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
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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 (10) clay bricks?

    ii) List and explain the different types of refractory bricks. (6)

12. a) Explain with flow diagrams the dry and wet process of manufacturing (16) of cement.

    (OR)

    b) Discuss in detail about characteristic and function of coarse and fine (16) aggregates.

13. a) i) Explain the principles of hardened concrete. (8)

    ii) Write short notes on various types of special concrete. (8)

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)

Government College of Engineering :: Salem

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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   (16)
          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.
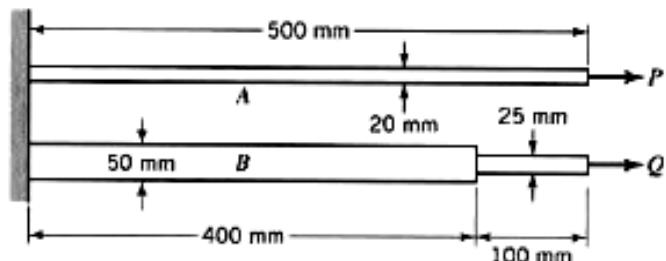

Figure.1

(OR)

b)   The shaft in Figure. 2 is supported in flexible bearings at A and D,   (16)
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.
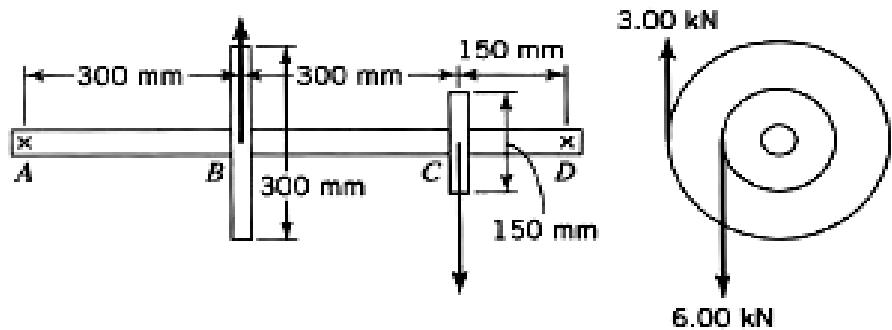
Figure.2

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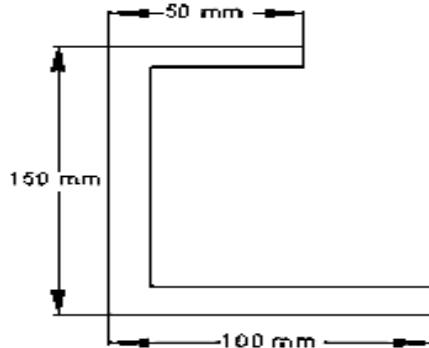
Figure.3

(OR)

b)   An extruded bar of aluminum alloy has the cross-section shown in   (16)
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.
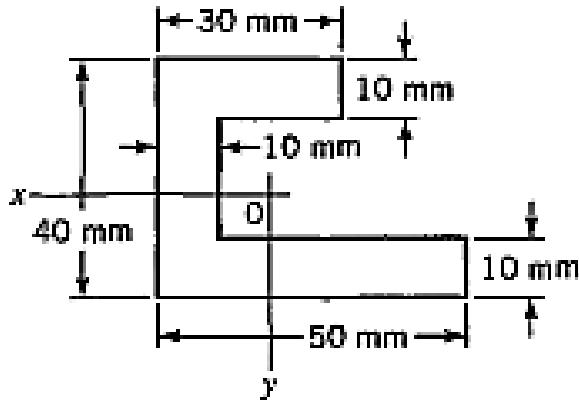
Figure.4

13. a) A crane hook whose horizontal cross-section through the centre of (16) 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.

