element.
4. Show that the global stiffness matrix is differed from element stiffness matrix?
5. Define serendipity element.
6. How will you modify a three-dimensional problem to a two-dimensional problem?
7. State the principle of superposition.
8. Write down the expression of governing equation for transverse vibration of beam.
9. Write down the governing equation for two-dimensional heat conduction.
10. Define the stream function for an incompressible flow.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Consider the differential equation $\left(\left(\frac{d^2y}{dx^2}\right) + 400x^2 = 0 \; for \; 0 \leq x \geq 1\right.$ (16)
Subject to boundary conditions y(0) = 0; y(1) = 0. The functions corresponding to this problem, to be extremized is given by $I = \int_0^1 \{-0.5 \left(\left(\frac{dy}{dx}\right)^2\right) + 400x^2y\}$. Find the solution of the problem using Rayleigh-Ritz method by considering term solution as $y(x) = c_1x(1-x) + c_2x^2(1-x)$.

(OR)

b) A simply supported beam subjected to uniformly distributed load over entire span and it is subjected to a point load at the center of the span. Determine the bending moment and deflection at mid span by using Rayleigh-Ritz method and compare with exact solution. (16)

12. a) Determine the shape function and element matrices for quadratic bar element. (16)

(OR)

b) Calculate the displacements and slopes at the nodes for the beam shown in figure.1. Find the moment at the midpoint of element 1. (16)

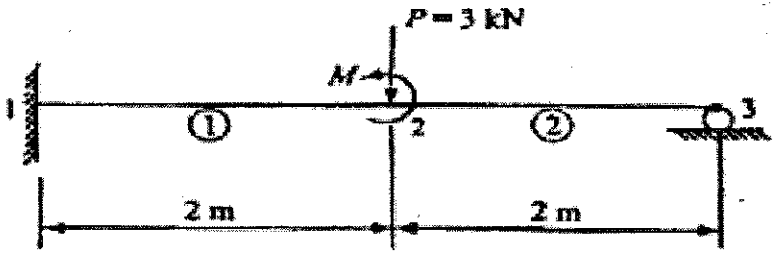


Figure.1

13. a) Derive the shape function of a CST Element. (16)

(OR)

b) Determine the stiffness matrix for a CST element. The coordinates are given in mm. Assume plane strain condition. E = 200 GPa. ν = 0.25. t = 10 mm. All dimensions are in mm. Shown in figure.2 (16)

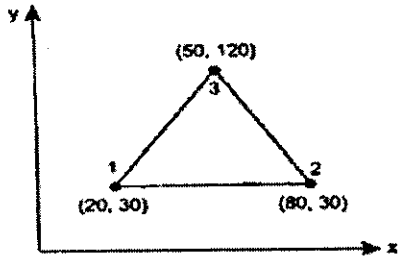


Figure.2.

14. a) Derive the stiffness matrix for beam element using strain energy and direct stiffness method. (16)

(OR)

b) Determine all natural frequencies of the simply supported beam as shown in figure.3. Compare the results obtained using the following, (16)

i) One-element model.

ii) Two-element model.

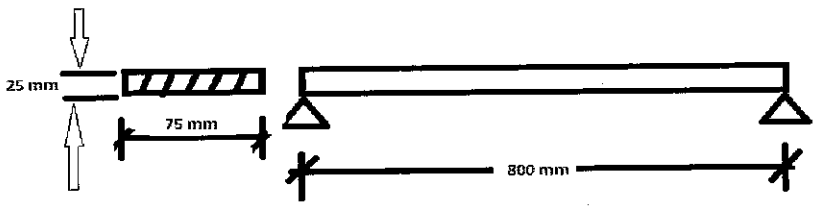


Figure.3.

15. a) An aluminium alloy fin of 7 mm thick and 50 mm long protrudes from a wall, which is maintained at 120°C. The ambient air temperature is 22°C. The heat transfer coefficient and thermal conductivity of the fin material are 140 W/m^2K and 55 W/mK respectively. Determine the temperature distribution of fin. (16)

(OR)

b) Derive the stiffness matrix and load vector for fluid mechanics in two dimensional finite element. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE63 – Robotics

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Classify the robot as per the type of control and mobility.
2. List any four applications of robots in the manufacturing area.
3. When will the hydraulic drive be preferred in robots?
4. List any four factors to be considered while designing grippers.
5. Differentiate between transducer and sensor.
6. What is meant by feature extraction?
7. Define degrees of freedom.
8. List any two applications of straight-line interpolation in robotics.
9. How does RGV differ from AGV?
10. What are the three levels of safety sensors used in a robot?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the robotics wrist and indicate wrist pitch, yaw and roll. And discuss the technical specifications of Robotics. (16)

(OR)

b) Explain the four common Robot configurations with neat sketches and narrate individual merits, demerits and applications. (16)

12. a) Discuss the salient features, capabilities, application merits and limitations of non-servo and servo-controlled Robots. (16)

(OR)

b) Discuss in detail the various considerations for the selection of grippers in robots. (16)

13. a) Describe the working principle of position sensors with a neat sketch. Also, state its applications. (16)

(OR)

b) How are the images processed and analyzed in a machine vision system? Explain with a suitable example. (16)

14. a) Derive the forward and backward transmission for a robot with a 3-degree-of-freedom arm. (16)

(OR)

b) Write a palletizing program to pick the parts from the input chute and place them on a pallet with 24 positions. (16)

15. a) Describe the factors to be considered for the industrial application of robots. (16)

(OR)

b) List and explain the direct and indirect costs of a robot application project with a suitable example. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

CIVIL /METALLURGY/ELECTRICAL AND ELECTRONICS ENGINEERING

18MEOE05 – Professional Ethics and Human Values

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the qualities of self-confident people?
2. Differentiate Morality and Ethics.
3. What are all the problems in moral dilemma?
4. List the theories about right action.
5. What are the types of Standards?
6. Outline the conditions essential for valid informed consent.
7. Classify different types of intellectual property rights.
8. Why do we need a risk-benefit analysis?
9. What is bias? And state the types of it.
10. Brief about the IEEE Code of Ethics.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Bring out the difference between personal ethics and professional ethics. (8)

ii) Define human values. Elaborate and give examples. (8)

(OR)

b) i) What is the meaning of respect? How do we disrespect others due to lack of right understanding of this feeling? (8)

ii) How character is formed? Explain the essence of Indian spirituality. (8)

12. a) i) Justify the relationship between autonomy and authority with an example. (8)

ii) What is meant by moral autonomy? What are the abilities needed to boost moral autonomy? (8)

(OR)

b) i) Evaluate the difference between Kohlberg's theory and Gilligan's theory. (8)

ii) What are the various types of inquiries? Explain with an appropriate example. (8)

13. a) i) What are the various roles and functions of codes of ethics? (8)

ii) Explain the responsibilities of engineers concerning the environment. (8)

(OR)

b) i) What are the ethical problems involved in the Challenger accident? Explain. (8)

ii) Discuss the roles played by the codes of ethics set by professional societies. (8)

14. a) i) Define the term Risk and Safety. How do we as an Engineer assess the safety? (8)

ii) What is meant by collective bargaining? Brief the process of collective bargaining. (8)

(OR)

b) i) Discuss the concept of safe exit in the Chernobyl case study. (8)

ii) Discuss the following (8)

1) Patents

2) Trademarks

3) Copyrights.

15. a) i) Explain in detail the various advantages and disadvantages of MNCs. (8)

ii) What are the 'Ten commandments of computer ethics'? (8)

(OR)

b) i) Who are the consultants? Write short notes on consulting engineers and the areas they work. (8)

ii) Discuss an engineer's involvement in weapons work. Why do some engineers refuse to do war work? (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEH309 – Digital Manufacturing and IOT

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Definition of Digital Manufacturing.
2. What is called 'digital factory'?
3. Discuss the role of digital tools in Collaborative Product Development.
4. Compare digital mock-ups with physical prototypes.
5. State 'Smart factory'.
6. List out few benefits of smart factory in manufacturing industries.
7. Define feedback systems and its importance in the context of IoT and IIoT implementations.
8. Describe common data acquisition mechanisms used in IoT and IIoT systems.
9. What are the types of building blocks?
10. What is digital-twin technology?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	With the help of a suitable illustration explain the concept of Digital Manufacturing.	(8)
		ii)	With the help of a block diagram explain the Architecture of Digital Manufacturing System.	(8)
			(OR)	
	b)	i)	Discuss on Product layout and Process layout give suitable example.	(8)
		ii)	Write short notes on practical benefits of Digital Manufacturing.	(8)
12.	a)	i)	Describe methods used to ensure that customer requirements are accurately translated into design specifications.	(8)
		ii)	Discuss the importance of process consistency in product development.	(8)
			(OR)	

b) i) Explain the various scope and challenges for implementing Digital Supply Chain management at industries. (8)

ii) Define virtual testing and explain its role in the product lifecycle. (8)

13. a) Explain the concept of Smart Design/Fabrication and its role in modern manufacturing. (16)

(OR)

b) Explain the key principles of a smart factory in IoT. (16)

14. a) i) Explain the role of cloud computing in supporting IoT and IIoT applications in Industry 4.0. (8)

ii) Define IoT and IIoT. How do they differ in terms of applications? (8)

(OR)

b) i) Write short notes on Cyber physical systems. (8)

ii) Write down the few applications of Intelligent networks of manufacturing. (8)

15. a) Write short notes on Digital thread and Digital Shadow. (16)

(OR)

b) i) Describe the characteristics of a Good Digital Twin platform. (8)

ii) List out the various Impact and Challenges for implementing the Digital Twin platform. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18ME408 – Engineering Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define equilibrium of particles in space.
2. With the aid of simple sketch, state the principle of transmissibility of forces.
3. Draw free body diagram for the given figure 1.

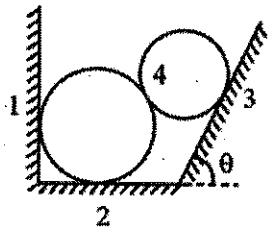


Figure.1.

4. The position vector and force are 2i – 3j + 4k and 120i – 100j + 300k. Find the moment of the force about the origin.
5. Differentiate centroid and centre of gravity.
6. What is parallel axes theorem for moment of inertia?
7. State Pappus – Guldinus therorem I & II.
8. Define Angle of repose.
9. A particle is projected into space at an angle of 35° to the horizontal at a velocity of 40 m/s. Find the maximum height reached by the projectile.
10. What is co-efficient of restitution?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Determine the magnitude and direction of the resultant force on the console given in figure.1. (16)

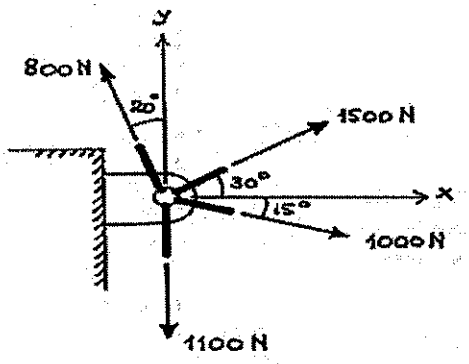


Figure.1.

(OR)

b) A rectangular plate is supported by three cables as shown in figure.2. The tension in cable AC = 60 N, determine the weight of the plate. (16)

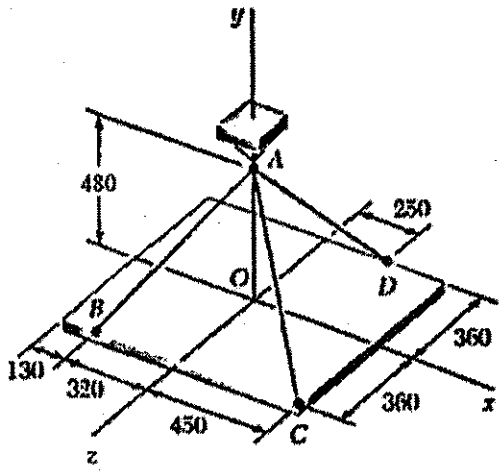


Figure.2.

12. a) Two smooth balls A and B having mass of 2 kg and 5 kg respectively rest between the inclined plane as shown in figure.3. Determine the reactions of planes on balls. The radius of both the balls is same. (16)

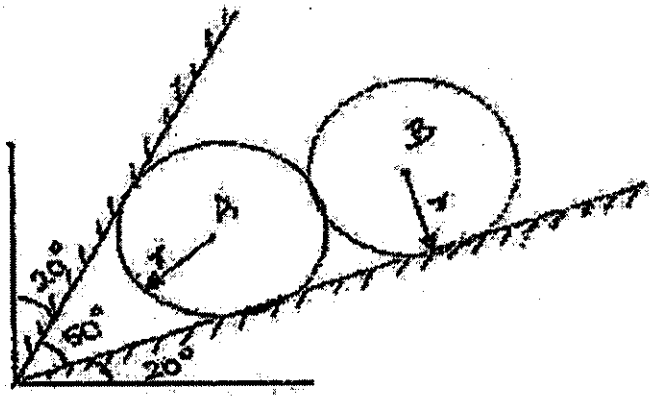


Figure.3

(OR)

b) A force couple system acting on a rectangular plate is shown in figure.4 below. i) Find the equivalent force couple system at the origin O. ii) Find the single resultant force and its location on x – axis. (16)

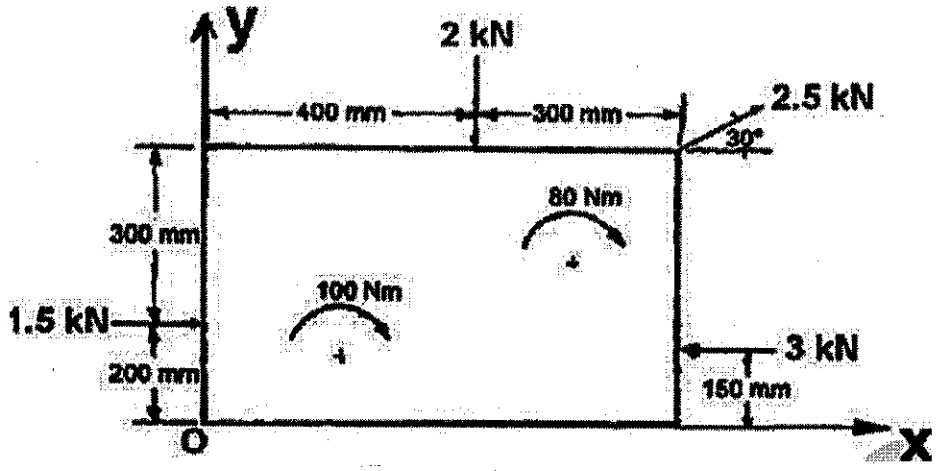


Figure.4.

13. a) Find the centroid of the lamina shown in figure.5 about the base and the 250 mm edge. (16)

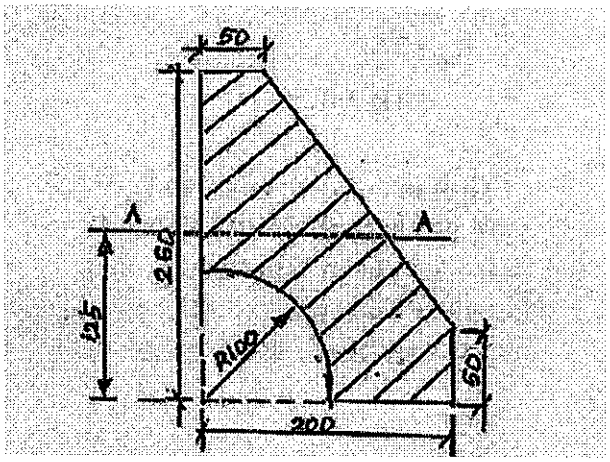


Figure.5

(OR)

b) Find the moment of inertia for the shaded area shown in figure.6 about the edge AB' and AA'. (16)

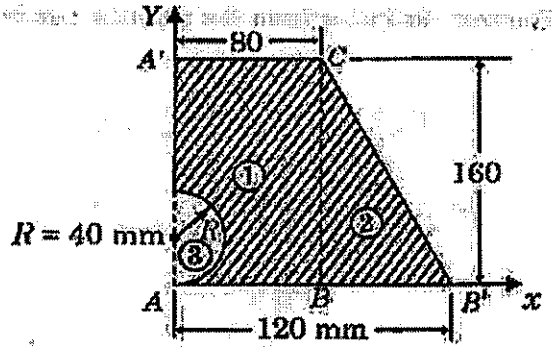


Figure.6

14. a) Block A of mass 30 kg rests on block B of mass 40 kg as shown in figure.7. Block A is restrained from moving by a horizontal rope tied at point C, what force P applied to the plane inclined at 30° with horizontal is necessary to start block B down the plane. Take co – efficient of friction for all surfaces as 0.35. (16)

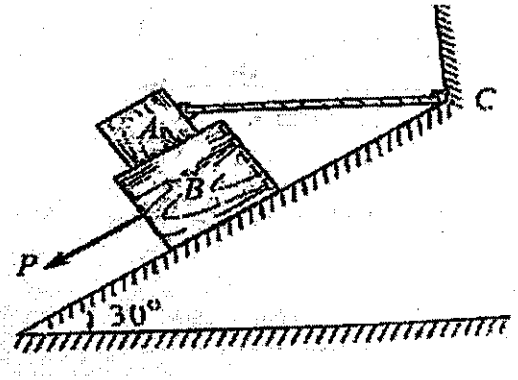


Figure.7.

(OR)

b) A block of weighing 1500 N is overlying on a horizontal floor and leaning against a vertical wall as given in figure.8 is to be raised by applying a horizontal force to the wedge. Assume the co-efficient of friction between all the surfaces in contact to be 0.3, determine the minimum horizontal force 'P' to be applied to raise the block. (16)

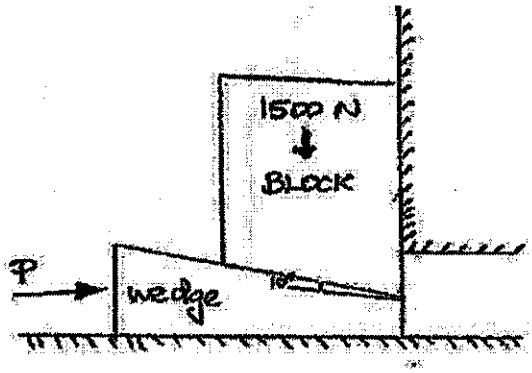


Figure.8.

15. a) Three perfectly elastic balls A, B and C of masses 4 kg, 8 kg and 16 kg move in the same direction with velocities of 8 m/s, 2 m/s and 1.5 m/s respectively. If the ball A impinges with the ball B, which in turn impinges with the ball C, prove that the balls A and B will be brought to rest by the impacts. (16)

(OR)

b) Two rough planes inclined at 30° and 60° to horizontal are placed back to back as shown in figure.9. The blocks of weights 50 N and 100 N are placed on the faces and are connected by a string running parallel to planes and passing over a frictionless pulley. If the co-efficient of friction between planes and blocks is 1.3, find the resulting acceleration and tension in the string. (16)

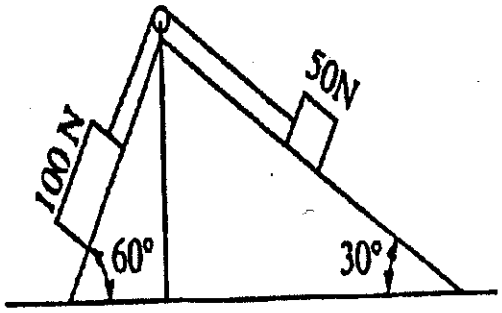


Figure.9.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME405 – Materials Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define solid solution in alloys.
2. What are the main alloying elements in stainless steel?
3. What is spheroidizing?
4. Draw the isothermal transformation diagram.
5. What are the key properties of Al_2O_3 (alumina) ceramics?
6. Write down the chemical vapor deposition and its main application in coatings.
7. Differentiate between creep and fatigue.
8. What is the purpose of a tensile test in material testing?
9. Explain radiographic testing in NDT.
10. Write is the purpose of surface engineering charts.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw and explain the Iron-Carbon equilibrium diagram with various phases and reactions. (10)

    ii) Difference between substitution and interstitial solid solutions with examples. (6)

(OR)

    b) i) Discuss the effect of alloying elements (Mn, Si, Cr, Mo, V, Ti, and W) on the properties of steel. (10)

    ii) What are the characteristics and applications of bearing alloys? (6)

12. a) i) Explain the heat treatment process of hardening and tempering and discuss their effects on the properties of steel. (10)

    ii) What is the principle of the Jominy end quench test and how is it used to measure the hardenability of steel? (6)

(OR)

b) i) Explain the processes of Carburizing, Cyaniding and Nitriding. Discuss their advantages and applications in industrial components. (10)

ii) Describe the heat treatment of HSS tools and mention how it improves machining performance. (6)

13. a) Explain the fracture mechanics and defects typically found in ceramics. Discuss their impact on the strength, reliability and lifespan of ceramic components in engineering applications. (16)

(OR)

b) Discuss the manufacturing processes, mechanical properties and specific applications of fiber and particulate-reinforced composite materials. (16)

14. a) Discuss the causes, characteristics, and failure mechanisms of each type of fracture, along with real-world examples of material failures. (16)

(OR)

b) Explain the Izod and Charpy impact tests in detail. Describe the test setup, procedure and interpretation of results and applications. (16)

15. a) i) Describe the principle and working procedure of ultrasonic testing. How does this method help in detecting flaws in materials? (10)

ii) Discuss the basic principle of Non-Destructive Testing. (6)

(OR)

b) i) Explain the concept of elastic contact mechanics and its significance in surface engineering, especially in relation to wear and fatigue. (10)

ii) What are the differences between high and low energy beam methods in surface engineering? (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE301 – Electric Circuit Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Recall the Electric network elements.
2. Outline the power triangle.
3. Illustrate the superposition theorem.
4. In the circuit shown in Figure.1, determine the maximum power transferred to load and current.