(OR)

b) A rectangular plate is 2000 mm square and 20 mm thick, two (16) 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 x 10⁶ mm⁴). The plate supports a uniformly distributed load of 0.03 N/mm², E = 2.16 x 10³ N/mm². Calculate

    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 (16) Figure.5 for torsional shear stresses and torsional rigidity. Uniform thickness = t.
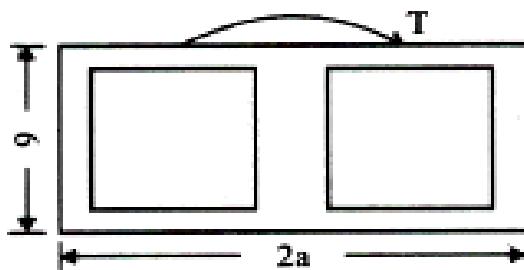

Figure.5

(OR)

b)   An aluminum alloy extruded section as shown in Figure.6 is (16) 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.
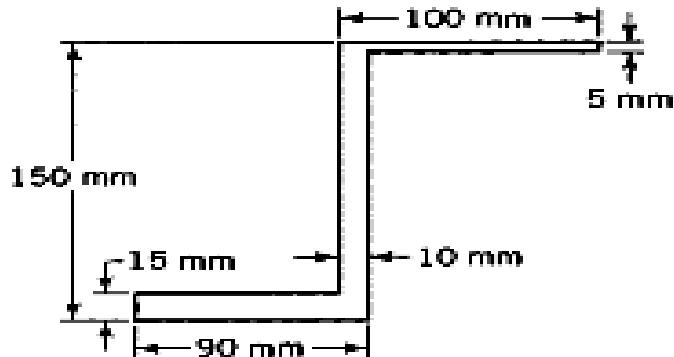
Figure.6

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)

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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)

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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   (10)
       test them.

    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 (6)
       respect to fluid dynamics in human body.

    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, (8)
tendons and cartilages.

(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 (8)
stages.

15. a) Discuss how finite element analysis, support to design of ergonomics (16)
with biomechanics principles.

(OR)

b) Discuss the various ergonomics factors to be considered for designing (16)
of computer workstation.

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Government College of Engineering :: Salem
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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 (16) cell power plants.

(OR)

b) Discuss the types of fuel cells suitable for stationary power generation (16) and their advantages over conventional power plants

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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 (16) of workers.

(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)

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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   (10)
         without a capacitive filter.

    ii) Explain the operation of negative clamping circuit.   (6)
                                    (OR)
    b) i) Explain the operation of forward biased and reverse biased PN   (8)
         junction Diode.

    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   (8)
         β = 150.

    ii) Differentiate between a BJT and FET.   (8)
                                    (OR)

b) i) Draw the symbol and equivalent circuit of a UJT. Explain the (8) operation of UJT with the help of its V – I characteristics.

ii) With neat sketches, necessary equations explain the drain and (8) transfer characteristics of MOSFET in depletion mode.

13. a) Derive the equations for voltage gain, current gain, input impedance (16) and output admittance for a BJT using low frequency h-parameter model for CC configuration.

(OR)

b) With circuit diagram and small signal equivalent circuit, explain the (16) common source amplifier using MOSFET.

14. a) Explain the operation of differential amplifier in detail and derive its (16) expressions.

(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 (16) amplifier in detail.

(OR)

b) Explain the operation of Wien bridge oscillator in detail and derive its (16) frequency of oscillation.

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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
                                    Part A   (10 x 2 = 20 Marks)
                              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?

                                    Part B   (5 x 16 = 80 Marks)

                              Answer ALL Questions

11. a)   Apply the principles of Quadrature Phase Shift Keying (QPSK) to show   (16)
         how it improves bandwidth efficiency in wireless systems compared to
         BPSK.

                                    (OR)
    b)   Describe the characteristics of a wireless channel, including path loss   (16)
         and fading and explain their impact on signal transmission in
         wireless communication systems.

12. a)   Explain in detail about the impedance matching with illustrations.   (16)
                                    (OR)
    b)   Explain how the imaginary and real components of impedance are   (16)
         matched in narrowband Low Noise Amplifier (LNA) impedance
         matching.

13. a) Illustrate the Gilbert Mixer distortion in high frequency case. (16)

(OR)

b) Explain the design of switching and sampling mixers and analyze (16) their distortion and noise characteristics in a wireless communication system.

14. a) How the ring oscillator operates and explains it with an example (16) circuit?

(OR)

b) Construct the architecture of DECT with relevant diagrams. (16)

15. a) Describe the function and importance of a quadrature local oscillator (16) generator in a transmitter system. What are the common techniques used to generate quadrature signals?

(OR)

b) What are the important design factors to consider when creating (16) power amplifiers for transmitters? How do these factors influence the amplifier's efficiency and linearity?

Register Number :

Time : 3 Hours   Maximum Marks : 100

Part A   (10 x 2 = 20 Marks)

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.