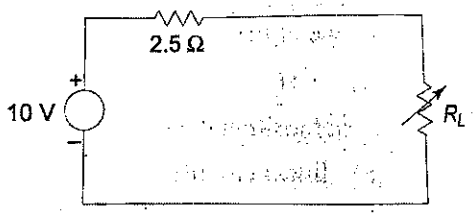


Figure.1

5. Using dot conversion, write the voltage equations for the coils shown in Figure.2.

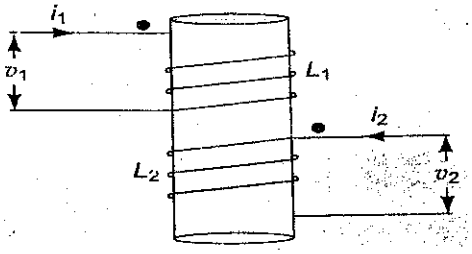


Figure.2

6. To inductive coupled coils have self-inductance L_1= 50 mH and L_2 = 200 mH. If the coefficient of coupling is 0.5 find. The mutual inductance between the coils.
7. What is steady state and transient responses of a circuit?
8. Write the expression for free response of a RC series circuit.
9. The input power to a 3-phase AC motor is measured as 5 kW. If the voltage and current to the motor are 400 V and 8.6 A respectively, determine the power factor of the system.
10. In two wattmeter method of power measurement of a 3-phase balanced system, calculate the power factor of the system if both watt meters show the same positive reading.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A sinusoidal alternating current with 50 Hz frequency has an RMS value of 20 A. Write down the equation for instantaneous value and find this value at a) 0.002s and 0.0125s after passing through a positive maximum value. b) Calculate, at what time, measured form positive maximum value, will the instantaneous current be 14.14 Amperes. (8)

ii) For the circuit shown in Figure.2. Determine the value of the impedance if the source delivers a power of 200 W and the power factor 0.71. Also find the apparent power. (8)

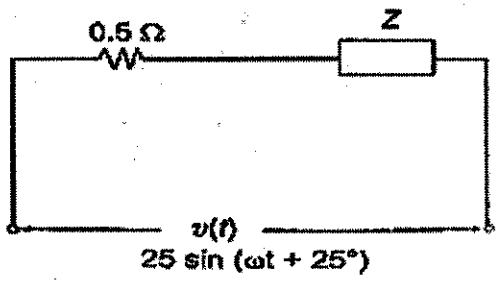


Figure.2

(OR)

b) Write the node voltage equations and determine the currents I_1, I_3, I_5, and I_{10} for the circuit shown in Figure.6. (16)

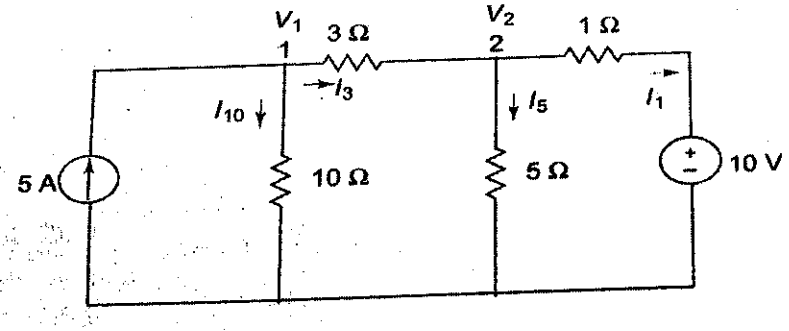


Figure.6

12. a) Determine the Star – Delta and Delta – Star equivalent parameters with circuit diagrams. (16)

(OR)

b) Find the Thevinin's and Norton's equivalents for the circuit shown in Figure.7 with respect to terminal ab. (16)

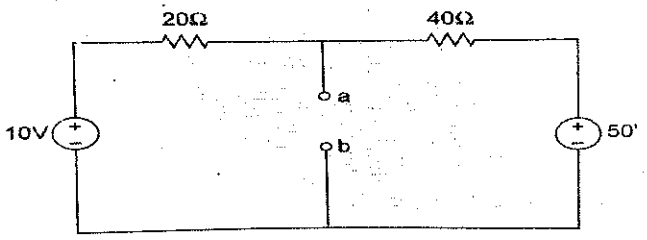


Figure.7.

13. a) i) For the circuit shown in Figure.8, determine (8)

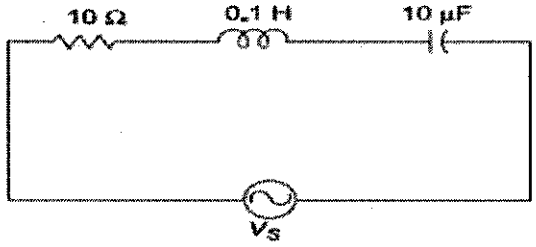


Figure.8

1. the impedance at resonant frequency
2. band width
3. Q factor.
4. Half power frequencies

ii) Determine the quality factor of the coil for the series circuit consisting of R = 10 Ω, L = 0.1 H and C = 10μF. Also find impedance and power factor. (8)

(OR)

b) i) Deduce the resonant frequency equation for a parallel RLC circuit. (8)

ii) For the single tuned circuit shown in Figure.9, determine (8)

1. Resonant frequency
2. The output voltage at resonant
3. The maximum output voltage.
4. Assume $R_s >> wrL_1$ and K = 0.9

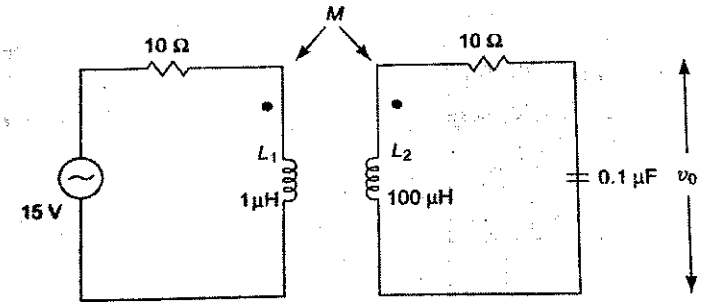


Figure.9

14. a) For the RC circuit shown in Figure.10, find the current transient hen the switch I closed at t = 0. (16)

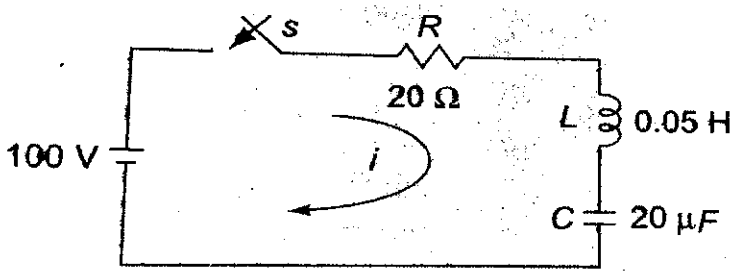


Figure.10

(OR)

b) Illustrate the transient response of R-L circuit for a sinusoidal input and obtain the solution for the current. (16)

15. a) A three phase delta connected RYB system with an effective voltage of 400 V, has a balanced load with impedance 3+j4 Ω. Calculate (16)

1) Phase currents
2) Line currents
3) Power factor
4) Power in each phase

(OR)

b) Explain two watt meter method of power measurement in three phase circuit with a circuit (star or Delta) and prove sum of the two watt meter power is equal to the 3 phase power with phasor diagram. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEH103 – Electric and Hybrid Vehicle Technology

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the parameters that can describe the vehicle performance?
2. Identify the importance of hybrid vehicles over electric vehicles.
3. State the various types of hybrid drive systems.
4. How does the power flow in electrical vehicle drive?
5. List six major components of a BEV.
6. How do you calculate efficiency of an electrical drive system efficiency?
7. State the significance of storage devices in plug-in hybrid vehicles.
8. Write your views on the size of power electronic devices used in EVs.
9. What is energy management system in electric vehicle?
10. What are the challenges expected while implementing energy management strategies in hybrid electric vehicles?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Elaborate on the history of electric vehicles in India and share your views on why, in recent days, it has been an emerging topic.	(10)
		ii)	State the factors that can influence the selection of batteries for EVs.	(6)
			(OR)	
	b)	i)	Discuss the social importance of hybrid vehicles in India and state your views on them.	(10)
		ii)	Briefly describe the transmission characteristics of EVs.	(6)
12.	a)		Analyze how you can do the fuel efficiency analysis on hybrid vehicles and identify their needs in the present scenario.	(16)
			(OR)	

b) Examine how power flow control is effectively done in the hybrid drive-train with the help of suitable diagrams. State your views on the present challenges involved. (16)

13. a) Discuss how you can select the drives for electrical vehicles, whether AC or DC, with proper justification in terms of performance characteristics. (16)

(OR)

b) Explain the working of a switched reluctance motor drive with a neat sketch and discuss its torque-speed characteristics. (16)

14. a) Analyze how energy storage devices contribute to the overall efficiency and performance of electric vehicles and briefly describe how they are integrated into EV drivetrains. (16)

(OR)

b) Examine the integration of an internal combustion engine with electrical drives in hybrid vehicles with a suitable configuration diagram. State the present challenges involved in it. (16)

15. a) Describe the rule-based and optimization-based energy management strategies for electric vehicles and make a performance comparison with suitable examples. (16)

(OR)

b) Elaborate on your understanding of the deep-reinforced learning strategy of energy management and describe their performance with dynamic programming. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEH106 – Solar Power Plants

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define a power plant.
2. Explain the main feature of a solar power plant.
3. What is a vapour cycle in solar power systems?
4. Mention advantages of binary cycles over conventional cycles.
5. Define a solar receiver.
6. Explain hybrid solar thermal system.
7. Name the international organization promoting photovoltaic (PV) power.
8. What is the role of power electronics in solar PV systems?
9. List out the two common methods of fixing power tariffs.
10. How is the payback period calculated?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Classify the power plants based on the source of energy, Explain briefly with suitable examples. (16)

(OR)

b) Discuss the selection criteria for choosing the type and location of a power plant. (16)

12. a) Explain the Organic Cycle, its components and its advantages for low-temperature solar applications. (16)

(OR)

b) Compare the Ericsson cycle with the Brayton cycle, highlighting their differences in efficiency and operation. (16)

13. a) Describe the process of energy transfer in a solar thermal power plant and its integration with power cycles. (16)

(OR)

b) Explain about the working principle of a solar chimney with a suitable diagram. (16)

14. a) Compare the advantages and limitations of photovoltaic power systems over other renewable energy sources. (16)

(OR)

b) Mention the factors affecting the electrical performance of solar PV systems and methods to optimize it. (16)

15. a) Illustrate the factors affecting the economy of a power plant and explain methods to calculate it. (16)

(OR)

b) Discuss the trends shaping the future of power plants with a focus on renewable energy integration. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEH204 – Introduction to Machine Learning

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define task and experience.
2. How do you define the performance of a machine?
3. How does the candidate elimination algorithm handle noise in the data?
4. What is the role of prior knowledge in concept learning?
5. What are nodes and leaves in a decision tree?
6. How does pruning help to address overfitting in decision trees?
7. What is a neuron in the context of artificial neural networks?
8. What is the backpropagation algorithm?
9. Define prior probability and posterior probability.
10. What is the VC dimension?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What is machine learning? List the types of machine learning and explain each one of them. (16)

(OR)

b) Define Hypothesis. How does a hypothesis work? Explain with a neat sketch. (16)

12. a) Explain in detail about supervised and unsupervised learning. Compare and contrast the differences between them. (16)

(OR)

b) Explain the role of inductive bias in machine learning algorithms. Discuss different types of inductive bias and their implications. (16)

13. a) Define and explain the core principle of information gain used by ID3 for selecting the best attribute to split the data at each node. (16)

(OR)

b) Discuss the key issues that can arise in decision tree learning and explain how these issues can impact the accuracy and generalization ability of the learned decision tree. (16)

14. a) Explain the biological inspiration behind artificial neural networks. Discuss the key components of a biological neuron and how they are modeled in artificial neurons? (16)

(OR)

b) Compare and contrast different types of neural networks and discuss their applications. (16)

15. a) Derive the formula for Bayes' Theorem and differentiate between Bayes' Theorem and Conditional Probability (16)

(OR)

b) Discuss the underlying probabilistic assumptions and explain how the Naive Bayes classifier works for both categorical and continuous features and discuss its limitations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE31 – Applied Hydraulics and Pneumatics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Name the three popular types of positive displacement pumps.
2. List the types of fire-resistant fluids used for fluid power systems.
3. What is a double-rod cylinder? When it is normally used?
4. Classify hydraulic motors.
5. What is a fail-safe circuit?
6. What is meant by an air-over oil system?
7. Name three reasons for considering the use of pneumatics instead of hydraulics.
8. Why air leaks into the atmosphere from a pneumatic system is often ignored?
9. List any four types of faults and causes of a hydraulic system breakdown.
10. List a few low-cost automation applications.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A pump has a displacement volume of 100 cm^3. It delivers 0.0015 m^3/s at 1000 rpm and 70 bars. If the prime mover input torque is 150 Nm, (8)

    1. What is the overall efficiency?
    2. What is the theoretical torque required to operate the pump?

    ii) Comment on the relative comparison in performance among the gear, vane, and piston pumps. (8)

(OR)

b) i) An oil of specific gravity 0.9 and viscosity, 0.0001 m^2/s flows at a rate of 0.002 m^3/s through a 20 mm diameter commercial steel pipe. What is the equivalent length of a 20 mm wide open gate valve placed in the line? (8)

ii) Comment on the selection of a pump for a specific application. (8)

12. a) i) Explain the functioning of a proportional control valve with a neat sketch. (8)

ii) Explain the working of the Telescopic cylinder with a neat sketch. (8)

(OR)

b) i) Explain the significance and design aspects associated with a hydraulic reservoir. (8)

ii) With a neat sketch explain the operations of a pressure-reducing valve. Sketch its graphical symbol. (8)

13. a) i) Construct a regenerative circuit and explain. (8)

ii) What is an accumulator? Explain any two types in detail. (8)

(OR)

b) i) Construct a double pump hydraulic circuit employed in a punching press and explain how it functions. (8)

ii) List the applications of an accumulator in hydraulic circuits and explain any two of them. (8)

14. a) i) Explain the ladder logic diagram with an example. (8)

ii) Explain the working of the Quick exhaust valve with a neat sketch. (8)

(OR)

b) i) Develop a Pneumatic circuit for A + B + B – A - sequence using the cascade method. (8)

ii) Explain the principle of working in a FRL unit with a neat sketch. (8)

15. a) i) Sketch and explain the function of a hydraulic circuit for a surface grinding machine. (8)

ii) Explain the troubleshooting to be carried out in a pneumatic system. (8)

(OR)

b) i) Sketch and explain the function of a pneumatic circuit for pick and place applications. (8)

ii) Explain the troubleshooting to be carried out in a hydraulic system. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI,VII & VIII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE32 – Professional Ethics and Human Values

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between 'morality' and 'ethics'.
2. What are the factors that shape self-confidence in a person?
3. Differentiate 'Kohlberg and Gilligan theory' of moral development.
4. List the uses of ethical theories.
5. What are the elements that should make an engineer a responsible experimenter?
6. Distinguish between the codes of ethics and codes of conduct.
7. Compare 'safety' and 'risk'.
8. Differentiate between 'Patent' and 'Trade secret'.
9. What are the duties of an engineer as an experimenter, in environmental ethics?
10. Define the concept of 'moral leadership'.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Analyze the role of integrity in work ethics with suitable examples.	(8)
		ii)	Illustrate the necessity for adherence to civic virtues.	(8)
			(OR)	
	b)	i)	Enumerate some important human values.	(8)
		ii)	Analyse the role of empathy in the spiritual development for excellence in an organization.	(8)
12.	a)		Discuss different approaches to moral decision-making.	(16)
			(OR)	
	b)		Compare and contrast the ethical theories.	(16)
13.	a)	i)	Explain the importance of Moral responsibility.	(8)
		ii)	Illustrate the importance of learning from the past taking the Titanic disaster is an example.	(8)
			(OR)	

b) i) Enumerate the models of research ethics with suitable examples. (8)

ii) Explain the outcomes of the challenger case study. (8)

14. a) Explain the Bhopal gas tragedy. Discuss the violation of moral, ethical, and professional codes of standards in it. Write a conclusion to avoid such a tragedy in the future. (16)

(OR)

b) Illustrate with example how IPR provides security to the manufacturing and selling of a product. (16)

15. a) i) Explain how engineers should act as managers and its Importance. (8)

ii) Analyse the ethical issues involved in the use of Computer Technology. (8)

(OR)

b) i) Analyze the ethical role of engineers in weapon development. (8)

ii) Illustrate the importance of a code of conduct in the current scenario. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE504 - Design of Reinforced Concrete Elements

(IS 456 -2000 and Design Charts from SP-16 are Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the different types of loads that have to be considered in the design of a building?
2. Define characteristic strength of material.
3. Why it is necessary to provide transverse reinforcement in one way slab?
4. Write short note on doubly reinforced section.
5. Define development length.
6. What you mean by diagonal tension?
7. According to IS code all the columns shall be designed for minimum eccentricity. Justify.
8. Describe about the function of the traverse reinforcements in a Reinforced Concrete Column.
9. List out the different types of Footing.
10. Write the classification of Staircases based on structural behavior.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the merits and demerits of the Working Stress Method and Ultimate Load Method for design of Reinforced Concrete Structures. (16)

(OR)

b) Determine the design stress level at ultimate limit state in Fe 250, Fe 415 and Fe 500 grade steel corresponding to tensile strains of 0.001, 0.002, 0.003 and 0.004. (16)

12. a) A rectangular beam is to be simply supported on supports of 230 mm thick. The clear span of the beam is 6 m. The beam is to have a width of 300 mm. The characteristic super imposed load is 12 KN/m. Using M 20 Grade concrete and Fe 415 steel, design the beam. Adopt limit state design method. (16)

(OR)

b) Design a two way slab for an office floor size 3.5 m x 4.5 m with discontinuous and simply supported edges on all the sides with the corners prevented from lifting and supporting a service live load of 4 kN/m². Adopt M 20 Grade concrete and Fe 415 steel bars. (16)

13. a) Determine the reinforcement required for a rectangular beam section for the following data. (16)

Size of the beam = 300 mm X 500 mm,
Factored Moment = 80 KNm,
Factored Torsion = 40 KNm,
Factored Shear force = 70 KN.

Use M 25 Grade concrete and Fe 500 steel.

(OR)

b) How does the shear span influence the mode of shear failure? Explain (16)

14. a) Determine the ultimate load carrying capacity of a circular reinforced concrete column of 300 mm diameter reinforced with 6 nos. of 20 mm diameter bars as longitudinal reinforcement. The column is provided with 8 mm diameter helical reinforcement at a pitch of 50 mm with a clear cover of 40 mm to the longitudinal reinforcement. Adopt M 20 concrete and Fe 415 steel bars. (16)

(OR)

b) A reinforced concrete short rectangular column is of 350 mm X 500 mm in size. Determine the reinforcement required for the column to support an ultimate load of 1500 kN with an ultimate moment of 100 kNm about x axis and 80 kNm about y axis. Assume the unsupported length of the column about both the axes as 5 m. Use M 25 Grade concrete and Fe 500 steel. (16)

15. a) A square column of size 400 mm carries a service load of 600 kN. Design an isolated footing for the column by limit state method, if the safe bearing capacity of the soil is 250 kN/m². Adopt M 20 Grade concrete and Fe 415 steel bars. (16)

(OR)

b) Design a Reinforced Concrete footing for masonry wall of 230 mm thick to support a working load of 200 km/m. Assume the Safe Bearing Capacity of the soil as 200 kN/m². Use M 25 Grade concrete and Fe 500 steel. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC504 – Computer Networks

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Which layer implements the node to node channel connection in OSI layered architecture?
2. What are the two approaches of packet switching?
3. Outline the services provided by the Data link layer.
4. What are the three different configuration supported by HDLC?
5. Change the following IPv4 addresses from binary notation to dotted-decimal notation.
   i) 10000001 00001011 00001011 11101111
   ii) 11000001 10000011 00011011 11111111
6. Determine the two major mechanisms defined to help transition from IPv4 to IPv6.
7. What are the responsibilities of Transport Layer?
8. List the flag used in TCP header.
9. How would you express URL?
10. What are the four firewall rules?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw the OSI network architecture and explain the functionalities of every layer in detail. (10)

    ii) Briefly explain the different types of packet switching techniques with suitable networks. Write each of its advantages and disadvantages. (6)

(OR)

    b) i) Explain in detail about the different phases of virtual Circuit networks. (10)

    ii) Discuss in detail about the guided media for transmission. (6)

12. a) i) Differentiate wired and wireless LANS using IEEE 802.3 and IEEE 802.11 standards. (8)

ii) Analyse the architecture of IEEE 802.11. (8)

(OR)

b) i) Suppose the following sequence of bits arrives over a link 110101111101011111100101111110110. Show the resulting frame after any stuffed bits have been removed .Indicates any errors that might have been introduced into the frame. (8)

ii) Interpret your understanding of bit-oriented protocol namely HDLC. (8)

13. a) i) Analyze the Link State algorithm in detail. (8)

ii) Consider the network shown in Figure.1. Compute the shortest path from C to all other nodes using Link-State algorithm. Also update the forwarding table of node C. (8)

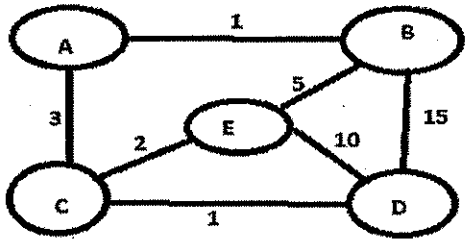


Figure.1

(OR)

b) Outline the key differences between IPv4 and IPv6 protocols. Discuss the motivations behind transitioning from IPv4 to IPv6 and highlight the advantages that IPv6 offers over IPv4 in terms of addressing, security and scalability. (16)

14. a) i) Draw a TCP state transition diagram for connection management. (8)

ii) The UDP header in hexadecimal format is as: 0632000D001CE217 (8)
Obtain the following from it:

1) Source port number
2) Destination port number
3) Total length
4) Length of the data.
5) Name of client process.