Part B   (5 x 16 = 80 Marks)

Answer ALL Questions

11. a)   Determine the current I_0 in the circuit using mesh analysis. Shown in   (16)
   figure.1.
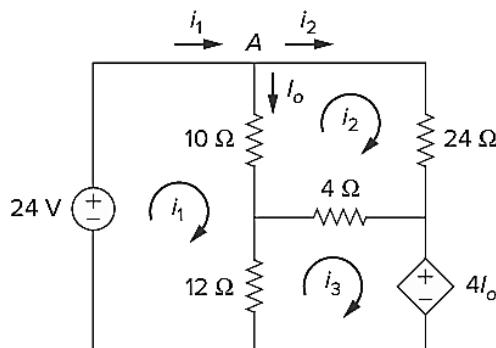
Figure.1

b) Determine the Thevenin equivalent at terminals a-b of the given (16) circuit. Shown in figure.2.
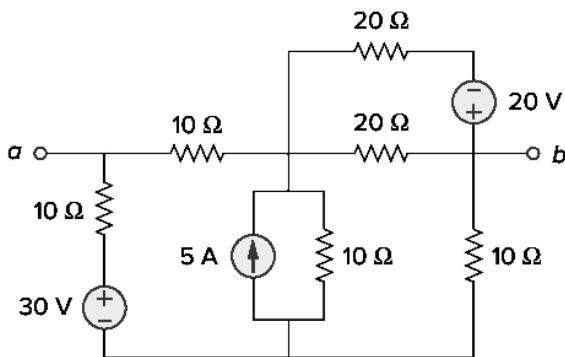

Figure.2

12. a) The Switch in the network of circuit is opened at t = 0.Find i(t)t>0 if, (16) a) L = 1/2 H and C = 1 F   b) L = 1H and C = 1 F. Shown in figure.3.
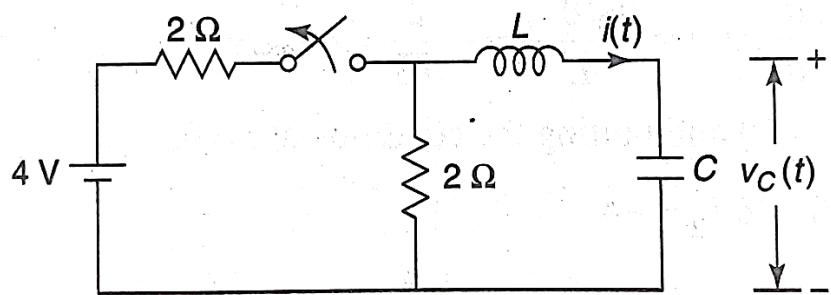

Figure.3

(OR)

b) Find the driving-Point admittance function and Draw Pole-Zero plot (16) for the network shown in figure.4.
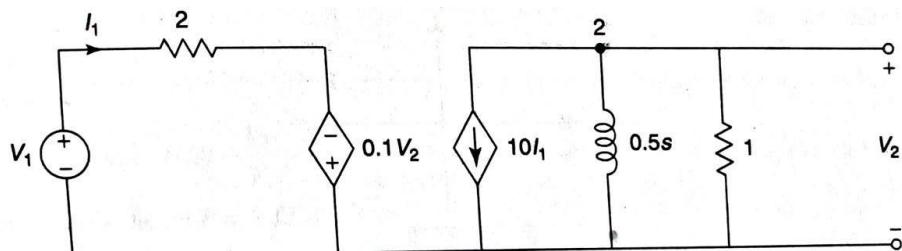

Figure.4.

13. a) Derive the expression for the resonant frequency of the parallel circuit (16) as shown in figure.5.


$v = V_m \sin \omega t$
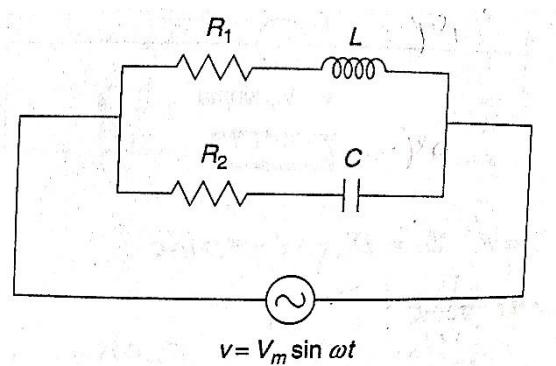
Figure.5.