(OR)

b) i) How is congestion controlled? Explain in detail about congestion control mechanisms in transport layer. (8)

ii) If IP provides connectionless service. How TCP supports connection oriented service? (8)

15. a) i) Analyze the message format and the message transfer and the underlying protocol involved in the working of the electronics mail. (8)

ii) Explain in detail about HTTP operation. (8)

(OR)

b) i) Analyze the role of a DNS on a computer network with reference to its components. (8)

ii) Explain the WWW in detail. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I & II Semester (Full Time)

(2018 Regulations)

COMMON TO ALL BRANCHES

18ME101 – Engineering Graphics and Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the symbols of first angle and third angle projections.
2. What do you understand from the term orthographic projection?
3. What do you mean by right regular prism?
4. Define oblique plane.
5. Write few applications of development of surfaces.
6. When will you get the true shape of base in side view?
7. What is isometric scale?
8. Distinguish between isometric view and isometric projection.
9. What do you mean by station point in perspective projection?
10. Enumerative different methods of drawing perspective projections.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A line PQ measuring 60 mm is inclined to the HP at 30° and to the VP at 45° with the end P, 20 mm above the HP and 15 mm in front of the VP. Draw its projections. (16)

(OR)

b) A regular pentagon of 30 mm sides is resting on HP, on one of its sides with its surface 45° inclined to HP. Draw its projections when the side in HP makes 30° angle with VP? (16)

12. a) A cone with 50 mm base diameter and the axis length of 65 mm has one of its generators in the VP and inclined at 30° to HP. Draw the projections of the cone. (16)

(OR)

b) A cylinder of diameter 30 mm axis length 50 mm is resting on the HP on a point so that its axis is inclined at 45° to the HP and parallel to the VP. Draw its top view and front view. (16)

13. a) A hexagonal prism of base 30 mm and axis 65 mm is resting on HP on its base with two of its vertical faces perpendicular to VP. The solid is cut by a plane that is perpendicular to VP, inclined at 50° to HP and passing through a point at a distance of 15 mm from the top end. Draw the development of the lateral surface of the prism. (16)

(OR)

b) A cylinder with a base diameter of 50 mm and height 65 mm rests on its base on HP. It is cut by a plane perpendicular to VP and inclined at 30° to HP and meets the axis at a distance of 30 mm from the base. Draw the front view, sectional top view, and true shape of the section. (16)

14. a) A square pyramid of base size 40 mm and height 50 mm, rests centrally over a cube of edge 50 mm, which itself is placed on a cylinder of diameter 80 mm and thickness 30 mm. Draw the isometric projection of the combination of solids, if the axis of the three solids are in common line. (16)

(OR)

b) The hexagonal prism edge of base 30 mm and axis 70 mm long rests with one of its rectangular faces on HP and axis perpendicular to VP. It is cut by a plane perpendicular to HP and inclined at 30° to VP bisecting the axis. Draw the isometric projection of one part of the prism showing the section. (16)

15. a) A square pyramid of side of base 30 mm and height 50 mm rests on the ground with an edge of base inclined at 30° to the picture plane and the nearest corner 20 mm within the picture plane. The station point is on the central plane passing through the apex of pyramid and is located 50 mm in front of the picture plane and 60 mm above the ground. Draw the perspective view of the pyramid. (16)

(OR)

b) A cylinder 50 mm in diameter and 70 mm long rests on the ground plane with its axis horizontal. The front end of the axis is 20 mm from the picture plane and 20 mm to the left of the eye. The axis recedes to the right at an angle of 45°. The eye is 60 mm from the picture plane and 40 mm from the ground plane. Draw the perspective of the cylinder. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME502 – Instrumentation and control

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What do you mean by static calibration?
2. Classify transducers.
3. What are A/D converters? Give their application.
4. Point out the function of choppers.
5. List the elements of data acquisition and control.
6. What is data logging? Give examples.
7. What are static error coefficients?
8. List the type of inputs used to evaluate steady-state errors.
9. Identify the need for frequency response analysis.
10. What is a Bode plot? When it is used?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Analyze the different types of errors in measurements and measuring instruments. (8)

ii) Explain how displacement can be measured with the help of an inductive and capacitive transducer. Give the essential features of the construction of these two types of electrical transducers. (8)

(OR)

b) i) Analyze the response of a first-order system when subject to step input signal. (8)

ii) Distinguish between the following (8)

a) Accuracy and Precision b) Resolution and Threshold

c) Reproducibility and Repeatability d) Dead zone and Hysteresis.

12. a) i) How a Wheatstone bridge circuit is used for the measurement of strain. Explain the working of a null balance Wheatstone bridge circuit. (8)

ii) Analyze the amplifier characteristics. (8)

(OR)

b) i) Explain the principles of A/D and D/A conversion with examples. (8)

ii) Analyze the conversion concepts and methods in signal conditioning. (8)

13. a) i) Elaborate data acquisition and control system with a block diagram. (8)

ii) Analyze the single and multi-channel data acquisition systems. (8)

(OR)

b) i) Discuss the concept, benefits, and applications of digital transmission systems. (8)

ii) Analyze the data acquisition interface requirements. (8)

14. a) i) Explain the determination of a closed loop response from an open loop response with an example. (8)

ii) Analyze the response of systems for different time-based inputs. (8)

(OR)

b) i) Explain the different types of feedback control systems. (8)

ii) Analyze the steady state errors due to impulse and step. (8)

15. a) i) Draw the Bode plot for the transfer function (12)
$G(s) = 10/(s\,(1+0.5s)\,(1+0.1s))$.

ii) Write notes on Resonant peak frequency domain specification. (4)

(OR)

b) i) Draw the Polar plot for the open-loop transfer function of a closed-loop control system is represented as (12)
$G(s)\,H(s) = 5/\,((s(s+1)\,(s+2))$.

ii) Write notes on Bandwidth frequency domain specification. (4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MEOE04 – Principles of Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Is management considered an art or a science? Justify your answer.
2. Differentiate between management and administration.
3. List the important functions of management.
4. Mention three responsibilities of managers towards subordinates.
5. Define the term "goal distortions" and provide an example.
6. How do quantitative techniques contribute to decision making in management? Give an example.
7. Define organization as a structure and as a process.
8. What is a matrix organization structure and when is it typically used?
9. List the sources of recruitment commonly utilized by organizations.
10. What is the importance of repairing in the context of controlling?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the main features of management and explain their significance in organizational functioning. (8)

ii) Explain the principles of administrative management proposed by Henri Fayol. How do these principles guide managerial decision-making and organizational performance? (8)

(OR)

b) i) Discuss the evolution of management thought, focusing on the different schools of management thinking and their contributions to modern management practices. (8)

ii) Describe the principles of scientific management proposed by Frederick Taylor. (8)

12. a) i) Compare the roles and responsibilities of top-level, middle-level and front-line managers within an organization. (10)

ii) Explain how the managers reconcile their various functions and roles to lead diverse teams towards achieving organizational goals. (6)

(OR)

b) i) Describe the challenges managers may face in balancing their responsibilities towards subordinates, peers and supervisors. Suggest strategies to overcome these challenges. (10)

ii) Explain the significance of organizational structure in the organizing function of management. Provide examples to support your explanation. (6)

13. a) i) Explain the major types of planning used in organizations. Compare strategic planning, tactical planning and operational planning with examples. (10)

ii) Describe the decision-making process in organizations. What are the key steps involved? (6)

(OR)

b) i) Describe the components of a decision tree. How can decision trees be used to analyze uncertain situations and make optimal decisions? Provide a step-by-step example. (10)

ii) Explain the importance of budgets and the steps involved in the budgeting process. (6)

14. a) i) Compare different types of business/industrial organizations, including sole trading, partnership, company, cooperative, and public enterprise. Explain their respective advantages and disadvantages. (10)

ii) Explain the group properties of modern organizations and their significance in organizational dynamics and effectiveness. (6)

(OR)

b) i) Discuss the concept of functional organization. How does it enhance specialization and efficiency in organizational operations? Provide examples to illustrate your points. (10)

ii) Explain the organizational structure of line organizations commonly found in military settings. (6)

15. a) i) Explain the aims and objectives of HR recruitment in organizations. How do these objectives align with the broader goals of the organization? (10)

ii) Explain the aims and objectives of HR recruitment in organizations. How do these objectives align with the broader goals of the organization? (6)

(OR)

b) i) Explain the essential characteristics and different types of control mechanisms used in organizations. Describe the various requirements of effective control system. (10)

ii) Explain different performance appraisal methods used in organizations. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME303 – Thermodynamics

(Psychometric Chart or Steam Tables to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the conditions for attaining a state of thermodynamic equilibrium.
2. Differentiate between point function and path function.
3. Write the processes involved in Carnot cycle.
4. A reversible heat engine operates between a source at 727°C and sink at 27°C. What is the least rate of heat rejection per KW network output of the engine?
5. Draw the standard Rankine cycle on P-V and T-S coordinates.
6. Discuss latent heat of vaporization.
7. Write Maxwell relations.
8. Differentiate between an ideal and a perfect gas.
9. List the difference between air conditioning and refrigeration.
10. Draw sensible heating and cooling process in a psychometric chart.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Air at 4 bar, 0.2 m^3 of and 130°C is contained in a system. A reversible adiabatic expansion takes place till the pressure falls to 1.02 bar. The gas is then heated at constant pressure till enthalpy increases by 72.5 kJ. Calculate: (i) The work done; (ii) The index of expansion, if the above processes are replaced by a single reversible polytropic process giving the same work between the same initial and final states. Take C_p = 1 kJ/kg K, C_v = 0.714 kJ/kg K (16)

(OR)

b) Air at 1.02 bar, 22°C, initially occupying a cylinder volume of 0.015 m^3, is compressed reversibly and adiabatically by a piston to a pressure of 6.8 bar. Calculate: (16)

1) The final temperature

2) The final volume

3) The work done

12. a) A Carnot engine takes heat from an infinite reservoir at 550°C and rejects it to a sink 275°C. Half of the work delivered by the engine is used to run generator and the other half is used to run heat pump which takes heat at 275°C and rejects it at 440°C. Express the heat rejected at 440°C by the heat pump as % of heat supplied to the engine at 550°C. If the operation of the generator is 500 W, Find the heat rejected/hour by the heat pump at 440°C? (16)

(OR)

b) A fluid undergoes a reversible adiabatic compression from 4 bar, 0.3 m^3 to 0.08 m^3 according to the law, $pv^{1.25}$ = constant. Determine (16)

i) Change in enthalpy

ii) Change in internal energy

iii) Change in entropy

iv) Heat transfer

v) Work transfer

13. a) A vessel having a capacity of 0.05 m^3 contains a mixture of saturated water and saturated steam at a temperature of 245°C. The mass of the liquid present is 10 kg. Find the following : (16)

i) The pressure

ii) The mass

iii) The specific volume

iv) The specific enthalpy

v) The specific entropy

vi) The specific internal energy.

(OR)

b) Steam initially at 400 Kpa and 0.6 dry is heated in a rigid vessel of 0.1 m^3 volume. The final condition is 600 Kpa. Find the amount of heat added, final condition and mass of steam. (16)

14. a) Derive Joule-Thomson coefficient equation. And discuss why it is zero for ideal gas. (16)

(OR)

b) A vessel of 1.8 m^3 capacity contains oxygen at 8 bar and 50°C. The vessel is connected to another vessel of 3.6 m^3 capacity containing carbon monoxide at 1 bar and 20°C. A connecting valve is opened and the gases mix adiabatically. Calculate : (16)

(i) The final temperature and pressure of the mixture ;

(ii) The change of entropy of the system. Take : For oxygen Cv = 21.07 kJ/mole K. For carbon monoxide Cv =20.86 kJ/mole K.

15. a) Give short notes on following (16)

1) Specific humidity

2) Relative humidity

3) Dew point temperature

4) Wet bulb depression

(OR)

b) Air has a dry bulb temperature of 250°C and wet bulb- temperature of 150°C. If the barometer reads 1bar, Calculate (16)

1) Vapour pressure

2) Specific humidity

3) Saturation ratio

4) Relative humidity

5) Dew point temperature

6) Vapour density

7) Enthalpy of mixture

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME603 – Design of Machine Elements

(Use of approval design data book is permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the methods used to improve fatigue strength?
2. A component is loaded with normal and shear stresses as σ_x = 15 MPa ; σ_y = 5 MPa; and τ_{xy} = 10 MPa. Find the maximum shear stress developed in the component.
3. What is the difference between spindle and axle?
4. Differentiate between rigid and flexible couplings.
5. State the advantages of the welded joints.
6. What is preloading of bolts?
7. What are the forces acting on connecting rod?
8. What is nipping of leaf spring?
9. What is the limitation of Mckees equation?
10. What situations demand the use of needle roller bearings?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A hollow shaft of 40 mm outer diameter and 25 mm inner diameter is subjected to a twisting moment of 120 N-m, simultaneously; it is subjected to an axial thrust of 10 kN and a bending moment of 80 N-m. Calculate the maximum compressive and shear stresses. (16)

(OR)

b) A machine component is subjected to a flexural stress which fluctuates between + 300 MN/m^2 and –150 MN/m^2. Determine the value of minimum ultimate strength according to 1) Gerber relation; 2) Modified Goodman relation; and 3) Soderberg's relation. Take yield strength = (0.55 times Ultimate strength); Endurance strength = (0.5 times Ultimate strength); and factor of safety = 2. (16)

12. a) A shaft is to transmit 50 kW at 1200 rpm. It is also subjected to a bending moment of 275 N-m. Allowable shear stress is 60 N/mm^2. The shaft is not to twist more than 2° in a length of 2 m. G = 80 x 103 N/mm^2. Design the shaft. (16)

(OR)

b) A Knuckle joint is to transmit a force of 140 kN. Allowable stresses in tension, shear and compression are 75 N/sq.mm, 65 N/sq.mm and 140 N/sq.mm respectively. Design the joint. (16)

13. a) An electric motor weighing 5 kN is to be lifted by eye - bolt, which has been screwed into the body of the motor. Design the eye - bolt, assuming suitable proportions, if the permissible stresses for the bolt material are 60 MPa, 30 Mpa and 80 MPa in tension, shear and crushing respectively. (16)

(OR)

b) A circular rod 45 mm diameter and 210 mm long is welded to a steel plate with axis of the rod perpendicular to the plate. The rod is subjected to a load of 10 kN at the free end, the direction of the load being perpendicular to the axis of the rod. The material of the plate & the rod are Mild Steel. Determine the size of the weld to withstand the loading. (16)

14. a) Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, G = 84 kN/mm^2. Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring, showing details of the finish of the end coils. (16)

(OR)

b) A rimmed flywheel made of grey cast iron (mass density = 7100 kg/m^3) is used on a punching press running at a mean speed of 200 rpm. The punching operation consists of one quarter revolution during which the flywheel is required to supply 3000 Nm of energy. The coefficient of speed fluctuations is limited to 0.2. The rim, which contributes 90 % of the required moment of inertia, has a mean radius of 0.5 m due to space limitations. The cross-section of the rim is square. Determine its dimensions. (16)

15. a) Design a journal bearing for a centrifugal pump from the following data: Load on the journal = 20000 N; Speed of the journal = 900 rpm; Type of oil is SAE 10, for which the absolute viscosity at 55°C = 0.017 kg/m-s; Ambient temperature of oil = 15.5°C; Maximum bearing pressure for the pump = 1.5 N / mm^2. Calculate also mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C. Heat dissipation coefficient = 1232 $W/m^2/°C$ (16)

(OR)

b) A lever loaded safety valve is 70 mm in diameter and is to be designed for a boiler to blow-off at pressure of 1 N/mm^2 gauge. Design a suitable mild steel lever of rectangular cross-section using the following permissible stresses: Tensile stress = 70 MPa; Shear stress = 50 MPa; Bearing pressure intensity = 25 N/mm^2. The pin is also made of mild steel. The distance from the fulcrum to the weight of the lever is 880 mm and the distance between the fulcrum and pin connecting the valve spindle links to the lever is 80 mm. (16)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18CM201 – Basic Civil and Mechanical Engineering

Time : 3 Hours | Maximum Marks : 100

Part - I (4 x 2 = 8 Marks)

Basic Civil Engineering

Part A

Answer ALL Questions

1. Define Hooke's law.
2. What are the qualities of good brick?
3. List any four uses of a dam.
4. Differentiate between shallow and deep foundation.

Part B (2 x 16 = 32 Marks)

Answer ALL Questions

5. a) i) Draw and explain the salient points in stress-strain curve of steel. (8)

   ii) Briefly explain any two mechanical properties of materials. (8)

   (OR)

   b) i) State the various constituents of concrete and its uses. (8)

   ii) State and explain the objectives, principles and classification of surveying. (8)

6. a) Elaborately discuss the points to be considered while selecting a site for construction of dam. (16)

   (OR)

   b) Explain the following terms: (16)

   1) Beam
   2) Lintel
   3) Roofing and flooring
   4) Plastering

Part - II (6 x 2 = 12 Marks)

Basic Mechanical Engineering

Part A
Answer ALL Questions

7. How boilers are classified?
8. Write the working principle of a reciprocating pump.
9. List the components of an IC engine.
10. Write the applications of petrol engines.
11. Mention the components of a vapor compression refrigeration system.
12. Explain the working principle of an air conditioning system.

Part B (3 X 16 = 48 Marks)

Answer ALL Questions

13. a) i) Explain the working of a Cochran boiler with neat sketch. (10)

ii) Differentiate between boiler accessories and mountings with examples. (6)

(OR)

b) i) Explain the working principle of a double acting reciprocating pump with neat sketch. (10)

ii) Give an example for a reaction turbine and explain its working principle. (6)

14. a) i) List the terminologies associated with IC engines and describe any five of them. (10)

ii) Make a comparison between petrol and diesel engines. (6)

(OR)

b) i) Explain the working of a two stroke petrol engine with a neat sketch. (10)

ii) Make a comparison between two stroke and four stroke engines. (6)

15. a) i) List the terminologies associated with a refrigeration and air conditioning system and describe any five of them. (10)

ii) List the properties required for a good refrigerant and describe any three of them. (6)

(OR)

b) i) Explain the working principle of a vapour compression refrigeration system with neat sketch. (10)

ii) Explain the components of a split type air conditioner with a neat sketch. (6)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE36 – Refrigeration and Air Conditioning

(Use of steam tables, Refrigerant property tables are permitted in the examination)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Unit of Refrigeration.
2. What properties should a good refrigerant have following?
3. List the different methods of improving the COP of simple vapour compression.
4. What is the principle of vapour compression refrigeration system?
5. State the advantages and limitations of vapour absorption refrigeration system.
6. What are the various methods of air refrigeration used for aircraft?
7. When Gibbs Dalton law applied to the mixture of gases?
8. Define specific humidity.
9. Give the different heat loads to be considered for the evaluation of a cooling load of a given room.
10. What is the purpose of ventilation in air-conditioning system?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Difference between a refrigerator and heat pump. (6)

ii) Explain the working of a Reversed Carnot cycle of refrigeration with P-V and T-S Diagrams. (10)

(OR)

b) i) Write short notes on practical applications of refrigeration. (6)

ii) An air refrigerator used for food storage provides 50 tons of refrigeration. The temperature of air entering the compressor is 7° C and the temperature before entering into expander is 27° C .Assuming 30 % more power is required than theoretical, find (a).Actual C.O.P of the cycle (b).KW capacity required to run the compressor. (10)

12. a) Vapour compression refrigerator works between the pressure limits of 60 bar and 25 bar. The working fluid is just dry at the end of compression and there is no under cooling of the liquid before the expansion valve. Determine (i) C.O.P of the cycle (ii) Capacity of the refrigerator if the fluid flow is at the rate of 5 kg/min. (16)

Pressure Bar	Temperature °C	Enthalpy kJ/kg		Entropy kJ/kg K	
		Liquid	Vapour	Liquid	Vapour
60	295	151.96	293.29	0.554	1.0332
25	261	56.32	322.58	0.226	1.2464

(OR)

b) Sketch and explain a two-stage cascade refrigeration system. (16)

13. a) i) Describe the working of a vapour absorption refrigeration system with the help of a neat sketch. (8)

ii) Explain with help of a neat sketch, the working of a steam jet refrigeration system. (8)

(OR)

b) i) Explain the working principle of pulse tube refrigeration system with a neat sketch and state its applications. (8)

ii) Explain the working principle and operation of thermoelectric refrigerator. (8)

14. a) The sling psychrometer in a loboratory test recorded the following readings. (16)

Dry bulb temperature = 35 °C

Wet bulb temperature = 25 °C

Calculate the following i) specific humidity ii) relative humidity iii) vopour density in air iv) dew point temperature v) enthalpy of mixture per kg of dry air. Take atmospheric pressure = 1.0132 bar.