(OR)

b) Obtain the dotted equivalent circuit for the coupled circuit shown in (16) figure.6 and find mesh currents. Also, find the Voltage across the capacitor.
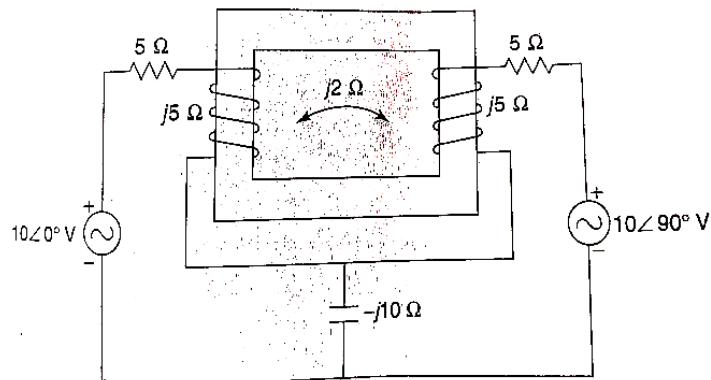
Figure.6.

14. a) Find Y parameters for the network shown in figure.7. (16)
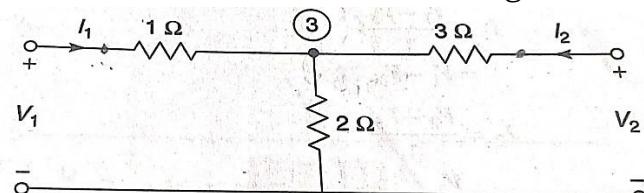
Figure.7.

(OR)

b) Obtain ABCD parameters for the network shown in figure.8. (16)
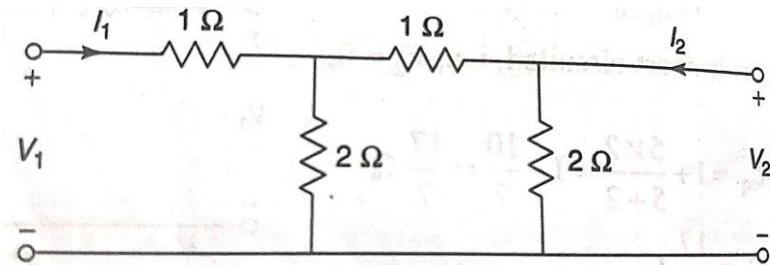
Figure.8.

15. a) Explain the concept of Positive Real Functions (PRFs). Provide the (16) definition and discuss the necessary and sufficient conditions for a function to be positive real.

(OR)

b) Describe the Foster and Cauer forms of LC network synthesis. (16) Discuss the synthesis procedure of LC networks using these forms with suitable examples.

Government College of Engineering :: Salem

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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   (16) waste management practices?

(OR)

   b)   How can the public health and economic aspects of waste storage be   (16) applied in effective waste management strategies?

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)

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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   (16)
        examples.

(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   (16)
        stiffness matrix.

13. a) Explain the process of Discretization. How does it affect the accuracy (16)
        of the analysis?

(OR)

    b) Discuss the role of convergence requirements in FEA. How do they   (16)
        influence the reliability of the analysis results?

14. a) Discuss the impact of choosing between subparametric, (16) isoparametric, and superparametric elements on the accuracy and convergence of the FEA results.

(OR)

b) i) Describe the role of Gauss quadrature. How does it enhance the (8) accuracy and efficiency of numerical integration in element stiffness matrices?

ii) What is static condensation? How does it simplify the solution (8) process, particularly for large-scale structures?

15. a) Describe briefly the Weighted Residual Methods in FEA. How do they (16) differ in terms of error minimization and application scope?

(OR)

b) i) Compare the Collocation method and the Galerkin method. Which (8) method offers better accuracy and under what conditions?

ii) Discuss the application and advantages of the Least Square method. (8) How does it differ from other weighted residual methods?

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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   (12)
           $u = ay^2 + by + c$ 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.

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/m³) (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/cm² (abs), find the absolute pressure at A. (12)

(Take density of water as 1000 kg/m³)
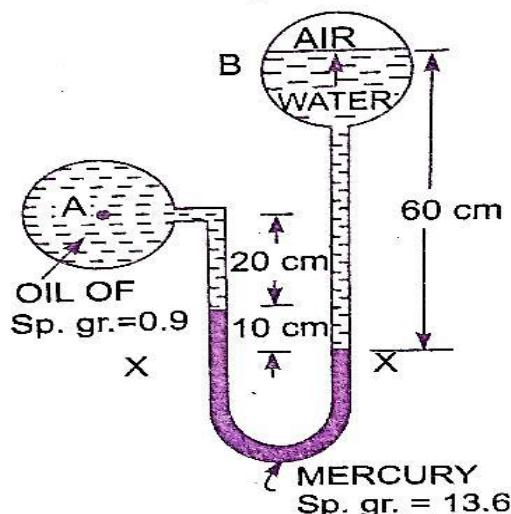
Figure.1

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/m³) (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/m³. (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 Ψ = 2 xy. 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)
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/cm². Find
the intensity of pressure at section 2. (Take density of water as
1000 kg/m³)

ii) A pitot static tube placed in the centre of a 250 mm pipe line has one (6)
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.

(OR)

b) Derive the Hagon-Poiseuille's equation for laminar flow of fluid in (16)
straight and circular pipe with proper assumptions and neat sketch.

14. a) i) An oil of specific gravity 0.9 and viscosity 0.06 poise is flowing (12)
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.

ii) Enlist any four minor losses with relevant formulae. (4)

(OR)

b) i) Find the displacement thickness, the momentum thickness and (10)
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.

ii) Discuss in detail about the boundary layer separation phenomena (6)
with neat sketch. Also give controlling methods.

15. a) Drag force (F) of a partially submerged body is a function of relative (16)
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.

(OR)

b) The efficiency(η) of a fan depends on density(ρ), viscosity of the (16)
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, $\eta = \varphi[\mu/(D^2\omega\rho), Q/(D^3 \omega)]$

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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)

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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/m³

    Safe Bearing Capacity of the Soil = 160 KN/m²

    Angle of internal Friction of Soil = 33⁰

    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   (60)
        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/m². Draw
        reinforcement detailing for the footing.

                        Part – B (Steel)   (1 x 40 = 40 Marks)

2. a) Design a column with single lacing system for given conditions to carry   (40)
        a factored axial load of 1500 KN. The effective height of the column
        is 4.2 m.

        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   (40)
        to support a UDL (live load) of 60 KN/m over the span with yield stress
        of steel as 250 N/mm². Use IS 800-2007 and steel tables.

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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   (10)
application. Take the example of turning, milling and grinding, and
suggest the type of cutting fluid used.

   ii) With a suitable diagram, explain the cutting tool angles of a   (6)
single-point cutting tool in an orthogonal plane.

(OR)

 b) i) What is meant by built-up-edge (BUE)? With a neat sketch explain   (10)
the formation of a BUE. Explain the conditions, which promote the
growth of BUE along with its consequences.

   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 (10) lathe? Show with the help of sketches how these are achieved?

    ii) A shaft piece of outer diameter 32 mm and 75 mm length is to be (6) 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.

(OR)

   b) i) Briefly explain with neat sketches the types of work-holding devices (10) that are commonly employed in automatic lathes. Specify their limitations.

    ii) A shaft piece of outer diameter 32 mm and 100 mm length is to be (6) 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/mm².

13. a) Give a schematic sketch of a shaper labeling important parts and (16) their functions.

(OR)

   b) i) Explain the various milling cutters used and give their application (10) and relative merits.

    ii) Explain the different types of hole types and the processes used for (6) manufacturing them.

14. a) i) Describe the grinding wheel structure with the help of a neat sketch (8) and state different bonding and abrasive materials used in it.

    ii) Compare and contrast grinding, honing, and lapping operations. (8)

(OR)

   b) i) Describe the continuous broaching machine and list its applications, (8) advantages and limitations.

    ii) What are the grinding process parameters that are of interest? (8) Explain their effect on the grinding performance and the wear rates.