(OR)

b) Room air at 20 °C DBT and 50 % RH is mixed with outdoor air at 40 °C and 30 % RH in the ratio of 4:1. The mixture is passed through a cooling coil whose temperature is maintained constant at 10 °C whose by-pass factor is 0.2. Determine the following i) condition of air before entering the coil ii) condition of air leaving the coil iii) refrigeration load on the cooling coil when 250 m^3/min of air is supplied to the room. (16)

15. a) What is meant by infiltration and explain air change and crack length method in detail? (16)

(OR)

b) Explain the various types of air distribution systems with a neat sketch. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE402 – Transmission and Distribution

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Why high voltages are preferred for power transmission?
2. Mention the highest EHV AC transmission voltage level in India.
3. Distinguish between mutual and self GMD.
4. Write the advantage of using bundled conductors for high voltage AC transmission.
5. List the significance of Surge Impedance Loading in transmission line.
6. Mention the need for voltage control in transmission line.
7. List the advantages of suspension type insulators.
8. Compare underground and overhead cables.
9. Differentiate earthing from grounding.
10. Classify the substation according to service.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw and explain the structure of electric power system. (8)

ii) Compare EHVAC and HVDC transmission. (8)

(OR)

b) i) Explain the technical merits of HVDC over EHVAC transmission. (8)

ii) Write short notes on restructured power system. (8)

12. a) i) Derive an expression for loop inductance of a single phase transmission system. (8)

ii) Determine the expression for the capacitance per phase of a three phase overhead transmission system when the conductors are symmetrically spaced. (8)

(OR)

b) i) Derive the flux linkages with conductor per phase and the inductance per phase of a three-phase overhead transmission system when the conductors are regularly transposed. (8)

ii) Write short notes on: (8)

a) Power lines interference with communication signals.

b) Skin and Proximity effect

13. a) i) Draw the phasor diagram of a short transmission line and derive an expression for voltage regulation and transmission efficiency. (8)

ii) Explain the performance of Nominal π method of medium transmission line. (8)

(OR)

b) i) Explain the performance of Nominal T method of medium transmission line. (8)

ii) Write short notes on: (8)

a) Voltage control in transmission lines

b) Ferranti effect

14. a) i) With neat diagram explain the methods of grading of cables. (8)

ii) Derive the expression for the capacitance of a single core cable. (8)

(OR)

b) i) Derive the expression for determining the voltage distribution in a string of suspension type insulator and calculate the string efficiency. (8)

ii) Write short notes on methods to improve string efficiency of an insulator. (8)

15. a) i) Draw the layout of the substation and explain the function of each equipment in the substation. (8)

ii) List the general requirements of a distribution system. (8)

(OR)

b) i) Explain in detail about the resistance and resonant grounding. (8)

ii) Explain the following systems of distribution: (8)

a) Radial

b) Ring main

c) Interconnected system

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE402 – Mechanics of Soils

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Show the relationship between void ratio and porosity.
2. How to find plasticity index of soil?
3. Point out the significance of effective stress with respect to ground water table.
4. Compare Boussinesq's theory with Westerguard's theory.
5. Indicate the parameters influencing permeability of soil.
6. Cite the condition to occur quick sand in soils.
7. State the importance of compaction.
8. Define compression index.
9. Specify the limitations of Mohr Coulomb's theory.
10. Differentiate drained and undrained shear strength test.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Illustrate the phase relationship of soils considering all variables with neat sketches. (16)

(OR)

b) i) Explain any two field tests used to identify type of soils. (8)

ii) A soil sample has a porosity of 40 %. The specific gravity of solids is 2.7. Calculate a) voids ratio b) Dry density c) Unit weight is the soil is 50 % saturated d) Unit weight if the soil is fully saturated. (8)

12. a) i) Outline the different types of soil water with its significance. (6)

ii) A uniform point load of 100 kN is applied on the surface of a soil at a depth of 3 m. Calculate the vertical stress at a point 2 m away from the load using the Boussinesq equation. Assume the soil has a Poisson's ratio of 0.3 and a modulus of elasticity of 50 MPa. (10)

(OR)

b) i) Explain the method of construction and applications of Newmark's influence chart. (8)

ii) Illustrate the concepts and applications of isobar. (8)

13. a) i) A laboratory permeability test is performed on a soil sample with a length of 40 cm and cross-sectional area of 10 cm^2. During the test, the flow of water through the soil is 200 ml in 5 minutes under a constant head of 30 cm. Calculate the coefficient of permeability (k) of the soil using Darcy's Law. (10)

ii) Draw the phreatic line for earth dam without filter at various slope conditions. (6)

(OR)

b) Illustrate the construction of flow net by graphical and electrical analogy methods with neat sketches. Also mention the suitable applications of flow net. (16)

14. a) i) The maximum dry density (MDD) is found to be 1.80 g/cm^3 at optimum moisture content (OMC) of 14 %, obtained from a standard proctor compaction test. Calculate the dry density of the soil when the moisture content is 12 %. Discuss the effect of moisture content on the compaction characteristics of the soil. (8)

ii) Explain the detailed steps involved in one-dimensional consolidation. (8)

(OR)

b) i) Express compactive energy imparted per unit volume of soil in light and heavy compaction test. (6)

ii) A 3 m thick clay layer in the field under a given surcharge will undergo 7 cm of total primary consolidation. If the first 4 cm of settlement takes 90 days, calculate the time required for the first 2 cm of settlement. (10)

15. a) Describe the principle and procedure involved in tri-axial compression test with neat sketch. (16)

(OR)

b) A soil sample is tested for shear strength using a direct shear test and the following data is obtained: (16)

Normal stress (σ) : 50 kPa, 100 kPa, and 150 kPa.

Shear stresses (τ) at failure : 25 kPa, 45 kPa, and 60 kPa.

Determine the cohesion (c) and the angle of shearing resistance (ϕ) of the soil using the Mohr-Coulomb failure criterion.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTMEE25 – Production Planning and Control

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the different types of ergonomic hazards and their effect on workers?
2. Mention the tools used in time study.
3. Define break even analysis.
4. How does the plant location affect environmental compliance and regulations?
5. Which type of material handling equipment is best for moving large volumes of materials over a long distance?
6. What are the relationship between plant layout and workflow efficiency?
7. List some advantage of ERP.
8. Enumerate the forecast errors.
9. What is the need for inventory?
10. Differentiate value analysis and value engineering.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Write short notes on the following work measurement techniques (16)
    i) PMTS
    ii) work sampling
    iii) Synthetic data
    iv) Performance rating.

(OR)

b) State and explain in brief the steps involved in conducting the method study procedure. (16)

12. a) A manufacturer sells an item for Rs.13 per unit. He incurs a fixed cost of Rs.60,000 and Variable cost of Rs.8 unit. Find the break even production quantity and also the number of units to be produced to get a profit of Rs.12,000. (16)

(OR)

b) What is the significance of Brown and Gibson model? Explain in detail with example. (16)

13. a) Discuss the major factors affecting the design of an efficient material handling system. How can these factors influence productivity and safety? (16)

(OR)

b) Explain briefly about the layout design procedures with an example. (16)

14. a) Discuss the main differences between qualitative and quantitative forecasting models. Provide examples of situations where each would be most effective. (16)

(OR)

b) Explain briefly about MRP I and MRP II with neat flowchart. (16)

15. a) Explain briefly about the procedure of process planning and design. (16)

(OR)

b) Explain how holding costs, ordering costs and demand rate impact EOQ with an example? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

II Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME201 – THERMAL ENGINEERING

(Use of standard thermodynamic tables, Mollier diagram, Psychometric chart and Refrigerant property tables is permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw an actual PV diagram of a four stroke engine.
2. Define Mean Effective Pressure.
3. What do you mean by valve overlapping period?
4. What is knocking in petrol engine?
5. Sketch the shapes of the nozzles.
6. State the reaction principles.
7. Brief the volumetric efficiency.
8. Write the advantages of inter-cooling in air compressors.
9. What is meant by sub-cooling in refrigeration? And give its significance.
10. Discuss the sensible heat factor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Derive the air standard efficiency of diesel cycle with PV and Ts diagram. (8)

ii) A gas engine working on the Otto cycle has a cylinder of diameter 200 mm and stroke 250 mm. The clearance volume is 1570 cc. Find the air-standard efficiency. Assume C_p = 1.004 kJ/kg K and C_v = 0.717 kJ/kg K for air. (8)

(OR)

b) i) In an Otto cycle air at 17°C and 1 bar is compressed adiabatically until the pressure is 15 bar. Heat is added at constant volume until the pressure rises to 40 bar. Calculate the air-standard efficiency, the compression ratio and the mean effective pressure for the cycle. Assume: Cv = 0.717 kJ/kg K and R = 8.314 kJ/kmol K. (8)

ii) Explain the Brayton cycle with pV and Ts diagram. (8)

12. a) i) Write the procedure for calculating the air - fuel ratio with an example. (10)

ii) Draw and brief the valve timing diagram of a four stroke petrol engine. (6)

(OR)

b) i) Discuss various types of lubrication system. (10)

ii) Draw the port timing of a two stroke petrol engine and explain the processes. (6)

13. a) Discuss the following governing of steam turbines with neat sketches (16)

1) Throttle governing

2) Nozzle control governing

3) By-pass governing.

(OR)

b) Explain the pressure compounding and velocity compounding of the turbines. (16)

14. a) A single stage double acting air compressor of 150 KW power takes air in at 16 bar & delivers at 6 bar. The compression follows the law $PV^{1.35} = C$. The compressor runs at 160 rpm with average piston speed of 150 m/min. Determine the size of the cylinder. (16)

(OR)

b) A single stage single acting reciprocating air compressor is required to handle 30 m^3 of free air per hour measured at 1 bar. the delivery pressure is 6.5 bar and the s peed is 450 rpm allowing volumetric efficiency of 75 % an isothermal efficiency of 76 % and mechanical efficiency of 80 % Find the indicated mean effective pressure and the power required the compressor. (16)

15. a) i) Explain simple vapour compression refrigeration cycle with T-s and P-h diagram. (8)

ii) On a particular day, the atmospheric air was found to have a dry bulb temperature of 30°C and a wet bulb temperature of 18°C. The barometric pressure was observed to be 756 mm of Hg. Using the tables of psychrometric properties of air, determinae the relative humidity, the specific humidity, the dew point temperature, the enthalpy of air per kg of dry air and the volume of mixture per kg of dry air. (8)

(OR)

b) i) Explain the aqua - ammonia vapour absorption system with a neat schematic diagram. (8)

ii) The humidity ratio of atmospheric air at 28°C dry bulb temperature and 760 mm of mercury is 0.016 kg / kg of dry air. Determine: (8)

1. partial pressure of Water vapour
2. relative humidity
3. dew point temperature
4. specific enthalpy and
5. vapour density.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME401 – Thermal Engineering

(Refrigeration table and Psychrometric chart to be permitted.)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the p-V and T-s diagram for Otto cycle.
2. The efficiency of an Otto cycle is 60% and $\gamma = 1.5$. What is the compression ratio?
3. Compare two stroke and four stroke engines.
4. Define knocking.
5. What is meant by supersaturated flow of nozzle?
6. Compare velocity and pressure compounding.
7. Distinguish reciprocating air compressor with centrifugal air compressor.
8. Define volumetric efficiency of reciprocating air compressor.
9. Define COP of a refrigerator.
10. What is meant by degree of subcooling?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The minimum pressure and temperature in an Otto cycle are 100 kPa and 27°C. The amount of heat added to the air per cycle is 1500 kJ/kg. (16)

    i) Determine the pressures and temperatures at all points of the air standard Otto cycle.

    ii) Also calculate the specific work and thermal efficiency of the cycle for a compression ratio of 8:1. Take for air: $C_v = 0.72$ kJ/kgK and $\gamma = 1.4$.

(OR)

b) Explain actual and theoretical p-V diagrams of four stroke engine with suitable sketch. (16)

12. a) Explain the battery coil ignition system with suitable diagram. Also compare coil ignition system and flywheel magneto. (16)

(OR)

b) The power output of an I.C. engine is measured by a rope brake dynamometer. The diameter of the brake pulley is 700 mm and the rope diameter is 25 mm. The load on the tight side of the rope is 50 kg mass and spring balance reads 50 N. The engine running at 900 r.p.m. consumes fuel of calorific value of 44000 kJ/kg, at a rate of 4 kg/h. Assume g = 9.81 m/s^2. Calculate (16)

1) Brake specific fuel consumption
2) Brake thermal efficiency and
3) Mechanical Efficiency.

13. a) Derive an expression for maximum discharge through convergent - divergent nozzle for steam. (16)

(OR)

b) In an impulse turbine, the steam enters the wheel through a nozzle with a velocity of 500 m/s and an angle of 20^0 to the direction of motion of blade. The blade speed is 200 m/s and the exit angle of the moving blade is 25^0. Find the inlet angle of moving blade, exit velocity of steam and its direction and work done per kg of steam. (16)

14. a) Derive the expression for volumetric efficiency for a reciprocating air compressor. Explain it using p-V diagram. (16)

(OR)

b) A single stage, single acting reciprocating air compressor has a bore of 200 mm and a stroke of 300 mm. It receives air at 1 bar and 20^0 C and delivers it at 5.5 bar. If the compression follows the law $pv^{1.3} = C$ and clearance volume is 5 percent of the stroke volume, determine i) mean effective pressure ii) the power required to drive the compressor, if it runs at 500 rpm. (16)

15. a) Explain the working principle of a vapour compression refrigeration system with suitable sketch. (16)

(OR)

b) Explain the working of central air conditioning with suitable sketch. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME304 – Manufacturing Technology - I

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the differences between orthogonal and oblique cutting?
2. List the major functions of cutting fluids.
3. What are the various methods available for taper turning in a lathe?
4. What are the differences between the automatic lathe and the capstan lathe?
5. What are the different types of drills used?
6. How is a milling machine specified?
7. How is grinding different from other machining operations?
8. What are the parameters related to a broach that are important?
9. What are the main features of NC Machines?
10. List the CNC programming techniques.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the basis for the selection of a specific cutting fluid for a given application. Take the example of turning, milling and grinding, and suggest the type of cutting fluid used. (10)

ii) With a suitable diagram, explain the cutting tool angles of a single-point cutting tool in an orthogonal plane. (6)

(OR)

b) i) What is meant by built-up-edge (BUE)? With a neat sketch explain the formation of a BUE. Explain the conditions, which promote the growth of BUE along with its consequences. (10)

ii) Explain the mechanisms of tool wear. What are its regions? (6)

12. a) i) What are the types of surfaces that can be generated in a centre lathe? Show with the help of sketches how these are achieved? (10)

ii) A shaft piece of outer diameter 32 mm and 75 mm length is to be machined from a stock of CRS C40 steel, 40 mm and 75 mm long. Calculate the machining times with the HSS tool required for completing the part. Use a cutting speed of 30 m/min, the feed rate is 0.3 mm/rev and the depth of cut is 2 mm. (6)

(OR)

b) i) Briefly explain with neat sketches the types of work-holding devices that are commonly employed in automatic lathes. Specify their limitations. (10)

ii) A shaft piece of outer diameter 32 mm and 100 mm length is to be machined from a stock of C40 steel, 40 mm and 100 mm long. Calculate the cutting force and power required for machining the part. Use a cutting speed of 30 m/min, the feed rate is 0.3 mm/rev and the depth of cut is 2 mm. The value of 'K' for C40 Steel = 1600 N/mm^2. (6)

13. a) Give a schematic sketch of a shaper labeling important parts and their functions. (16)

(OR)

b) i) Explain the various milling cutters used and give their application and relative merits. (10)

ii) Explain the different types of hole types and the processes used for manufacturing them. (6)

14. a) i) Describe the grinding wheel structure with the help of a neat sketch and state different bonding and abrasive materials used in it. (8)

ii) Compare and contrast grinding, honing, and lapping operations. (8)

(OR)

b) i) Describe the continuous broaching machine and list its applications, advantages and limitations. (8)

ii) What are the grinding process parameters that are of interest? Explain their effect on the grinding performance and the wear rates. (8)

15. a) i) Describe four main features of CNC machines that distinguish them from conventional machine tools. (6)

ii) Write the CNC part program for the following The component to be machined is shown in Figure.1. It is assumed that the pocket is through and hence only the outside is to be machined as a finish cut of the pocket. The tool to be used is a 20 mm diameter slot drill. The setting is done with point A as reference (0, 0, 0) and the reference axes are along X and Y directions. (10)

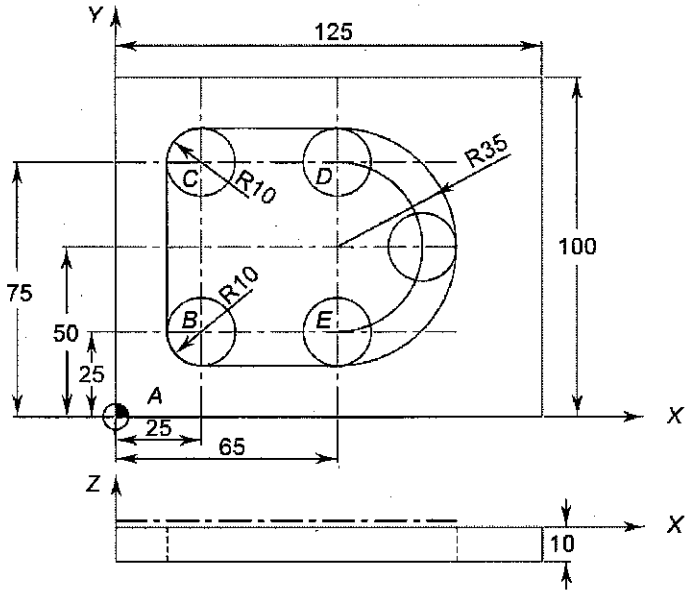


Figure.1

(OR)

b) i) Briefly explain the principle of Computer Numerical Control for machine tools. Also, mention its applications. (6)

ii) Write the APT program for the component shown in Figure.2. Use Point P2(0,0) as origin. (10)

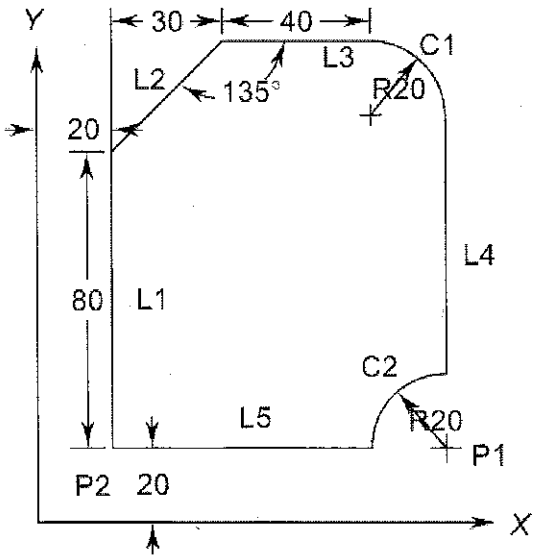


Figure.2

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Government College of Engineering :: Salem

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B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME603 – Applied Hydraulics and Pneumatics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the significance of hydraulic power?
2. Explain the cushioning mechanism in the hydraulic system.
3. Draw the 3/2 way valve and note its parts.
4. State the functions of a solenoid valve.
5. Compare accumulator and intensifier.
6. Discuss about quick return mechanism.
7. Mention the type of compressors used in pneumatic systems.
8. List down the pressure sensing devices used in a pneumatic system.
9. What is meant by Pneumo-hydraulic circuits?
10. What are the applications of PLC in Pneumatic systems?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Classify the pumps. Explain the working of a gear pump with a suitable diagram. (8)

ii) Explain the working of the single-stage double-acting reciprocating pump with a suitable sketch. (8)

(OR)

b) i) What is the need for an actuator in a pneumatic system? Explain the working of linear hydraulic actuator with a suitable sketch. (8)

ii) Explain with a suitable sketch any two types of fluid motors. (8)

12. a) Explain the working of pressure reducing valve and sequencing valve with suitable diagram. (16)

(OR)

b) Explain the various electrical control systems that are used in the pneumatic system. (16)

13. a) What are the types of accumulators used in pneumatic systems? Explain any two types with a sketch. (16)

(OR)

b) Explain with a suitable diagram the circuit diagram of the hydraulic system used in the milling machine. (16)

14. a) Draw and explain the complete pneumatic circuit with filter, regulator and lubricator unit for real-time applications. (16)

(OR)

b) What are control elements used in pneumatic systems explain in the sketch? (16)

15. a) Explain the working principle of a PLC which is used for fluid power control. (16)

(OR)

b) Explain in detail about failure and troubleshooting in pneumatic systems. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VIII Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12MEE22 – Professional Ethics and Human Values

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define ethics and explain its significance in professional life.
2. What is the difference between integrity and honesty?
3. State the senses of 'Engineering Ethics'.
4. Analyze the moral dilemmas faced by engineers in professional settings.
5. What is meant by 'codes of ethics' in engineering?
6. Explain the role of engineers as responsible experimenters.
7. Compare the outcomes of the Chernobyl and Three Mile Island incidents.
8. Discuss the importance of Intellectual Property Rights (IPR) in engineering.
9. What are the primary ethical concerns of multinational corporations?
10. Evaluate the significance of environmental ethics in global industries.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the importance of values and ethics in engineering professions. (8)

ii) Describe the key principles of civic virtue and work ethic. (8)

(OR)

b) i) Define spirituality and discuss its relevance in professional ethics. (8)

ii) Analyze the impact of empathy and self-confidence on ethical decision-making. (8)

12. a) Explain Kohlberg's and Gilligan's theories of moral development with examples. (16)

(OR)

b) Compare the professional roles and ethical responsibilities of engineers in diverse cultural contexts. (16)

13. a) Outline the significance of engineering as a social experiment. (16)

(OR)

b) Explain the importance of professional codes of ethics in ensuring engineering accountability. (16)

14. a) i) Explain the process of safety risk assessment with examples. (12)

ii) Analyze the ethical concerns in conflicts of interest among engineers. (4)

(OR)

b) i) Discuss the role of collegiality and loyalty in engineering ethics. (12)

ii) Design a framework to address discrimination issues in engineering workplaces. (4)

15. a) Analyze the ethical dilemmas faced by engineers in the development of weapons technology. (16)

(OR)

b) Discuss the significance of environmental ethics in multinational corporations and their global impact. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME503 – Dynamics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the requirements of an equivalent dynamical system?
2. What is meant by turning moment diagram or crank effort diagram?
3. Define static balancing of shaft.
4. When is a system said to be completely balanced?
5. What is meant by free vibration and forced vibration?
6. What is meant by logarithmic decrement?
7. Name two vibration measuring instruments.
8. What is fundamental frequency?
9. What is meant by hunting in governor?
10. Write down the expression for finding the speed of a Proell governor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A steam engine 200 mm bore and 300 mm stroke has a connecting rod 625 mm long. The mass of the reciprocating parts is 15 kg and the speed is 250 rpm. When the crank is 30° to the inner dead centre and moving outwards, the difference in steam pressures is 840 kN/m^2. Determine: (16)

1. The force on the crank shaft bearing and
2. The torque acting on the frame.

(OR)

b) The turning moment diagram for a four stroke gas engine may be assumed for simplicity to be represented by four triangles, the areas of which from the line of zero pressure are as follows: Expansion stroke = 3550 mm^2; Exhaust stroke = 500 mm^2; Suction stroke = 350 mm^2 and compression stroke = 1400 mm^2 each mm^3 represents 3 N-m. Assuming the resisting moment to be uniform, find the mass of the rim of a fly wheel required to keep the mean speed 200 rpm within ± 2 %. The mean radius of the rim may be taken as 0.75 m. Also determine the crank positions for the maximum and minimum speeds. (16)

12. a) A two cylinders uncoupled locomotive has inside cylinders 0.6 m apart. The radius of each crank is 300 mm and is at right angles. The revolving mass per cylinder is 250 kg and the reciprocating mass per cylinder is 300 kg. The whole of the revolving and two-third of the reciprocating masses are to be balanced and the balanced masses are placed, in the planes of rotation of the driving wheels, at a radius of 0.8 m. The driving wheels are 2 m in diameter and 1.5 m apart. If the speed of the engine is 80 kmph, find hammer blow, maximum variation in tractive effort and maximum swaying couple. (16)

(OR)

b) A shaft carries four rotating masses A, B, C and D in this order along is axis. The mass of B, C and D are 30 kg, 50 kg and 40 kg respectively. The planes containing B and C are 30 cm apart. The angular spacing of the planes containing C and D are 90° and 210° respectively relative to B measured in the same sense. If the shaft and masses are to be in complete dynamic balance, find (16)

i) the mass and the angular position of mass A and

ii) the position of planes A and D.

13. a) A vibrating system consists of a mass of 50 kg, a spring of stiffness 30 kN/m and a damper. The damping provided is only 20 % of the critical value. Determine (16)

1. The damping factor
2. The critical damping coefficient
3. The natural frequency of damped vibrations
4. The logarithmic decrement
5. The ratio of two consecutive amplitudes.

(OR)

b) A shaft is simply supported at its ends and is of 40 mm in diameter and 2.5 m in length. The shaft carries 3 point loads of masses 30 kg, 70 kg and 45 kg at 0.5 m, 1 m and 1.7 m respectively from the left support. The weight of the shaft per meter length is given as 73.575 N. The Young's modulus for material of the shaft is 200 GN/m². Find the critical speed of shaft. (16)

14. a) Explain the working principle of vibration exciter. (8)

Brief about the function of FFT analyzer in vibration measurement. (8)

(OR)

b) Explain the term flexibility, stiffness, eigen values and vectors. (16)

15. a) In a Porter governor, each arm is 200 mm long and is pivoted at the axis of rotation. The mass of each ball is 5 kg and the load on the sleeve is 30 kg. The extreme radii of rotation are 80 mm and 140 mm. Plot a graph of the controlling force vs. radius of rotation and set off a speed scale along the ordinate corresponding to a radius of 160 mm. (16)

(OR)

b) A hartnell governor moves between 300 rpm and 320 rpm for a sleeve lift of 15 mm. The sleeve arms and ball arms are 90 mm and 135 mm respectively. The levers are pivoted at 125 mm from the governor axis and mass of each ball is 2.5 kg. The ball arms are parallel to the governor axis at the lowest equilibrium speed. Determine (16)

1) Spring load at the lowest and highest equilibrium speeds and
2) Stiffness of the springs.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME702 – Renewable Sources of Energy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define photovoltaic conversion and list its advantages.
2. Explain one limitation of solar power systems.
3. Differentiate between induction and synchronous wind generators.
4. Discuss the importance of wind mapping in locating generators.
5. Identify two sources of biomass and their energy potential.
6. List the steps involved in biogas generation.
7. Analyze the challenges in tidal energy power generation.
8. Explain the fundamental principles of geothermal energy.
9. Evaluate the operational differences between hydrogen and battery-based electric vehicles.
10. Analyze the efficiency of biomass fuels like rice husk in automotive applications.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the conversion of solar energy into electrical energy with a neat diagram. (8)

ii) Analyze the limitations of large-scale solar energy utilization. (8)

(OR)

b) i) Explain the components of a photovoltaic system in detail. (8)

ii) Examine the limits, merits and demerits of concentrating solar power (CSP) systems. (8)

12. a) Discuss the design considerations for a wind farm, including turbine placement and generator type. (16)

(OR)

b) Explain with neat sketch the working of a horizontal-axis wind turbine and its applications. (16)

13. a) Explain the process of wood gasification and its role in biomass energy systems. (16)

(OR)

b) Analyze the environmental impact of municipal waste-based biogas production. (16)

14. a) i) Explain the operating principles of an OTEC system with diagram. (12)

ii) Evaluate the scope of geothermal energy for industrial power generation. (4)

(OR)

b) i) Explain the working of a simple wave energy converter with neat sketch. (12)

ii) Design a basic system for small-scale tidal power generation. (4)

15. a) Analyze the advantages and challenges of using biomass fuels in vehicles. (16)

(OR)

b) Discuss the design and operation of hydrogen storage systems for automotive applications. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME505 – Thermal Turbo Machines

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare fans and blowers.
2. Write the similarity laws used in turbo machines.
3. Define degree of reaction.
4. Write down the applications of a diffuser.
5. Compare lift and drag.
6. Define surging.
7. Compare impulse and reaction turbines.
8. Mention the effect of degree of freedom.
9. Compare horizontal axis and vertical axis wind turbine.
10. What is the significance of axial thrust in a turbine?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) How the velocity triangles are drawn for turbines? Explain one typical example with step by step procedure. (16)

(OR)

b) In an impulse turbine, the steam enters the wheel through a nozzle with a velocity of 500 m/s and an angle of 20° to the direction of motion of blade. The blade speed is 200 m/s and the exit angle of the moving blade is 25°. Find the inlet angle of moving blade, exit velocity of steam and its direction and work done per kg of steam. (16)

12. a) Explain the working principle of axial and centrifugal blowers with suitable sketches. (16)

(OR)

b) Explain with suitable diagram about various efficiencies and performance characteristics of centrifugal compressors. (16)

13. a) Classify the propellers and explain any two types with suitable sketches. (16)

(OR)

b) Explain the working principle of an axial flow compressor with appropriate diagram. (16)

14. a) Explain with neat sketch about the working of 90° IFR turbine. (16)

(OR)

b) Explain the working principle of Kaplan turbine with sketch. (16)

15. a) Explain with suitable sketches about stage velocity triangles, stage efficiencies and stage losses of radial flow turbines. (16)

(OR)

b) Explain with suitable sketch about horizontal axis wind turbine. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME704 – Finite Element Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Discretization and assemblage.
2. Name any four FEA softwares.
3. Write the shape function and displacement function for a 1Dimension two noded element.
4. Define 'Natural coordinate system'.
5. How do you define two dimensional elements?
6. Write a strain displacement matrix for CST element.
7. State the conditions to be satisfied in order to use axisymmetric elements.
8. Explain isoparametric elements?
9. Write down the governing equation for two-dimensional heat conduction.
10. Define the stream function for an incompressible flow.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) List and briefly describe the basic steps in finite element analysis. (16)

(OR)

b) A simply supported beam subjected to uniformly distributed load over entire span and it is subjected to a point load at the center of the span. Determine the bending moment and deflection at mid span by using Rayleigh-Ritz method and compare with exact solution. (16)

12. a) Derive the stiffness matrix for one dimensional bar element. (16)

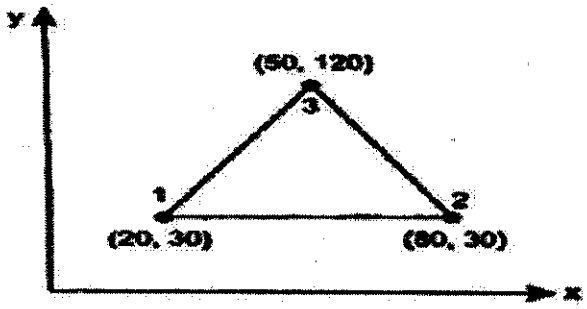
(OR)

b) Discuss the generation of stiffness matrix and load vector for a beam element. (16)

13. a) Derive the shape function of a CST Element. (16)

(OR)

b) Determine the stiffness matrix for a CST element. The coordinates are given in mm. Assume plane strain condition. E = 200 GPa. ν = 0.25. t =10 mm. shown in figure.1. (16)



All dimensions are in mm.

Figure.1

14. a) Derive the stiffness matrix for the axisymmetric element. Take E = 2.1 X 10^5 N/mm2. ν = 0.25.The coordinates are in mm. Shown in Figure.2 (16)

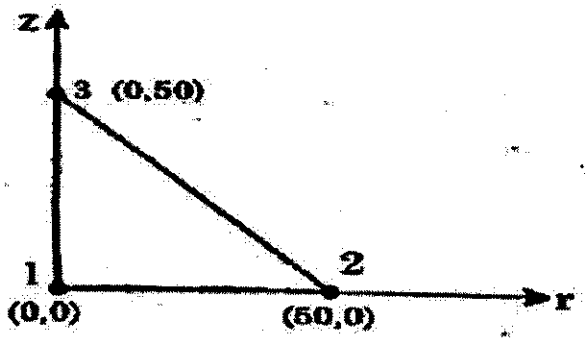


Figure.2

(OR)

b) Evaluate the Jacobian matrix at the local coordinates ε=η= 0.5 for the linear quadrilateral element with its global coordinates as shown in Figure.3. Also evaluate the strain-displacement matrix. (16)

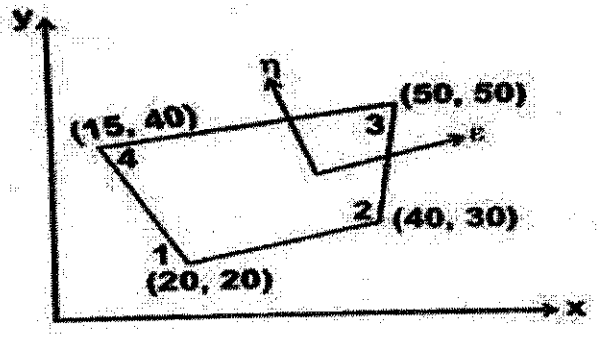


Figure.3

15. a) An aluminium alloy fin of 7 mm thick and 50 mm long protrudes from a wall, which is maintained at 120° C. The ambient air temperature is 22°C. The heat transfer coefficient and thermal conductivity of the fin material are 140 W/m²K and 55 W/mK respectively. Determine the temperature distribution of fin. (16)

(OR)

b) Derive the stiffness matrix and load vector for fluid mechanics in two dimensional finite element. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME703 – Mechatronics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Sketch the graphical representation of Mechatronics.
2. List the applications of Mechatronics in day to day activities.
3. Difference between static physical and dynamic physical models.
4. Draw force-voltage analogous circuit for the Mechanical system.
5. Classify actuator based on motion.
6. Generalize the applications of AC and DC servomotor.
7. How does input/output processing work in a PLC?
8. Compare ON delay timer and OFF delay timer.
9. Prepare any four statements about the problem definition.
10. Summarize the drawbacks of traditional design approach.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe each component of typical mechatronics system and draw schematic diagram. (16)

(OR)

b) Explain the main components of a measurement system using block diagram. (16)

12. a) Derive the mathematical model for the fluid power system. (16)

(OR)

b) Write the mathematical equations to model for the given system Shown in Figure.1 (16)

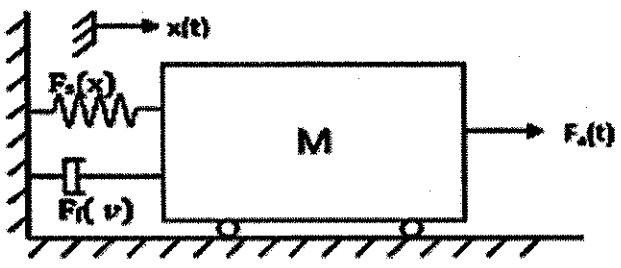


Figure.1

13. a) i) Draw and explain the block diagram of Fuzzy logic controller. (8)

ii) With neat sketch, explain the construction and working principle of solenoid. (8)

(OR)

b) i) A hydraulic cylinder is to be used to move a work piece in a manufacturing operation through a distance of 50 mm in 10 sec and a force of 10 KN is required to move the workpiece. Determine the required working pressure and hydraulic liquid flow if a cylinder with a piston diameter of 100 mm is available. (8)

ii) Write short notes on stepper motors. (8)

14. a) i) Discuss the selection criteria for PLC. (8)

ii) Develop PLC ladder program that can be used to start a motor and then after a delay of 100s start a pump when the motor is switched off there should a delay of 10s before the pump is switched off. (8)

(OR)

b) i) Apply the concept of Cascade Timer to control the motor and also draw the ladder diagram. (8)

ii) Consider a pneumatic system with single-solenoid controlled valves and involving two cylinders A and B, with limit switches a–, a+, b–, b+ detecting the limits of the piston rod movements. Design a ladder programme with the requirement being when the start switch is triggered, the sequence A^+, B^+, A^- with 10s time delay, B^- occurs and stop at that point until the start switch is triggered again. (8)

15. a) What are the different phases in Mechatronic design process? Also what do you mean by integrated design approach. Explain. (16)

(OR)

b) Design a mechatronics system for a PLC based car parking barrier system and explain the same. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME305 – Kinematics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define degrees of freedom of a mechanism.
2. Identify the various types of constrained motions.
3. What are the properties of the instantaneous centre?
4. Define Coriolis component of acceleration.
5. What do you mean by path generation?
6. Write Freudenstein's equation of three precision points of a four-bar chain.
7. Differentiate between the base circle and the prime circle.
8. What are the methods for reducing the pressure angle of a cam?
9. State the law of gearing.
10. How a four-wheeled vehicle is affected by a gyroscopic couple?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the working of Whitworth's quick return mechanism with a neat sketch. (10)

ii) Explain the offset slider crank mechanism. (6)

(OR)

b) i) Sketch the Peaucellier straight-line motion mechanism and prove that the generating points move in a straight line. (10)

ii) Explain the basic structures of Robot Manipulators. (6)

12. a) In the mechanism shown in Figure.1, O_1O_2 = 210 mm, O_1B = 300 mm and O_2A = 60 mm. The crank O_2A rotates at 300 rpm in the CCW direction. Find (16)

a) the angular speed of link O_1A, and

b) the velocity of slider.

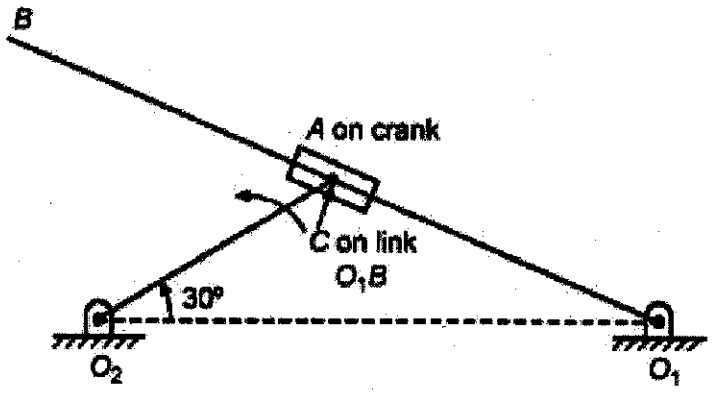
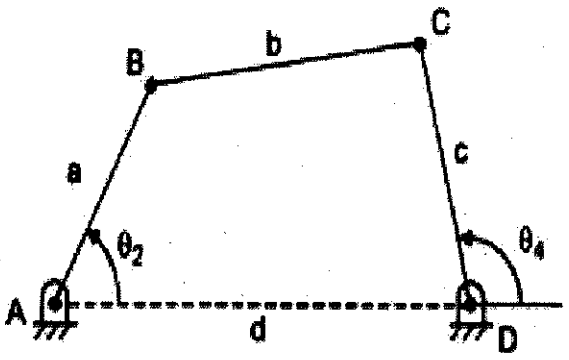


Figure.1.

(OR)

b) A link AB of a four-bar mechanism ABCD revolves uniformly at 120 rpm in a clockwise direction. Find the angular acceleration of links BC and CD and the acceleration of point E in link BC. Given: (16)
AB = 75 mm, BC = 175 mm, EC = 50 mm, CD = 150 mm, AD =100 mm, and angle <BAD = 90°

13. a) The following data are given for the four-bar linkage shown in Figure.2.Determine the lengths of various links. (16)



$\theta_2 = 60°; \theta_4 = 90°$

$\omega_2 = 3$ rad/sec; $\omega_4 = 2$ rad/sec

$\alpha_2 = -1$ rad/sec^2; $\alpha_4 = 0$

Figure.2.

(OR)

b) Derive Freudenstein's equation for a four-bar linkage as shown in Figure.3. (16)

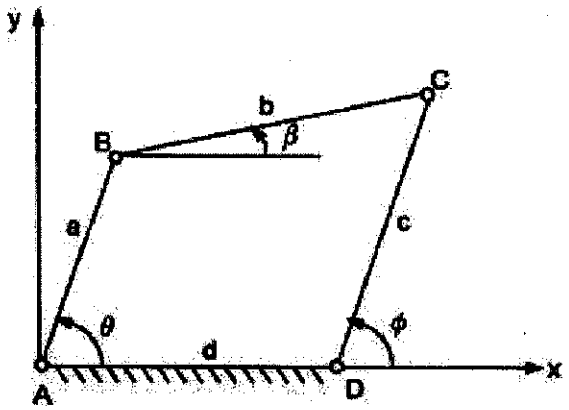


Figure.3.

14. a) Draw the profile of a cam operating a knife-edge follower when the follower's axis passes through the camshaft's axis. The following data is given: Lift = 40 mm, angle of ascent = 60°, dwell = 45°, angle of descent = 90°, and dwell for the remaining period of cam rotation. The motion of the cam is simple harmonic during both ascent and descent. The least radius of the cam is 50 mm. If the cam rotates at 300 rpm, determine the maximum velocity and acceleration of the follower during ascent and descent. (16)

(OR)

b) The following data refers to a tangent cam operating a radial roller follower: Minimum radius of cam = 45 mm, Lift = 15 mm, Nose radius = 18 mm, Radius of roller = 20 mm, Semi-angle of cam action = 70°, Angular velocity of cam = 10 rad/s. Draw the displacement, velocity and acceleration diagrams for one rotation of the cam. (16)

15. a) A pair of involute spur gears having 20 and 40 teeth are in mesh, the speed of the smaller wheel being 2000 rpm. Calculate the sliding velocity between gear teeth faces. (16)

1) at the point of Engagement,
2) at the pitch point and
3) at the point of disengagement

If the smaller wheel is the driver. The pressure angle is 20°, addendum = 5 mm, and module = 5 mm. Also, find the angle turned through by the pinion while any one pair of teeth is in contact.

(OR)

b) In an epicyclic gear train shown in Figure.4, the number of teeth on gears A, B, and C is 50, 25, and 55 respectively. The arm rotates at 450 rpm clockwise. Calculate. (16)

1) the speed of gear C when A is fixed, and
2) the speed of gear A When C is fixed.

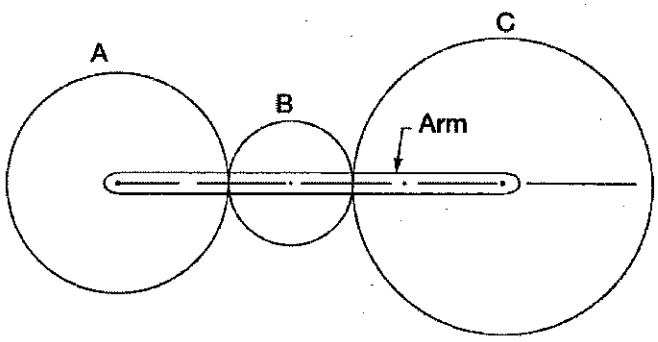


Figure.4.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME604 – Instrumentation and Sensors

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between accuracy and precision.
2. Name the dynamic characteristics of measurement systems.
3. Define proximity sensors.
4. Note down the names of any two flow measurement devices.
5. Write down the applications of choppers.
6. Define sampling.
7. Mention the elements of a data acquisition and control.
8. Define data logging.
9. What is meant by VI programming?
10. Write down the applications of computers in instrumentation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What are the different types of errors? Explain how errors can be eliminated in instrumentation. (16)

(OR)

b) Explain the static and dynamic characteristics of an instrument in detail. (16)

12. a) Explain with suitable sketch about flow measurement sensors. (16)

(OR)

b) Explain with suitable sketch about torque and power measurement Sensors. (16)

13. a) Explain with suitable sketch about voltage to time A/D conversion. (16)

(OR)

b) Explain the working principle of wheats stone bridge with suitable diagram. (16)

14. a) Explain the arrangement and functions of data acquisition system with suitable block diagram. (16)

(OR)

b) Explain data logging, data conversion and digital transmission systems with suitable diagrams. (16)

15. a) Explain the architecture of virtual instrumentation with suitable block diagram. (16)

(OR)

b) Explain the VI programming, loops, charts, arrays and clusters with necessary diagrams. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME504 – Design of Machine Elements

(Use of Approved Design Data Books permitted in the examination)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Stiffness and Resilience.
2. List out the factors involved in arriving at factor of safety.
3. What are the types of keys? List the various failures occurred in the keys.
4. What are the main functions of the knuckle joints?
5. What are the stresses act on screw fastenings?
6. Define Pitch and Lead.
7. What is eccentric loading of springs?
8. Define : Leaf springs.
9. What are the required properties of bearing materials?
10. State the type of stresses induced in a rim flywheel?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The crane hook carries a load of 20 kN as shown in Figure 1. The section at X – X is rectangular whose horizontal side is 100 mm. Find the stresses in the inner and outer fibres at the given section. (16)

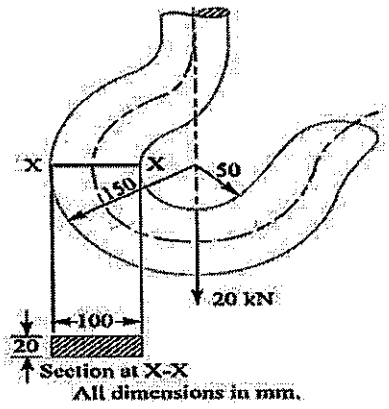


Figure 1

(OR)

b) A machine component is subjected to a flexural stress which fluctuates between +300 MN/m² and −150 MN/m². Determine the value of minimum ultimate strength according to 1. Gerber relation 2. Modified Goodman relation and 3. Soderberg relation. Take yield strength = 0.55 Ultimate strength; Endurance strength = 0.5 Ultimate strength; and factor of safety = 2. (16)

12. a) A shaft supported at the ends in ball bearings carries a straight tooth spur gear at its mid span and is to transmit 7.5 kW at 300 RPM. The pitch circle diameter of the gear is 150 mm. The distances between the centre line of bearings and gear are 100 mm each. If the shaft is made of steel and the allowable shear stress is 45 MPa, determine the diameter of the shaft. Show in a sketch how the gear will be mounted on the shaft; also indicate the ends where the bearings will be mounted? The pressure angle of the gear may be taken as 20°. (16)

(OR)

b) Two shafts made of plain carbon steel are connected by a rigid protective type flange coupling. The shafts are running at 500 r.p.m. and transmit 25 kW power. Design the coupling completely for overload capacity 25 per cent in excess of mean transmitted torque capacity. Assume the following permissible stresses for the coupling components : (16)

Shaft — Permissible tensile stress = 60 MPa;
Permissible shear stress = 35 MPa;

Keys — Rectangular formed end sunk key having permissible compressive strength = 60 MPa;

Bolts — Six numbers made of steel having permissible shear stress = 28 MPa;

Flanges — Cast iron having permissible shear stress = 12 MPa.