15. a) i) Describe four main features of CNC machines that distinguish them (6) from conventional machine tools.

ii) Write the CNC part program for the following The component to be (10) 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.
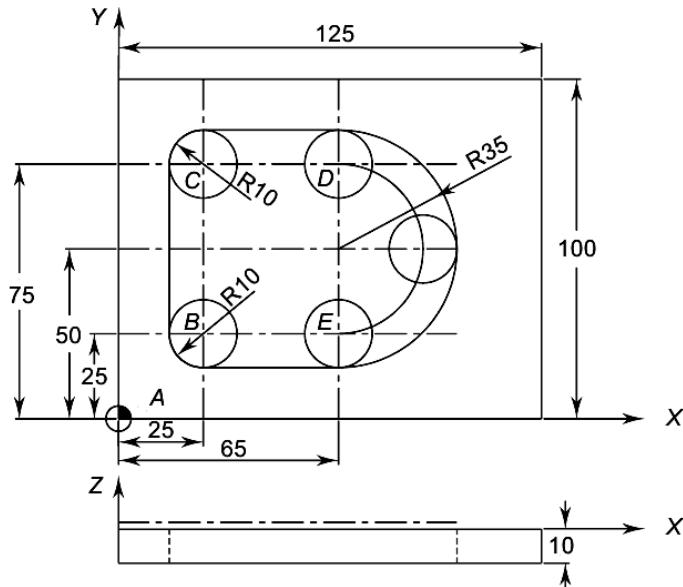
Figure.1

(OR)

b) i) Briefly explain the principle of Computer Numerical Control for (6) machine tools. Also, mention its applications.

ii) Write the APT program for the component shown in Figure.2. Use (10) Point P2(0,0) as origin.
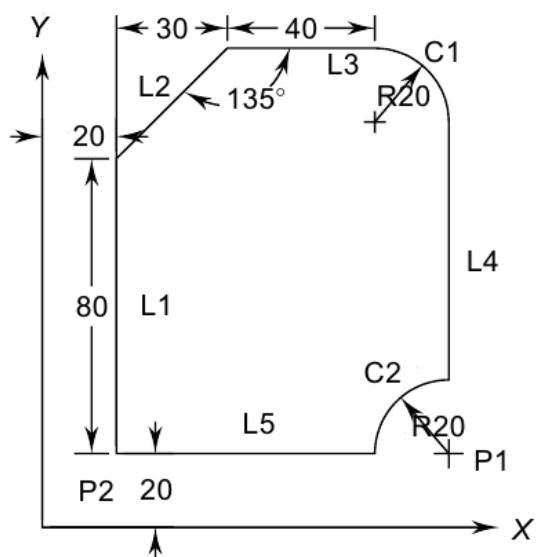
Figure.2

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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   (16)
         advantages of gear hobbing?

(OR)

     b) Explain the gear grinding and gear lapping processes with neat   (16)
         sketches.

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   (16)
         section with the help of sketches.

13. a) i) Describe how high velocity forming process is beneficial in   (6)
             comparison to conventional forming process.

         ii) Explain with neat sketch unconfined type explosive forming.   (10)

(OR)

b) State process parameters of electromagnetic forming process. Also (16) explain its working principle with schematic.

14. a) Explain with a neat sketch the principle and working of (16) Electro-chemical Machining (ECM) process.

(OR)

b) i) Discuss the importance of abrasive jet machining. (4)

ii) Explain briefly with a neat sketch the principle and working of (12) Ultrasonic machining process.

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)

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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 (16) K-Map.

$$F = \sum m(0,1,2,3,6,9,11,14,15)+d(4,8,12)$$

(OR)

b) i) Implement the expression $f(A,B,C,D) = \sum m(0,2,3,6,8,9,12,14)$ using (8) Multiplexer.

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 (16) flipflop.

(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 (16) 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.

(OR)

b) i) Explain the fundamental and pulse mode circuits in asynchronous (8) sequential logic.

ii) Briefly explain about the removal of hazards using hazard covers in (8) k-map.

Government College of Engineering :: Salem

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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
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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
<div align="center">Part A   (10 x 2 = 20 Marks)</div>

<div align="center">Answer ALL Questions</div>

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.

<div align="center">Part B   (5 x 16 = 80 Marks)</div>

<div align="center">Answer ALL Questions</div>

11. a)   Aluminum pin fins of parabolic profile with blunt tips are attached on   (16)
         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^2K. If the thermal conductivity of the fins is
         240 W/m^2K, determine the efficiency, heat transfer rate, and
         effectiveness of each fin.

(OR)

b) A furnace of 2 m x 1.5 m x 1.5 m size contains gases at 1500 K while (16) 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.