13. a) Design a double riveted double strap butt joint for the longitudinal seam of a boiler shell, 750 mm in diameter, to carry a maximum steam pressure of 1.05 N/mm2 gauge. The allowable stresses are: σ_t = 35 MPa; τ = 28 MPa and σ_c = 52.5 MPa. Assume the efficiency of the joint as 75 %. (16)

(OR)

b) A 125 × 95 × 10 mm angle is welded to a frame by two 10 mm fillet welds, as shown in Figure 2. A load of 16 kN is apsplied normal to the gravity axis at a distance of 300 mm from the centre of gravity of welds. Find maximum shear stress in the welds, assuming each weld to be 100 mm long and parallel to the axis of the angle. (16)

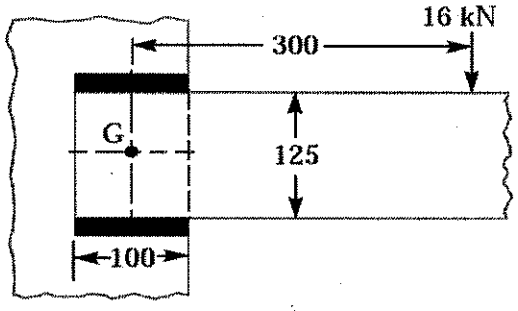


Figure 2

14. a) Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, G = 84 kN/mm^2. Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring, showing details of the finish of the end coils. (16)

(OR)

b) A cranked lever, as shown in figure has the following dimensions : (16)

Length of the handle = 300 mm

Length of the lever arm = 400 mm

Overhang of the journal = 100 mm

If the lever is operated by a single person exerting a maximum force of 400 N at a distance of 1/3rd length of the handle from its free end, find: 1. Diameter of the handle 2. Cross-section of the lever arm and 3. Diameter of the journal.

The permissible bending stress for the lever material may be taken as 50 MPa and shear stress for shaft material as 40 MPa.

15. a) A four stroke diesel engine has the following specifications : (16)
Brake power = 5 kW; Speed = 1200 r.p.m.; Indicated mean effective pressure = 0.35 N/mm^2; Mechanical efficiency = 80%. Determine: 1. bore and length of the cylinder 2. thickness of the cylinder head and 3. size of studs for the cylinder head.

(OR)

b) Design a journal bearing for a centrifugal pump running at (16)
1440 r.p.m. The diameter of the journal is 100 mm and load on each bearing is 20 kN. The factor ZN/p may be taken as 28 for centrifugal pump bearings. The bearing is running at 75°C temperature and the atmosphere temperature is 30°C. The energy dissipation coefficient is 875 W/m^2/°C. Take diametral clearance as 0.1 mm.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12MEE24 – Robotics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define a robot and explain its significance in modern manufacturing.
2. What are the basic components of a robot's anatomy?
3. What is an end effector in robotics, and why is it important?
4. Compare the design considerations for mechanical and pneumatic grippers.
5. What are the main components of a machine vision system?
6. Define feature extraction and its role in machine vision.
7. What is forward kinematics, and how is it different from inverse kinematics?
8. Describe the concept of teach pendant programming.
9. How are automated guided vehicles implemented in industries?
10. Evaluate the safety considerations for robot operations in loading and unloading operation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Define robot anatomy and describe its different parts. (8)

ii) Describe the various types of robot classifications and their specifications. (8)

(OR)

b) i) Explain the importance of coordinate systems and work envelopes in robotics. (8)

ii) Analyze the significance of joint notations and reference frames. (8)

12. a) Explain the different types of end effectors and their design considerations. (16)

(OR)

b) Describe the layout and design of a robot work cell, including interlocks, multiple machines and machine interfaces. (16)

13. a) Define machine vision and explain sensing, image conversion, and data storage techniques. (16)

(OR)

b) Analyze the role of lighting techniques and digitizing image data in robotics inspection systems. (16)

14. a) i) Discuss the differences in forward and inverse kinematics for manipulators with 2 D and 3 D degrees of freedom. (12)

ii) Evaluate the challenges involved in deriving the kinematic equations for a manipulator with four degrees of freedom in three-dimensional space. (4)

(OR)

b) Explain the robot programming commands and languages in detail. (16)

15. a) Analyze the industrial implementation of Robotics applications in material handling, assembly, and welding environments. (16)

(OR)

b) Evaluate the safety considerations and challenges for robots deployed in hostile environments and remote locations. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12CM401 – Solid Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Poisson's ratio, and what does it represent?
2. What is the difference between a gradually applied load, a suddenly applied load, and an impact load?
3. A cantilever beam of length 4 m is subjected to a point load of 10 kN at its free end. Calculate the maximum shear force and bending moment.
4. State the theory of simple bending.
5. What is the slenderness ratio of a column, and why is it important?
6. A simply supported beam of length 6 m is subjected to a uniformly distributed load of 5 kN/m. Find the maximum deflection using the double integration method.
7. What is a biaxial state of stress, and how does it differ from a uniaxial state of stress?
8. Define principal planes and principal stresses.
9. Define torsional rigidity and its significance in shaft design.
10. What is Wahl's factor, and how is it used in spring design?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the relationship between elastic constants, including Young's modulus, shear modulus, and bulk modulus. (16)

(OR)

b) Analyze the deformation of a simple compound bar subjected to axial loading. (16)

12. a) A cantilever beam of length 8 m is subjected to a uniformly distributed load of 10 kN/m. Calculate the maximum shear force, maximum bending moment, and the point of contra flexure. Also, sketch the shear force and bending moment diagrams. (16)

(OR)

b) A rectangular beam of width 300 mm and depth 500 mm is subjected to a bending moment of 100 kNm. Calculate the maximum stress, maximum shear stress, and the load-carrying capacity of the beam. (16)

13. a) A cantilever beam of length 8 m is subjected to a uniformly distributed load of 10 kN/m. Using the double integration method, derive the equation of the elastic curve and find the maximum deflection and slope. (16)

(OR)

b) A cantilever beam of length 12 m is subjected to a uniformly distributed load of 15 kN/m. Using the moment area method, find the deflection and slope at the free end. (16)

14. a) A thin cylinder with a radius of 200 mm and a thickness of 10 mm is subjected to an internal pressure of 5 MPa. Calculate the hoop stress, longitudinal stress, and maximum shear stress. (16)

(OR)

b) A material is subjected to a biaxial state of stress with stresses of 80 MPa and 40 MPa on two perpendicular planes. Calculate the principal stresses, principal planes, and maximum shear stress. (16)

15. a) A solid circular shaft of diameter 50 mm is subjected to a torque of 10 kNm. Calculate the maximum shear stress, angle of twist, and torsional rigidity of the shaft. (16)

(OR)

b) A spring is subjected to an axial load of 10 kN. The spring has a stiffness of 20 kN/m. Calculate the deflection of the spring under the axial load. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME402 – Engineering Materials and Metallurgy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Phase diagram and mention its importance?
2. Give the classification of Cast iron.
3. What is Hardenability?
4. Mention is the use of a TTT diagram.
5. List the defects occur in the ceramics.
6. What is fiber reinforced composites?
7. Describe the factors affecting fatigue strength.
8. Distinguish between elastic and plastic deformation of a solid.
9. What are the advantages of magnetic particle inspection?
10. Write some importance of the surface engineering.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw iron-iron carbide equilibrium diagram and mark on it all salient temperatures and composition fields. (16)

(OR)

b) Discuss the influence of each of the following alloying elements on the properties of steel: (16)

1) Molybdenum
2) Chromium
3) Manganese
4) Vanadium
5) Titanium and
6) f) Tungsten.

12. a) Compare and contrast the process of full annealing, process annealing and stress relief annealing. (16)

(OR)

b) Discuss the different types of stainless steel, making reference to approximate compositions, structures, heat treatments. (16)

13. a) i) Discuss the properties and applications of Al_2O_3 and SiC. (8)

ii) Explain in detail about any one ceramic coating method. (8)

(OR)

b) i) Explain briefly about the chemical vapour deposition method. (8)

ii) Differentiate the matrix phase and dispersed phase of a composite material. (8)

14. a) i) Explain the mechanism of plastic deformation by slip and twinning with neat sketch. (8)

ii) Describe with neat sketch about fatigue test. (8)

(OR)

b) i) Explain the testing procedure for Vickers hardness test and mention the advantages and limitations. (8)

ii) Describe the procedure of Charpy impact testing and the properties obtained from it. (8)

15. a) Explain the following Non-destructive testing: (16)

1) Radiographic testing
2) Ultrasonic testing
3) Liquid penetrant Inspection techniques.

(OR)

b) Explain any two surface modification (deposition) methods. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME605 – Design of Transmission Systems

(Use of approved design data book is Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the advantages of wire ropes.
2. What is a Silent chain? In what situations, silent chains are preferred?
3. Define Pressure angle.
4. What are the materials commonly used for gears?
5. Classify bevel gears.
6. Describe the various losses in the worm gear.
7. What is preferred number? Give its uses.
8. What are the stresses induced in power screws?
9. Differentiate clutch and brake.
10. Define Self-locking brakes.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Select a high speed duck flat belt drive for a fan running at 360 rpm which is driven by 10 kW, 1440 rpm motor. The belt drive is open type and space available for a center distance of 2 m approximately. The diameter of the driven pulley is 1000 rpm. (16)

(OR)

b) Design a V-belt drive to the following specifications: Power to be transmitted 75 kW, Speed of driving wheel is 1440 rpm, Speed of driven wheel is 400 rpm, Diameter of driving wheel is 300 mm, Centre distance is 2500 mm and Service is16 hours/day. (16)

12. a) Design a spur gear pair to transmit 22.5 kW at 900 rpm. Speed reduction ratio is 2.5. Material for pinion and wheel are C15 steel and cast iron grade 30 respectively. Take pressure angle 20° and working life of gears is 10,000 hours. (16)

(OR)

b) Design a helical gear for the following specification: Power – 12.5 kW, Pinion Speed – 1200 rpm, Gear ratio – 3.5, Pressure angle is 20°, helix angle is 15°. Gear are expected to work 6 hours / day for 10 years. (16)

13. a) Design a straight bevel gear drive between two shafts at right angles to each other. Speed of the pinion shaft is 360 rpm and the speed of gear wheel shaft is 120 rpm. Pinion is made of steel and wheel is made of cast iron, Each gears are expected to work 2 hrs / day for 10 years. (16)

(OR)

b) Design the worm gear drive to transmit 22.5 kW at a worm speed of 1440 rpm. Velocity ratio 24:1. An efficiency of atleast 85 % is desired. The temperature raise should be restricted to 45°C. Determine the required cooling area. (16)

14. a) A nine speed gear box used as a headstock gear box of a turret lathe is to provide a speed range of 180 rpm to 1800 rpm. Using standard step ratio, draw the speed diagram, and the kinematic lay out. Also find and fix the number of teeth on all gears. (16)

(OR)

b) A vertical two start square threaded screw of a 100 mm mean diameter and 20 mm pitch supports a vertical load of 18 kN. The axial thrust on the screw is taken by a collar bearing of 250 mm outside diameter and 100 mm inside diameter. Find the force required at the end of a lever which is 400 mm long in order to lift and lower the load. The coefficient of friction for the vertical screw and nut is 0.15 and that for collar bearing is 0.20. (16)

15. a) A plate clutch with maximum diameter 60 mm has maximum lining pressure of 0.35 MPa. The power to be transmitted at 400 rpm is 135 kW and $\mu = 0.3$. Find inside diameter and spring force required to engage the clutch. Springs with spring index 6 and material spring steel with safe shear stress 600 MPa are used. Find the diameters if 6 springs are used. (16)

(OR)

b) A single block brake, the diameter of drum is 250 mm and the angle of contact is 90°. The operating force of 700 N is applied at the end of lever which is at 250 mm from the centre of the brake block. Determine the torque that may be transmitted. Fulcrum is at 200 mm from the centre of brake block with an offset of 50 mm from the surface of contact. The coefficient of friction is 0.35. (16)

gRegister Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12PH101 – Engineering Physics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention any two medical applications of ultrasonic waves.
2. Define reverberation time.
3. Justify the necessity for population inversion in a laser system.
4. Define the critical angle of an optical fibre.
5. Distinguish between conduction and convection.
6. A solid square of side 50 cm and thickness 10 cm is in contact with steam at 100°C on one side. A block of ice at 0°C rests on the other side of the solid. 5 kg of ice is melted in one hour. Calculate the thermal conductivity of the solid.
7. Calculate the de-Broglie wavelength of an electron which has been accelerated from rest on application of potential of 400 volts.
8. Summarize the physical significance of a wave function.
9. Name two materials commonly used in the construction of LEDs.
10. Draw the symbols for a photodiode and a phototransistor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Define Piezoelectric effect and describe the producing of ultrasonic waves by Piezo electric method. (16)

(OR)

b) Discuss the factors affecting the acoustics of a hall, including reverberation, resonance, echelon effect, focusing, and reflection, along with their remedies. (16)

12. a) Discuss the principle, construction, working and applications of CO_2 laser. (16)

(OR)

	b)	Compare step-index and graded-index optical fibers, as well as single-mode and multi-mode optical fibers, in terms of their construction and light propagation.	(16)
13.	a)	Summarize the different modes of heat transmission. Formulate an expression for the thermal conductivity of a material, and analyze why metal feels colder to the touch than wood, even when both are at the same temperature.	(16)
		(OR)	
	b)	Apply Lee's disc method to determine the thermal conductivity of a bad conductor and describe the procedure.	(16)
14.	a)	Arrive the time dependent Schrodinger wave equation and hence deduce the time independent Schrodinger wave equation.	(16)
		(OR)	
	b)	Explain the de Broglie concept of wave nature and analyze the Davisson-Germer experiment in detail.	(16)
15.	a)	Organize the construction, working principle, and advantages of Liquid Crystal Displays.	(16)
		(OR)	
	b)	Explain the construction and working of a photovoltaic cell.	(16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME701 – Process Planning and Cost Estimation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the advantages of work factor system.
2. State some application of ergonomics.
3. How does documentation contribute in process planning?
4. What is the significance of cycle time calculation in process planning?
5. Differentiate cost accounting and financial accounting.
6. List the elements of cost.
7. What is the purpose of contingency allowances in cost estimation?
8. List out the indirect expenses.
9. Give examples of factory overheads.
10. List the main components included in production cost estimation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain briefly about the tools and techniques of method study. (16)

(OR)

b) i) List the principle of motion economy as applied to: (8)

1) The use of human body
2) Design of tools and equipment
3) Arrangement of work place.

ii) Discuss about the work measurement techniques. (8)

12. a) i) Explain the prerequisites in process planning. (8)

ii) Give brief explanation of factors to be considered while selecting the most suitable process for manufacturing the component. (8)

(OR)

b) Explain operation planning and its components. What are the various aspects considered for planning operation sequence? (16)

13. a) Outline the preparation of cost sheet with a detailed example including all elements of cost involved in manufacturing of sheet metal product. (16)

(OR)

b) Briefly discuss the different types of costing method used in various industries and its application. (16)

14. a) i) A company manufactures pocket transistors. The details of its monthly expenditure are as follows: (10)

Direct material - Rs. 10000

Direct Labour - 200 hours at the rate of Rs. 5 per hour

-125 hours at the rate of Rs. 4 per hour

Applied overloads (factory overheads) = 10 % of prime cost, other overheads = 10 % of works cost

Profit = 20 % of total cost

Number of units manufactured per month = 200.

Estimate the selling price unit.

ii) Describe the data and sources for a casting company to estimate the depreciation cost. (6)

(OR)

b) i) Find the factory cost of a component made from solid steel bar 5 cm long and 2 cm in diameter. The machining operation requires 1.5 hours. Assume the following data: (10)

a) Density of mild steel 8 gm/cc.

b) Cost of mild steel Rs. 2 per kg.

c) Labour cost Rs. 1 per hour

d) Overhead charges 50% of direct labour cost.

ii) Differentiate between fixed costs and variable costs. (6)

15. a) What is the material cost of welding two plates of size 300 mm length and 150 mm width and 8 mm thickness to make a piece 300x300 mm approximately. Use rightward technique with no edge preparation cost. Take overall cost of oxygen as Rs. 0.70 per m^3, cost of acetylene at Rs.7 per m^3, cost of filler material Rs. 2.5/kg and One cm^3 of filler material weighs 11.28 gms. Assume dia of filler rod = 4 mm; filler rod used per meter of weld = 3.4 m. Rate of welding = 2.1 m/hr consumption of oxygen = consumption of acetylene = 7.1 m^3/hr. (16)

(OR)

b) i) A square bar of 3 cm side and 25 cm length is to be hand forged into a hexagonal bar of side of 1.5 cm. Find length of the hexagonal bar ignoring metal losses. Density remains same? (8)

ii) Discuss the production cost estimation for welded jobs with example. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME602 – Heat and Mass Transfer

(Heat and mass transfer data book to be permitted.)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Fourier's law of heat conduction.
2. Write down the three-dimensional heat conduction equation for Cartesian co-ordinate system.
3. Distinguish absorptivity and transmissivity.
4. Compare black body and grey body.
5. State Newton's law of cooling.
6. What is critical radius of insulation?
7. Define effectiveness of a heat exchanger.
8. Define LMTD.
9. Define molar fraction.
10. State the Fick's law of diffusion.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A furnace wall consists of three layers. The inner layer of 10 cm thickness is made of fire brick (k = 1.04 W/mK). The intermediate layer of 25 cm thickness is made of masonry brick (k = 0.69 W/mK) followed by a 5 cm thick concrete wall (k =1.37 W/mK). When the furnace is in continuous operation the inner surface of the furnace is at 800°C while the outer concrete surface is at 50°C? Calculate the rate of heat loss per unit area of the wall, the temperature at the interface of the firebrick and masonry brick and the temperature at the interface of the masonry brick and concrete. (16)

(OR)

b) Derive the steady state one dimensional heat conduction equation for Cartesian coordinates. (16)

12. a) Calculate the following for an industrial furnace in the form of a black body and emitting radiation at 2500°C (16)

i) monochromatic emissive power at 1.2 μm length

ii) wave length at which the emission is maximum

iii) maximum emissive power

iv) total emissive power

v) total emissive power of the furnace if it is assumed as a real surface with emissivity equal to 0.09.

(OR)

b) Calculate the radiant heat exchange per m^2 area for two large parallel plates of temperatures 427°C and 27°C respectively. ϵ (hot plate) = 0.9 and ϵ (cold plate) = 0.6.If polished aluminium shield is placed between them, find the percentage reduction in the heat transfer if ϵ (shield) = 0.4. Where ϵ is emissivity? (16)

13. a) Engine oil at 80°C flows over a flat surface at 40°C for cooling purpose. The flow velocity being 2 m/s. Determine at a distance of 0.4 m from the leading edge, the hydrodynamic and thermal boundary layer thickness. Also determine the local and average values of friction and convection coefficients. (16)

(OR)

b) Water at 20°C enters at the rate of 0.01 kg/s into a tube of 20 mm inner diameter. It is to be heated to 40°C.There is a uniform heat flux of 15 kW/ m^2 over the surface. Determine the i) Reynolds number ii) heat transfer coefficient ii) length of pipe needed v) friction factor. (16)

14. a) A counter flow double pipe heat exchanger using super heated steam is used to heat the water at a rate of 3 kg/s. The steam enters the exchanger at 180°C and leaves at 130°C the inlet and exit temperature of water are 30°C and 80°C respectively. The overall heat transfer coefficient is 820 W/m^2 Calculate the heat transfer area required. What should be the increase in surface area if fluid flow is parallel? Take Cp of water as 4.187 kJ/kgK. (16)

(OR)

b) The flow rate of hot and cold water streams running through a parallel flow heat exchanger are 0.2 kg/s and 0.5 kg/s respectively. The inlet temperatures on the hot and cold sides are 75°C and 20°C respectively. The exit temperature of hot water is 45°C. If the individual heat transfer coefficients on both the sides are 650 W/m^2 °C. Calculate the area of heat exchanger. (16)

15. a) Oxygen is diffusing through stagnant carbon monoxide at 0°C and 760 mm of Hg pressure under steady state conditions. The partial pressure of oxygen at two planes 3.5 mm apart is 90 mm of Hg and 20 mm of Hg respectively. Calculate the rate of diffusion of oxygen in gm-moles/s through cm^2 area. Assume diffusivity of oxygen in carbon monoxide = 0.17 cm^2/s and gas constant = 82.06 cm^2 atm/gm moleK. (16)

(OR)

b) Air at 1 atm 25°C containing small quantities of iodine flows with a velocity of 5.18 m/s inside a 3.048 cm diameter tube. Determine the mass transfer coefficient for iodine transfer from the gas stream to the wall surface. If C_m is mean concentrate of iodine in kg-mol/m^3 in the air stream, determine the rate of deposition of iodine on the tube surface where the iodine concentration is zero? (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME502 – Refrigeration and Air Conditioning

(Refrigeration Tables and Psychrometric chart are to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the function of rectifier in vapour absorption system?
2. Write a note on steam jet refrigeration.
3. Define Fouling Factor.
4. Mention any four refrigerants and its important properties.
5. Define DBT and DPT.
6. What is meant by bypass factor?
7. What are the main components of a cooling load?
8. Define RSHF.
9. Classify ducts in air conditioning systems.
10. What are the factors affecting comfort air conditioning?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With a neat sketch, explain the working principle of vapour compression refrigeration system. (12)

ii) What are the uses of p-H charts? (4)

(OR)

b) i) Explain with a neat sketch the working of lithium-bromide vapour absorption system. (12)

ii) Name the various methods of air refrigeration systems. (4)

12. a) i) Explain any two types of compressors used in the refrigeration system. (10)

ii) Briefly describe the working of chilling plant. (6)

(OR)

b) i) Explain the various types of condensers used in the refrigeration system. (10)

ii) Write about any one type of evaporator with neat sketch. (6)

13. a) Explain any four psychrometric processes with the help of psychrometric chart. (16)

(OR)

b) The atmospheric air has 35°C dry bulb temperature and 50 % relative humidity. Using Psychrometric chart, find (16)

i) Wet bulb temperature

ii) Humidity ratio

iii) Dew point temperature

iv) Enthalpy of air per kg of dry air.

14. a) A restaurant with a capacity of 100 persons is to be air-conditioned with the following conditions: (16)

Outside conditions : 30°C DBT and 70% RH

Desired inside conditions : 23°C DBT and 55% RH

Quantity of air supplied : 0.5 m^3 / min /person

The desired conditions are achieved by cooling, dehumidifying and then heating. Determine:

i) Capacity of cooling coil in tonnes of refrigeration

ii) Capacity of heating coil in kW

iii) Amount of water removed by dehumidifier

iv) By-pass factor of the heating coil if its surface temperature is 35°C.

(OR)

b) The following data relates to the office air conditioning plant having maximum seating capacity of 25 occupants: (16)

Outside design conditions : 34°C DBT, 28°C WBT

Inside design conditions : 24°C DBT, 50% RH

Solar heat gain : 9120 W

Latent heat gain per occupant : 105 W

Sensible heat gain per occupant : 90 W

Lighting load : 2300 W

Sensible heat load from other sources : 11630 W

Infiltration load : 14 m^3/min

Assuming 40 % fresh air and 60 % of recirculated air passing through the evaporator coil and the by-pass factor of 0.15, find the dew point temperature of the coil and capacity of the plant.

15. a) Explain about following in detail. (16)

1. Air Filter
2. Humidifier
3. Dehumdifier
4. Cooling tower

(OR)

b) Explain the following in detail. (16)

1. Room air conditioner
2. Refrigerated trucks
3. Marine air-conditioning

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VIII Semester (Full Time)

(2012 Regulations)

MECHANICAL ENGINEERING

12ME801 – Total Quality Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define quality.
2. Write down the elements of TQM?
3. Why are customer complaints important for a business?
4. How is supplier selection carried out?
5. Compare Tree diagram and Decision tree diagram.
6. What is the use of the control chart?
7. What is the house of quality in quality function deployment?
8. What are the improvement needs in total productive maintenance?
9. What is the need for ISO?
10. Mention the different types of quality audits.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the dimensions of product quality in an industry. (8)

ii) Explain the different types of quality costs and how analysis techniques can help in reducing them. (8)

(OR)

b) Discuss Deming's philosophy of quality management. How did his 14 points influence modern quality practices? (16)

12. a) How would you summarize customer complaints, customer satisfaction & retention? Explain in detail. (16)

(OR)

b) Describe Joseph M. Juran's contribution towards TQM. (16)

13. a) Explain in detail the seven traditional tools of quality. (16)

(OR)

b) i) How would you show your understanding of properties of normal curve? (8)

ii) Discuss about the stages of six sigma in process improvement. (8)

14. a) i) Write down the general procedure for bench marking process. (8)

ii) Describe the objective and benefits of quality function deployment. (8)

(OR)

b) i) Discuss how the Taguchi Quality Loss Function can help organizations move towards zero defects. (8)

ii) List out the steps for total productive maintenance development. (8)

15. a) Explain the need for ISO 9000 and other quality systems. How do these standards help organizations to improve product quality, customer satisfaction, and competitiveness? (16)

(OR)

b) i) Explain about the various processes used in ISO 9001 quality management system. (8)

ii) Write about the documentation procedures to be prepared for quality management system. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT301 - Elements of Physical Metallurgy

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Show the plane (111) and [110] direction in cubic crystal.
2. What is meant by allotropy? Give one example.
3. Whether the vacancy in a crystal desirable or not? Justify.
4. What is ASTM grain size number (N)?
5. State and explain Fick's laws of diffusion with simple sketche.
6. What is directional solidification?
7. State Gibb's phase rule.
8. How do alloys differ from compounds?
9. Give the chemical composition of Grey Cast Iron (GCI).
10. List the applications of mild steel.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the different types of crystal system with neat sketches. (8)

ii) A metal has an atomic weight of 63.54 g/mol, a density of 8.96 g/cc and a lattice parameter of 3.61 A. What is the crystal structure of the material? (8)

(OR)

b) i) Sketch the FCC unit cell and mark the atom positions. Derive the relationship between (8)

i) lattice parameter and atomic radius,

ii) Packing fraction and

iii) density for this unit cell,

ii) Write short notes on the following: (8)

i) Polycrystalline materials.

ii) Amorphous materials.

12. a) i) Explain all types of point defects with neat sketche. (10)

ii) Compare edge, screw and mixed dislocation. (6)

(OR)

b) i) Construct a Burger's circuit in a simple cubic structure with positive edge dislocation and label its Burger vector. (10)

ii) Compare slip and twinning. (6)

13. a) Explain the various diffusion mechanism and Krikendall effect in solid with examples. (16)

(OR)

b) Explain the solidification of a pure metal in a metallic mould, giving details of the different types of grains that grow during the process. (16)

14. a) i) State and explain Hume-Rothery rules for substitutional solid solutions. (8)

ii) Discuss the development of microstructure in Eutectoid reaction. (8)

(OR)

b) i) What are solid solutions? Discuss the different types of solid solutions with neat sketche and examples. (8)

ii) Draw any one Ternary phase diagram and label the phases. (8)

15. a) Draw a neat sketch of the Fe-C equilibrium diagram and label the different regions. Write down the important phase reactions. Discuss the solidification behaviour of a i) 0.4 %C steel ii) 0.8% C steel and iii) 1.0 % C steel with relevant microstructures. (16)

(OR)

b) Explain the different types of plain carbon steels and also discuss the effects of various alloying elements on steels. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINGIEERING

18MT302 – Minerals Dressing, Fuels & Furnaces

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the terms 'Ore' and "mineral'. Give two examples for each.
2. State the applications of Rittinger's law.
3. What is the principle of jigging?
4. What is heavy media separation? Give an example.
5. Define blast furnace gas.
6. List out the classification of petroleum.
7. What are the ways to minimize the heat losses in furnace?
8. Differentiate regenerator and recuperator.
9. Define and classify the refractory.
10. List any two important properties of refractories.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the working principle, feed size, capacity and applications of the following crusher/mill (16)
    1) Gyratory Crusher and
    2) Vibratory mills.

(OR)

b) Describe the physical, chemical, mechanical properties, uses and occurrence in India of the following minerals (16)
    1) Pyrolusite and
    2) Magnetite.

12. a) i) Explain 'froth floatation'. Illustrate the use of various reagents used in this process. (8)

    ii) Briefly discuss about the working mechanism of induced roll magnetic separator. (8)

(OR)

b) i) With a neat sketch describe in detail about wet and dry magnetic separation methods. (8)

ii) Discuss any two mechanical classifiers with neat sketch. (8)

13. a) i) Explain various Rebuilding processes involved in refining of petroleum. (10)

ii) Discuss effect of excess air on combustion product with suitable examples. (6)

(OR)

b) i) Discuss the advantages, disadvantages and applications of solid, liquid and gaseous fuels. (10)

ii) Explain the following properties in terms of Liquid fuel. (6)

1) Specific gravity

2) Viscosity

3) Flash Point

14. a) Explain the construction and working of an induction furnace. (16)

(OR)

b) Explain then working principle and construction of direct electric arc furnace. (16)

15. a) i) Discuss the general requirements of a refractory material. (8)

ii) Discuss pyrometric cone equivalent (PCE) test for refractory. (8)

(OR)

b) i) Write short notes on fire clay and graphite refractories. (8)

ii) Explain the general method for manufacturing of refractories. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT302 – Mineral Dressing, Fuels and Furnaces

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State Rittinger's law and mention its applications.
2. What are main objectives of mineral processing?
3. What is the principle of jigging process?
4. What is heavy media separation? Give an example.
5. List any two solid fuels used in industries.
6. What are the purposes of testing the solid and gaseous fuels?
7. Define the term "Thermal efficiency".
8. List the advantages of induction furnace.
9. How are refractory materials classified? Give one example.
10. List the applications of fire clay refractories.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With neat sketch explain the following: (8)
    1) Closed and open circuit grinding,
    2) Roll crusher.

    ii) Describe the physical characteristics of different ores. (8)

    (OR)

    b) i) Discuss the working of gyratory and jaw crusher with neat sketch. (8)

    ii) Explain the purposes of sizing in industrial processes. (8)

12. a) i) With neat sketch, describe in detail about wet and dry magnetic separation methods. (8)

    ii) Explain the high tension electrostatic separator with neat sketch. (8)

    (OR)

b) i) Explain the mineral beneficiation process using pneumatic jigs and wilfley table with neat sketch. (8)

ii) Give the detailed account on the collectors used in froth flotation technique. (8)

13. a) i) Explain the different classification of coke and discuss the important properties of coke. (10)

ii) Discuss in detail about blast furnace gas with suitable examples. (6)

(OR)

b) i) Explain the different classification and composition of crude petroleum. (10)

ii) Write short notes on i) Natural gas and ii) Water gas. (6)

14. a) Draw the construction of cupola melting furnace and discuss the important steps and chemical reaction involved in the furnace. (16)

(OR)

b) Draw a schematic diagram of coreless induction melting furnace and discuss its principle, sequence of operation, advantages and applications. (16)

15. a) How is high alumina refractory brick manufactured? Explain the thermal properties that are significant in the selection of a refractory material. (16)

(OR)

b) Explain the manufacturing of carbon and graphite refractories and list their properties and applications. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT303 – Metallurgical Thermodynamics and Kinetics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define system and Surrounding.
2. State first law of thermodynamics.
3. Write down the equation for Entropy with its unit.
4. Differentiate second law and third law of thermodynamics.
5. Define Gibb's free energy.
6. Give formula for Gibb's phase rule.
7. Compare Raoult's law and Henry's law.
8. Define regular solution.
9. What is an electrochemical cell?
10. Why do we need to find the rate of reaction?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain path and state properties with examples and discuss the thermodynamic equilibrium processes in detail. (16)

(OR)

b) Discuss briefly the Hess's law and Kirchhoff's law. (16)

12. a) Elaborate on entropy interpretation using Carnot cycle for determining the efficiency. (16)

(OR)

b) Discuss in detail about the thermodynamic potentials Gibb's Helmholtz equation and Maxwell equation. (16)

13. a) Describe the thermodynamic potentials Fugacity, Activity and Equilibrium constant with relevant equations. (16)

(OR)

b) Discuss P-G-T diagrams for any two alloy systems in detail. (16)

14. a) With neat sketches elaborate in detail on Real solutions and Ideal solutions. (16)

(OR)

b) State Sievert's law and write brief note on principle and applications of Gibb's-Duhem equation. (16)

15. a) Discuss the determination of thermodynamic quantities using Reversible Electrochemical Cells. (16)

(OR)

b) Explain the effect of concentration on the reaction rate for second and third order reactions. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT303 – Metallurgical Thermodynamics and Kinetics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is a thermodynamic path? Differentiate it from a thermodynamic state.
2. Define Enthalpy.
3. What is the significance of Carnot's cycle in thermodynamics?
4. Define the Zeroth Law of thermodynamics and its application.
5. What is Trouton's rule, and where is it applied?
6. Define Le Chatelier's principle.
7. Differentiate between partial and integral molar quantities.
8. State Henry's law and mention its significance in real solutions.
9. Define the Nernst equation and its application in electrochemical cells.
10. What is the Arrhenius equation, and how is it used to calculate activation energy?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the Classifications of the thermodynamic system and surrounding with suitable examples. (10)

ii) The enthalpy changes for the following reactions are as follows: (6)

$2B + 3H_2 + 3O_2 + aq. = 2H_3BO_3(dil.sol)$;

$\Delta H°_{298} = -512.8$ kcal(-2,146.6 kJ).

$B_2O_3 + 3H_2O(l) + aq. = 2H_3BO_3(dil.sol)$

$\Delta H°_{298} = -4.12$ kcal (-17.24 kJ).

$H_2 + \frac{1}{2} O_2 = H_2O$ (l);

$\Delta H°_{298} = -68.73$ kcal (-287.57 kJ).

Calculate the standard heat of formation of B_2O_3 in terms of per mole of B_2O_3 and per g of B_2O_3. Atomic weights of B and 0 are 10.82 and 16.0 respectively.

(OR)

b) i) Discuss in detail about the thermodynamic equilibrium with respective equations. (10)

ii) The reduction of iron oxide in the blast furnace proceeds according to the following reactions: (6)

$3Fe_2O_3 + CO = 2Fe_3O_4 + C0_2$;

$\Delta H°_{298}$ = -12.7 kcal (-53.1kJ)

$Fe_3O_4 + CO = 3FeO + CO_2$;

$\Delta H°_{298}$ = + 9.8 kcal (+41.0 kJ)

$FeO + CO = Fe + CO_2$

$\Delta H°_{298}$ = - 4.4 kcal (- 18.4 kJ)

Calculate $\Delta H°_{298}$ for the reaction

$Fe_2O_3 + 3C0 = 2Fe + 3CO_2$

12. a) i) Derive the Maxwell's relations by using appropriate thermodynamic principles. (10)

ii) Calculate the changes in heat content and entropy associated with the reduction of the oxides of iron and aluminium at 25°C, according to the following reactions: (6)

$Fe_2O_3 + 3C = 2Fe + 3CO$

$Al_2O_3 + 3C = 2Al + 3CO$

Given:

$2Fe + \frac{3}{2} O_2 = Fe_2O_3$;

$\Delta H°_{298}$ = -200,000 cal (-836,800 J).

$2Al + \frac{3}{2} O_2 = Al_2O_3$;

$\Delta H°_{298}$ = -404,000 cal (-1,690,336 J).

C (graphite) + $\frac{1}{2} O_2$ = CO;

$\Delta H°_{298}$ = -25,000 cal (-104,600 J).

Entropies of CO, Al, Fe, Al_2O_3,Fe_2O_3 and C(graphite) at 25°C are 47.3, 6.7, 6.5, 12.8, 21.5, and 1.39 cal/deg/mole (197.9, 28.0, 27.2, 53.6, 89.9, and 5.8 J/K/mol), respectively.

(OR)

b) i) Determine which of the following metals can be produced by the reduction of metal sulphide with metal oxide at 1000°C (1273 K) and 1 atm pressure (101,325 N/m²). (10)

Given:

$Cu_2S + 2Cu_20 = 6Cu + S0_2$;

$\Delta G° = 28,530 + 14.06\ T \log T - 70.43\ T$ cal

$PbS + 2Pb0 = 3Pb + S0_2$;

$\Delta G° = 98,440 + 16.1\ T \log T - 121.14\ T$ cal

$Ni_3S_2 + 4NiO = 7Ni + 2S0_2$;

$\Delta G° = 139,800 - 98.59\ T$ cal

ii) The heat capacity of solid magnesium at 1 atm pressure in the temperature range from 0° to 560°C (273 to 833 K) is given by the expression (6)

$Cp = 6.20 + 1.33 \times 10^{-3}\ T + 6.78 \times 10^{4}\ T^{-2}$ cal/deg/mole

Determine the increase of entropy per mole for an increase of temperature from 27° to 527°C (300 to 800 K) at 1 atm (101325 N/m²) pressure.

$\Delta G_{1000}, <Cr_2O_3>$ = - 205.5 kcal/mole

$\Delta G_{1000}, <MoO_3>$ = - 120.0 kcal/mole

$\Delta G_{1000}, <H_2O>$ = - 45.5 kcal/mole

Comment on your result.

13. a) Discuss the three thermodynamic potentials-fugacity, activity, and equilibrium constant-along with their respective equations and significance. (16)

(OR)

b) What are P-G-T diagrams and analyze the thermodynamic behavior of alloy systems using free energy-composition diagrams? (16)

14. a) Derive the Gibbs-Duhem equation and explain its applications in determining activity coefficients. (16)

(OR)

b) Analyze the concept of mixing and excess functions for regular solutions with relevant equations. (16)

15. a) Explain the thermodynamic quantities determined using reversible cells and their significance in electrochemical processes. (16)

(OR)

b) Analyze the kinetic behaviour of first and second order reaction and derive its rate law. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT601 – Non-ferrous Extractive Metallurgy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Name a few ores of metals which are abundant in India.
2. What is calcination process?
3. Name a few metals which are extracted through hydrometallurgy route.
4. What is cementation process?
5. Give the differences between aqueous electrolysis and fused salt electrolysis.
6. State the principle of fire refining.
7. State why sulfide ores are usually extracted by pyrometallurgical processes.
8. Give names of a few ores of nickel and aluminium.
9. State the names of different processes of gold extraction.
10. Name the ores of uranium and zirconium.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What is sintering of ores and explain one method of sintering of ores in detail? (16)

(OR)

b) Explain the principle of reduction of certain oxide ores using carbon as the reducer with the support of Ellingham's diagram. (16)

12. a) Explain the recovery of metallic values from the leach liquor by solvent extraction process with required sketches and block diagrams. (16)

(OR)

b) Explain the principle and practice of gaseous reduction of metallic values in aqueous leach solutions with required schematics. (16)

13. a) Explain the extraction of aluminium metal form the fused bath of alumina through electrolytic processes. (16)

(OR)

b) With neat sketches explain electrolytic refining and zone refining processes in detail. (16)

14. a) With a flow sheet, explain the extraction and refining of copper from its sulfide ores. (16)

(OR)

b) Explain the Pidgeon's process of producing magnesium from dolomite ore. (16)

15. a) With a flow sheet, explain the Kroll's process of titanium extraction from illmenite ore. (16)

(OR)

b) Explain the different methods of extraction of silver from its ore. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT502 – Forming Processes

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Prove that $\sum S_{ii} = 0$.
2. Differentiate between dynamic recovery and dynamic recrystallisation.
3. Define spread in forging.
4. Determine maximum possible reduction for cold rolling of 300 mm thick slab when μ is 0.08 and roll diameter is 600 mm. What is the maximum reduction on same mill for hot rolling if $\mu = 0.5$?
5. Is marble can be extruded? If so, how?
6. What is meant by tandem drawing?
7. What is meant by spring back and how it can be avoided?
8. Name any two explosives used in explosive forming.
9. Why compacts of fine powder sinter faster than compact of coarse powders?
10. What are the limitations of powder metallurgy?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the relative ease of hot work and cold work for the following metals: Aluminium, Lead, Steel and Titanium. (16)

(OR)

b) Compare the advantage and disadvantages of the tension test, compression test, plane strain compression test and torsion test for determining the flow stress for metal working process. (16)

12. a) i) Explain how front and back tension affects the rolling load. Schematically represent the distribution of load in no tension condition and with back and front tension. (8)

ii) Write briefly about various forging defects, causes and remedial actions. (8)

(OR)

b) i) Explain a few open die forging processes with neat sketches. (8)

ii) What is meant by mill spring and how it is controlled in rolling? (8)

13. a) i) The actual draw stress is less than ideal draw stress in tube drawing with moving mandrel. Explain how it is achieved? (8)

ii) With a neat sketch explain any two types of extrusion. (8)

(OR)

b) i) Write short notes on Equal channel Angular extrusion and Super plasticity. (8)

ii) Determine maximum possible reduction in drawing for (i) non strain hardening material (ii) annealed low carbon steel and (iii) annealed copper (Assume data suitably with proper justification). (8)

14. a) i) With neat sketch explain electro hydraulic forming. (8)

ii) The anisotropy of sheet metals of two heats is given in table. (8)
Which is preferred for deep drawing and why?

Normal anisotropy	Heat A	Heat B
R_0	1.5	2.0
R_{45}	1.5	1.5
R_{90}	1.8	1.8

(OR)

b) i) Explain how forming limit diagrams are drawn? What is its significance in sheet metal forming? (8)

ii) With a neat sketch explain Dynapak method. (8)

15. a) i) Explain principle and working of Cold Isostatic Pressing unit. (8)

ii) In what way the tooling for powder rolling differs from conventional rolling? Explain. (8)

(OR)

b) i) Explain the various steps involved in powder metallurgy manufacturing. (8)

ii) Explain the design considerations practiced in manufacture of powder metallurgy components. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VI & VII Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT602 – Forming Processes

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write Von Mises equation in metal forming.
2. Compare Bulk forming and Sheet metal forming.
3. List the possible defects during forging process.
4. Recall the terms: Bloom and Slab.
5. Compare direct and indirect extrusion.
6. What is Hydrostatic extrusion?
7. What is Shearing?
8. What is plastic strain ratio?
9. List the advantages and disadvantages of powder metallurgy.
10. What is liquid phase sintering?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Calculate the forming load using Slab analysis with neat sketches. (16)

(OR)

b) Analyze the following variables in metal forming operations. (16)

i) Temperature ii) Strain rate

iii) Metallurgical Structures iii) Residual stresses.

12. a) i) Discuss the types of presses and hammers used in forging operations. (8)

ii) Discuss the open die and closed die forging operations. (8)

(OR)

b) i) Discuss the forces and geometrical relationship in rolling process. (8)

ii) Discuss the types of rolling mills with neat sketches. (8)

13. a) i) Explain the production of seamless pipe and tube. (8)

ii) Explain the Equal Channel Angular Extrusion. (8)

(OR)

b) i) Explain the drawing of wires and tubes. (8)

ii) Explain the Super plasticity behavior in metals. (8)

14. a) Discuss the following sheet metal forming processes (16)
   i) Bending
   ii) Spinning
   iii) Stretch forming
   iv) Deep drawing.