12. a) Air at 20°C flows through an 8 cm dia pipe with a velocity of 9 m/s, (16) The pipe wall is at 80°C. The length of the pipe is 1 m. Determine the exit temperature of air.

(OR)

b) Air at – 10°C flows over a flat surface at 10°C with a free stream (16) 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.

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 (16) 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.

14. a) A slab 0.24 m thick initially at 80°C has both surfaces suddenly (16) 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.

(OR)

b) A semi infinite slab with a thermal diffusivity of 1.67 × 10^{-6} m^2/s (16) 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.

15. a) i) A tank contains a mixture of CO_2 and N_2 in the mole proportions of (10) 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.

ii) Discuss about concentration boundary layer. (6)

(OR)

b) A counter flow, concentric tube heat exchanger is used to cool the (16) 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?

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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   (16)
         detail about the fiber reinforced cement matrices.

    (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   (16)
         cement based composites.

    (OR)

    b)   Write a detailed note on the construction techniques adopted for   (16)
         fabricating SIFCON.

14. a) State the summary on the behavior of Ferrocement in tension, (16) compression, flexure and shear.

(OR)

b) Discuss in detail about orthotropic and anisotropic behavior of (16) composites material.

15. a) Write the steps involved in the design of Ferrocement as a flexural (16) members.

(OR)

b) i) Compare the stress strain relationship of SIFCON flexure member (8) with the conventional concrete flexure member.

ii) Discuss the use of ferrocement in structural applications. (8)

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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   (16)
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/mm². 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.

(OR)

b) A flywheel of mass 250 kg and radius of gyration of 600 mm is (16) 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.

12. a) A shaft is rotating at a uniform angular speed. Four masses m_1, m_2, (16) 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.

(OR)

b) A two cylinder uncoupled locomotive has inside cylinders 0.6 m apart. (16) 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.

13. a) A harmonic exciting force of 25 N is acting on a machine part, which (16) 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.

(OR)

b) The mass of an electric motor is 120 kg and it runs at 1500 rpm. The (16) 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.

14. a) A shaft of length 1.25 m is 75 mm in diameter for the first 275 mm of (16) 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.

(OR)

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

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

15. a) The mass of each ball in a Wilson-Hartnell governor is 2.5 kg. The (16) 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.

(OR)

b) The lengths of the upper and lower arms of a porter governor are (16) 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.

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IV Semester (Part Time)
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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   (16)
         for its average output voltage.
                              (OR)
    b)   Explain the steady state operation of a chopper fed DC drive with   (16)
         suitable waveform.

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   (8)
            reduced supply frequency is rarely used in practice. Justify the
            statement.

ii) A 400 B, 50 Hz, 3-phase SCIM develops full-load torque at 1470 rpm. (8) 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.

(OR)

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

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

(OR)

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

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

(OR)

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

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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.   (16)
         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.

(OR)

     b) Design a stiffened seat connection for an ISMB350 @ 514 N/m.   (16)
         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.

12. a) Design a self-supporting steel chimney of 100 m height. The diameter   (16)
         of the cylindrical shell is 4 m. The chimney has a 100 m thick brick
         lining supported on the shell.

b) A self-supporting steel chimney is 60 m high and has a diameter of (16) 3 m at the top. Design the foundation and the riveted points. The horizontal pressure may be assumed as 1.50 kN/m². Bearing stress in cement concrete is 4.0 N/mm².

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 (16) 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.

14. a) Design a welded plate girder for a simply supported bridge deck beam (16) 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.

(OR)

b) Explain the design principles of gantry girder. (16)

15. a) Design an I section purlin for an industrial building to support a (16) galvanized corrugated iron sheet roof.

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/m²

Imposed load = 1.5 kN/m²

Wind load = 1.0 kN/m²

(OR)

b) Write the step by step procedure for design of roof truss. (16)

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M.E. Degree Examinations – Nov/Dec 2024

I Semester (Full Time)

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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   (16)
its hardware resources.

(OR)

b) Discuss how flash programming and Data EEPROM Programming   (16)
operations are carried out in dsPIC30F controller with Programming
Algorithm.

12. a) Discuss the special power saving modes, Sleep mode and Idle mode   (16)
functions in dsPIC30F device.

(OR)

b) Draw the structure of I/O port configuration in dsPIC30F controller   (16)
and specify the functions of I/O Port Control Registers.