(OR)

b) Discuss the various high velocity forming methods with neat sketches. (16)

15. a) Explain any two powder production methods with neat sketches. (16)

(OR)

b) Explain the Hot Isostatic Pressing (HIP) of powders with neat sketches. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT503 – Steel Making

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the V-ratio in steelmaking, and why is it significant?
2. Mention the conditions under which phosphorus can be removed during the steelmaking process.
3. What is the principle behind Open Hearth Steel making process?
4. What are the various types of scrap charges used in an Electric Arc Furnace, and how do they affect the steelmaking process?
5. During the steel refining process in the LD Converter, is steel scrap added? Justify your answer.
6. Why is a convergent-divergent nozzle design preferred for the oxygen lance in LD steelmaking?
7. What is the role of stirring in a Ladle Furnace, and why is it essential?
8. What is the purpose of injection metallurgy in the steelmaking process, and how does it contribute to quality improvement?
9. Recommend a suitable material for moulding steel ingots and explain why this material is preferred.
10. How can segregation be minimized during the continuous casting process?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail the role of carbon and silicon reactions in the steel-making process. (8)

ii) What are the different raw materials used in the steel-making process? Discuss their importance, functions, and the various classes of each raw material. (8)

(OR)

b) i) What is slag in steel making? Discuss its functions, composition, and properties. (8)

ii) Explain the significance of deoxidation during steel production. Discuss the thermodynamics, kinetics, and mechanism of deoxidation in the steel-making process. (8)

12. a) i) Describe the constructional features of acid open hearth process. (8)

ii) Discuss external treatments used to remove sulfur, phosphorus, and silicon from steel. (8)

(OR)

b) i) Differentiate between the Acid and Basic Bessemer process. (8)

ii) What are the modern developments in Electric Arc Furnace (EAF) technology with respect to furnace design and operational features? (8)

13. a) i) Discuss the key characteristics of the LD steel-making process. (8)

ii) Illustrate the Kaldo steel-making process with a detailed diagram and explanation. (8)

(OR)

b) i) Explain the working principle of the oxygen bottom plowing process in steel making, supported by a schematic diagram. (8)

ii) Describe the principle and process of the Q-BOP steel-making method. (8)

14. a) i) Analyze the importance of decarburization in steel refining and explain the various methods of decarburization. (8)

ii) Explain the principle and construction of the Argon-Oxygen Decarburization (AOD) process with a neat sketch. (8)

(OR)

b) i) Investigate the significance of Tundish Metallurgy in steel production, providing suitable examples. (8)

ii) What is meant by degassing of steels? Explain two vacuum degassing methods with schematic sketches. (8)

15. a) i) Describe the characteristics of killed, rimmed, and capped steels, highlighting their differences and applications. (8)

ii) Provide a brief explanation of the S-type continuous casting process, supported by a neat sketch. (8)

(OR)

b) i) Analyze the common defects encountered in continuously cast products and suggest suitable remedies for each. (8)

ii) Evaluate the current state of the steel-making industry in India and globally, focusing on trends, challenges, and opportunities. Assess how these factors influence the future growth and sustainability of the industry. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT502 – Steel Making

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term 'de-oxidation' in the context of steel making.
2. List out the functions of slag in steel making.
3. What are the main reasons for the decline of the Open Hearth Process?
4. List the constructional features of an Electric Arc Furnace.
5. What are the operational features of the LD process?
6. Differentiate between the Top blown and Bottom blown basic oxygen processes.
7. What is the purpose of the AOD process in stainless steel making?
8. Define the term 'tundish metallurgy'.
9. What the differences are between killed, rimmed, and capped steels?
10. List common defects found in continuous casting products.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the physico-chemical principles and kinetic aspects of carbon and phosphorus reactions in steel making. (16)

(OR)

b) Analyze the oxygen transport mechanism in steel making and discuss the reactions occurring at the slag-metal interface. (16)

12. a) Discuss the production practices for Plain Carbon Steels, Low Alloy Steels, and Stainless Steels in electric steel making. (16)

(OR)

b) Explain the modern approaches to steel making, focusing on external treatments to remove sulfur, phosphorus, and silicon. (16)

13. a) Explain the design and operational features of the LD vessel and lance in the top-blown process. (16)

(OR)

b) Discuss the principles and mechanisms of refining in the Bottom blown basic oxygen conventional process (Q-BOP/OBM/LWS). (16)

14. a) Explain the decarburization techniques used in stainless steel making, focusing on the AOD, VOD, and CLU processes. (16)

(OR)

b) Describe the principle and function of degassing in vacuum treatment, detailing the different degassing processes used. (16)

15. a) Discuss the solidification process of steel in ingot molds and explain the associated defects and their remedies. (16)

(OR)

b) Explain the construction features and operational principles of a typical continuous casting machine. Discuss the current status and quality control measures in continuous casting technology. (16)

Registration Number :

Government College of Engineering, Salem

(An Autonomous Institution, Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2025

Semester: V [Full Time]

Metallurgical Engineering

22MT503/18MT502 – STEEL MAKING

(Regulations 2022/2018/2018A)

Time : 3 Hours | Maximum Marks : 100

PART A(10 x 2 = 20 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
1.	Give the condition for steel making process.	2	K2	1
2.	Mention the role and significance of slag in the steel-making process.	2	K1	1
3.	What were the key factors leading to the decline of the open-hearth steel-making process?	2	K1	2
4.	Give the principle of Electric Arc Furnace.	2	K2	2
5.	What is LD Process?	2	K3	3
6.	State the principle of the KALDO process to improve the refining of steel during production.	2	K2	3
7.	Expand AOD and VOD.	2	K1	4
8.	What are macro and micro inclusions?	2	K2	4
9.	Differentiate between killed and rimmed steels.	2	K2	5
10.	Give the significance of mould powder in continuous casting.	2	K3	5

PART B(5 x 16 = 80 Marks)

Answer **ALL** Questions

Q. No		M	BTL	CO
11. a)	Discuss the thermodynamic reactions, equations and kinetic factors influencing the removal of Carbon and Silicon during steel making.	16	K2	1
	(OR)			
b)	Discuss the functions, properties and theories of slag and evaluate the effectiveness of various slag compositions in achieving desired steel properties and cleanliness.	16	K2	1

Q. No		M	BTL	CO
12. a)	Compare and contrast the acid and basic Bessemer processes, highlighting differences in raw materials and chemical reactions with neat sketches.	16	K2	2
	(OR)			
b)	Discuss briefly the constructional and operational characteristics of electric arc furnaces and their role in producing steels.	16	K2	2
13. a)	What is the function of the lance in the LD process, and describe the key characteristics of the top-blown LD process and its significance in steel making.	16	K3	3
	(OR)			
b)	With neat sketches, discuss and compare the constructional and operational characteristics of ROTOR & KALDO processes.	16	K3	3
14. a)	What is decarburization? Explain the process of producing stainless steel by AOD and VOD with neat figures.	16	K3	4
	(OR)			
b)	Compare the principles and benefits of RH and DH degassing processes in secondary steel making with neat labelled diagrams.	16	K3	4
15. a)	Discuss the causes of various ingot defects and propose suitable remedies to minimize them in casting process.	16	K2	5
	(OR)			
b)	Discuss the construction features operational aspects and advantages of a modern continuous casting machine with neat sketches.	16	K2	5

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT504 – Corrosion Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is EMF series?
2. What is exchange current density?
3. List the factors that causes stress corrosion cracking.
4. Give the reasons for fretting corrosion.
5. What is sensitization?
6. State any two ASTM standards for corrosion testing.
7. State the preventive method for intergranular corrosion.
8. Give any two examples for corrosion inhibitors.
9. How to prevent scale formation in boilers?
10. What is the type of corrosion predominant in petroleum refineries?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Discuss the electrochemical behavior of active-passive metals in detail.	(16)
		(OR)	
	b)	Explain the various regions in pourbaix diagram of iron in water with a neat sketch.	(16)
12.	a)	Discuss the mechanisms of stress corrosion cracking and corrosion fatigue.	(16)
		(OR)	
	b)	Describe the causes and remedial measures for high temperature oxidation and hydrogen damage.	(16)

13. a) Explain the methods of linear polarization used for corrosion rate measurements. (16)

(OR)

b) Explain any two ASTM standard tests for Intergranular corrosion. (16)

14. a) With examples, explain chemical and mechanical methods by which corrosion may be prevented. (16)

(OR)

b) With examples, explain the mechanism of preventing corrosion by organic and inorganic coatings. (16)

15. a) Explain the mechanisms involved in corrosion of materials used for boilers. (16)

(OR)

b) Explain the possible corrosion mechanisms involved in corrosion of materials used in automotive industry. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT503 - Corrosion Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare EMF and Galvanic series.
2. What is Exchange current density?
3. What is hydrogen damage?
4. Recall the term: Freeting Corrosion.
5. Mention the purposes of corrosion testing.
6. List the ASTM standards used for SCC.
7. What are the mechanical methods used for corrosion protection?
8. List the any two corrosion inhibitors.
9. List the common types of corrosion in automobiles.
10. Name any one type of corrosion common in
    i) Boilers.
    ii) Petro chemical industries.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw the Pourbaix diagram of iron & aluminium and explain its importance. (16)

(OR)

b) Explain the Mixed Potential theory. (16)

12. a) Explain in detail stress corrosion cracking and pitting corrosion of metals. (16)

(OR)

b) Explain in detail Intergranular corrosion and Corrosion fatigue in metals. (16)

13. a) Analyze the susceptibility tests of IGC and Pitting Corrosion. (16)

(OR)

b) Analyze the Tafel extra polarisation and Linear polarisation methods to measure the corrosion rate in metals. (16)

14. a) Describe the various types of metallic, non metallic and inorganic coatings in corrosion protection. (16)

(OR)

b) Describe the Cathodic and Anodic protection of metals with suitable examples. (16)

15. a) Give a detailed account on types of corrosion in chemical processing and automobile industries with prevention methods. (16)

(OR)

b) Discuss in detail corrosion on water side of the boiler, fire side of the boiler and their preventive methods. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT505 – Casting Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the different types of foundries?
2. How patterns differ from the drawing of the casting?
3. What are the basic requirements for core sands?
4. What are the Principal ingredients of moulding sand?
5. Blind riser is always kept smaller than the open riser. Why?
6. What are the primary functions of gating system?
7. What is principle of induction melting furnace?
8. Steel casting cannot be melted in cupola furnace. Why?
9. Write any two ferro-alloys used for adjusting chemical composition of steel casting.
10. What are the main advantages of automation in foundries?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss in detail the different types of allowances used in patterns with required samples. (8)

ii) Discuss in detail the various stages of casting production with a neat flow chart. (8)

(OR)

b) i) Explain how green strength and permeability of sands are affected by (8)

(a) grain shape

(b) grain size

(c) grain size distribution.

ii) Explain clearly how the following sand differ from each other with respect to ingredients and properties. (8)

(a) Facing sand (b) Backing sand and (c) core sand

12. a) Describe the procedures involved in shell moulding process for production of metal castings with sketches. (16)

(OR)

b) Describe the procedures involved in investment casting process for production of metal castings with sketches. (16)

13. a) Calculate the pouring time and gating dimensions for a steel casting with dimension of 100 diameter and 300 mm length. Assume sprue height of 300 mm. Use the gating ratio of 1:2:1.5, density of 7.8 g/cc and casting yield of 50 %. (16)

(OR)

b) Discuss about the different methods used to calculate the dimensions of the riser in castings. Give a detailed account of different methods to improve the riser efficiency in the metal casting process. (16)

14. a) Draw the construction of cupola melting furnace and discuss the important steps and chemical reactions involved in each stage during melting. (16)

(OR)

b) 5 tonnes of grey cast iron castings with 2.15 % Silicon are required. The charge materials available are as follows: (16)

Charge materials	Elements (in wt %)	
	Si	P
Steel scrap	2.2	0.8
Pig iron A	3	1.5
Pig iron B	2	0.4

Assume a loss of 10 % for Si content during melting. There is no loss or gain for phosphorus content during melting. Two tones of scrap are to be remelted. Calculate the proportions of the pig iron and make necessary charge additions.

15. a) Draw a typical layout of a mechanized foundry. Discuss the important features of mechanization in each and every sections of foundry with respect to productivity and performance. (16)

(OR)

b) Explain the causes and remedies for the following castings defects with fishbone diagrams. (16)

i) Blow holes ii) Shrinkage iii) Sand inclusion and iv) hot tear

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22MT506 – Welding Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term open circuit voltage.
2. Distinguish between GMAW and FCAW.
3. What is autogenous welding?
4. Compare the cold pressure welding and hot pressure welding.
5. Differentiate between power density and heat input.
6. Show the types of PAW.
7. Define the term capillary action.
8. Compare the brazing and braze welding.
9. What is dilution in surfacing?
10. What is air–carbon arc cutting?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Classify the welding process based on various heat sources and shielding methods. (8)

ii) Outline the overview of various welding power sources used in terms of duty cycle, heat input, polarity and current. (8)

(OR)

b) i) Compare and contrast the principle, merits and applications of SMAW and SAW. (8)

ii) Compare and contrast the principle, demerits and applications of GMAW and GTAW. (8)

12. a) i) Summarize the principle, merits, demerits and applications of Induction pressure welding. (8)

ii) Identify the various defects generated by friction stir welding process with their causes and remedial measures. (8)

(OR)

b) i) Summarize the principle, merits, demerits and applications of explosive welding. (8)

ii) Identify the various defects generated by diffusion welding process with their causes and remedial measures. (8)

13. a) i) Compare the principle, merits, demerits and applications of ESW and EGW. (8)

ii) Organize the principle, merits, demerits and applications of EBW in detail with sketch. (8)

(OR)

b) i) Compare the principle, merits, demerits and applications of resistance spot welding and resistance seam welding. (8)

ii) Organize the principle, merits, demerits and applications of SW in detail with sketch. (8)

14. a) i) Examine the significance of wetting characteristics and joint design in brazing process. (8)

ii) Identify the principle, merits, demerits and applications of Dip brazing process. (8)

(OR)

b) i) Identify the principle, merits, demerits and applications of laser soldering process. (8)

ii) Examine the various types of filler materials and fluxes used in soldering process. (8)

15. a) i) Compare the types of surfacing techniques with neat sketches. (8)

ii) Organize the step by step procedure for hardfacing by FCAW. (8)

(OR)

b) i) Organize the principle of operation, cutting equipment and application of metal powder cutting process. (8)

ii) Compare the electron beam cutting and laser beam cutting process in terms of principle of operation, cutting equipment and applications. (8)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT701 – Characterization of Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State whether specimen polishing is mandatory for metallographic examination. Justify your statement.
2. List the application of quantitative metallography.
3. Draw schematic sketches of X-ray spectrum for a metal and for a glass. Why is the spectrum different for metal and glass?
4. What is GIXRD? List its applications.
5. What is meant by "Selected Area Diffraction (SAD)"? How is SAD used for materials characterization?
6. Suggest an electron optical technique for fractography. Justify your suggestion.
7. What are Auger electrons?
8. State the working principle of X-ray Photoelectron Spectroscopy.
9. Differentiate atomic force microscopy and scanning electron microscope.
10. List the applications of Differential Thermal Analysis (DTA).

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain with a sketch the principle, construction and working of a metallurgical microscope. (8)

ii) What is meant by lens aberration? Explain with schematic sketches the various lens aberrations with suggestion for remedial measures for each of them. (8)

(OR)

b) i) Discuss the various stages in the preparation of specimen preparation for metallographic studies. (8)

ii) Explain the working principle of polarised light illumination microscopy. State its advantages and applications. (8)

12. a) i) Derive with schematic sketch Bragg's law applicable for X-ray diffraction. Explain how Bragg's law is useful for materials characterization. (8)

ii) Explain the measurement of stress in materials using X-ray diffractometer. (8)

(OR)

b) i) Determine the crystal structure and lattice parameter of an element whose X-ray diffraction data is as given below: (8)

Copper X-ray Source with λ = 1.5406 Å									
Peak No	1	2	3	4	5	6	7	8	9
2θ(in degrees)	22.72	32.56	39.90	46.41	52.27	57.71	67.73	72.46	77.07

ii) Explain using schematic sketches the different x-ray methods. (8)

13. a) i) Discuss on the various signals produced during electron – specimen interaction. (8)

ii) Explain the different sample preparation methods used for Transmission Electron Microscopy (TEM). (8)

(OR)

b) i) Explain with schematic sketch the principle, construction and working of Scanning Electron Microscope (SEM). (8)

ii) Describe with schematic sketch the principle, instrumentation and working of Energy Probe Micro Analyser (EPMA). (8)

14. a) i) Explain with schematic sketch the principle, construction and working of Auger Electron Spectroscopy (AES). (8)

ii) Describe with schematic sketch the principle, instrumentation, working and applications of X-ray Fluorescence Spectrometer (XFS). (8)

(OR)

b) i) Explain with schematic sketch the principle, construction and working of Secondary Ion Mass Spectrometer (SIMS). (8)

ii) Describe with schematic sketch the principle, instrumentation, working and applications of Optical Emission Spectrometer (OES). (8)

15. a) i) Explain the materials characterization using Field ion microscopy (FIM). (8)

ii) Discuss the materials characterisation using Atomic Force Microscopy (AFM). (8)

(OR)

b) i) Discuss the working principle, instrumentation and applications of differential scanning calorimetry (DSC). (8)

ii) Describe the working principle, instrumentation and applications of Thermo Gravimetric Analysis (TGA). (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

VII Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT702 – Introduction to Industrial Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Industrial Management.
2. List the functions of a CEO.
3. State the purpose of planning.
4. What is Departmentalization?
5. Why is Organizational Behaviors so important in an enterprise?
6. Mention the types of Perception.
7. List out the barriers for effective communication.
8. Give the advantages of Group Decision.
9. What is ERP?
10. What is the significance of Strategic Management?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the functions of management in detail. (8)

ii) List out the tools of scientific management in brief. (8)

(OR)

b) i) Write brief note on Individual Ownership, Partnership and Joint Stock companies. (8)

ii) Explore the duties of the following in an Organization: (8)
   1. Share Holders
   2. Board of Directors

12. a) Why strategies are important in management and explain its types. (16)

(OR)

b) Define Staffing and also explain the procedure for recruiting an employee and Training methods. (16)

13. a) Discuss in detail about the role and functions of a manager. (16)

(OR)

b) Why individual's behavior is important in an organization and also states the causes of individual's behavior that affect the Environment of an organization. (16)

14. a) Discuss the characteristics of formal and informal groups in an organization. (16)

(OR)

b) Explain in detail about the types of group conflicts in an organization. (16)

15. a) i) Discuss in Brief about Management by Exception. (8)

ii) Elaborate the importance of SWOT Analysis for career planning. (8)

(OR)

b) i) Write the Importance of Information technology and Decisions support system in an organizational management. (8)

ii) Write a short note on: (8)

1. Supply Chain Management
2. Activity Based Management

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – Nov/Dec 2024

V Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT504 – Introduction to Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the three stages in measurement system.
2. Mention the applications of Sensors.
3. What are the types of limit gauges?
4. What are the instruments used for measurement of Flatness and roundness?
5. What are the strain gauge rosettes?
6. List the methods for force measurement.
7. What is Vibrometer?
8. What is the use of hot wire anemometer?
9. List the electrical pressure measuring devices.
10. What is the working principle of thermometer?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the working principle of various types of Sensors. (16)

(OR)

b) Explain the working principle of displacement and velocity transducers. (16)

12. a) Discuss the working principle of Optical protractor and Sine bar with neat sketches. (16)

(OR)

b) Discuss the direct and indirect methods of measurement of surface finish. (16)

13. a) Explain the various methods of measurement of torque. (16)

(OR)

b) Explain the testing procedure for calibration with standards. (16)

14. a) Discuss the working principle of variable head flow meter, variable area flow meter and Open channel flow meter. (16)

(OR)

b) Explain the working principle of Velocity seismic accelerometer and Piezo electric accelerometer. (16)

15. a) Describe the working principle of Pyrometer and Manometer. (16)

(OR)

b) Discuss the various devices used in pressure measurement. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

(2022 Regulations)

WELDING TECHNOLOGY

22WTE51 – Corrosion and Surface Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How does EMF series differ from Galvanic series?
2. Define the term "Fretting corrosion".
3. What are the factors affecting the atmospheric corrosion?
4. Name any two standards for Pitting corrosion.
5. How does current density affect the corrosion of metals?
6. What is EIS? Give its advantages.
7. Give the mechanism of cathodic protection?
8. What are inhibitors? Give its advantages.
9. List any two industries where the pitting corrosion is more predominant?
10. What are the organic coatings?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss in detail the principles of direct and electro chemical corrosion with suitable examples. (16)

(OR)

b) Explain the different types of corrosion based on the galvanic series and give suitable application for each type of corrosion. (16)

12. a) Discuss the salient features of potentiodynamic polarization curve of a passive metal with sketches. Highlight the significance of electrochemical impedance spectroscopy on corrosion behavior of metals. (16)

(OR)

b) Explain the principle and working procedures of the following corrosion tests: (16)

(i) Hydrogen Induced Cracking test

(ii) Pitting corrosion tests

13. a) Explain why austenitic stainless steels are prone to intergranular corrosion during welding. Give a detailed account of preventive methods of intergranular corrosion. (16)

(OR)

b) Discuss in detail the corrosion behavior of Ti alloys with respect to (16)

(i) Pitting corrosion,

(ii) Crevice corrosion and

(iii) Stress corrosion cracking.

14. a) Explain the selection criteria of coating materials for wear and corrosion of the materials with samples. (16)

(OR)

b) Discuss the importance of electro plating and electroless plating on metallic materials with specific examples. Highlight the advantages and limitations of each of them. (16)

15. a) Explain the principle and operation sequence of any two physical vapor deposition techniques with neat sketches. (16)

(OR)

b) Discuss about the importance of chemical vapour deposition on improving surface of the substrate with suitable examples. Highlight the properties and applications of thin coatings. (16)