13. a) Draw the block diagram of Type B-Type C pair 32 Timer and explain (16) synchronous counter mode of operation with configuration settings.

(OR)

b) With the help of functional block diagram, describe Simple Pulse (16) Width Modulation mode with configurations for PWM period and duty cycle.

14. a) Draw block diagram of motor control PWM module in dsPIC30F (16) controller and specify its hardware features and supporting registers.

(OR)

b) Discuss the operation of Programmable Digital Noise Filters and (16) Quadrature Decoder in Quadrature Encoder Interface module of dsPIC30F controller.

15. a) Explain how dsPIC30F controller used for generation of PWM's for (16) controlling voltage and frequency in a three phase PWM inverter.

(OR)

b) With the help of schematic diagram, explain how dsPIC30F controller (16) supports for vector control of three phase Induction Motor.

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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 (16) transformations.

(OR)

b) Explain the process of order-disorder phase transformations in (16) certain alloys with examples.

14. a) Explain the criteria for recovery, recrystallization and grain growth (16) and the property changes that occur during above processes.

(OR)

b) Compare the microstructural and property changes that occur during (16) cold working and hot working.

15. a) With sketches, explain the crystallography and characteristic features (16) of martensitic transformations?

(OR)

b) Discuss the crystallographic changes that occur during shape (16) memory effect in certain alloy systems with examples.

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III Semester (Full Time)

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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)

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IV Semester (Full Time)
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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   (10)
              pump with a neat sketch.

         ii) Explain any six properties of hydraulic fluids.   (6)

                                       (OR)

     b) i) Describe the construction and working principle of radial piston   (10)
              pump with neat sketch.

         ii) What are the advantages, disadvantages and applications of the gear   (6)
              pump?

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   (8)
              used in the hydraulic systems.

(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)

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III Semester (Full Time)
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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 (16)
          electric arc welding practice with neat sketches. Mention about their
          respective uses.

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 (6) technique in comparison to extrusion and tube drawing. Comment on the statement.

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 (8) disadvantages.

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)

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IV Semester (Full Time)
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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   (16)
          its operation in detail.
                                (OR)
    b)   With neat sketch explain the functioning of hydro-electric power plant   (16)
          in detail.

12. a)   Derive the expression for inductance of three phase line with   (16)
          unsymmetrical spacing.
                                (OR)
    b) i) Derive an expression for the capacitance per km of a single phase line   (8)
          taking into account the effect of ground.

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)
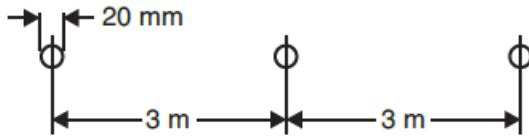
Figure.1.

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)

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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 (10)
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.

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

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

(OR)

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

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

ii) A 460 V Series motor runs at 500 rpm taking a current of 40 A. (8)
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.

(OR)

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

ii) A D.C. Shunt motor runs at 9000 r.p.m. from a 400 V supply when (8)
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.

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 (8)
side voltage regulation of a transformer for lagging power factor loads.

(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 (8)
two-winding transformer.

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

    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 (16) loss of 600 W. Determine the all day efficiency, when the load during the day is as follows:

    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 :

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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 $\cos\omega_0 t\, u(t)$.

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) $x(t/2)$
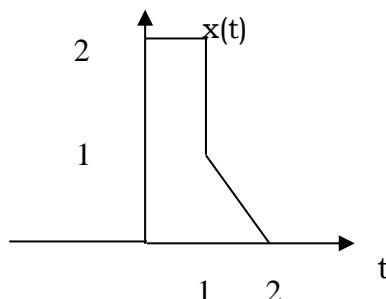
Figure.1

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 $y(n) = x^2(n) + \dfrac{1}{x^2(n-1)}$ 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)

T/2   -T/4   T/4 T/2
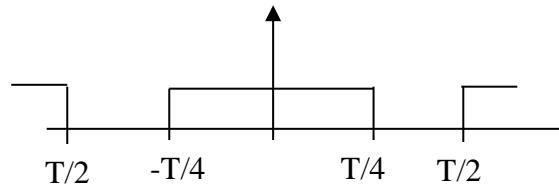
Figure.2

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)

$\dfrac{d^2 y(t)}{dt^2} + 5 \dfrac{dy(t)}{dt} + 6y(t) = x(t)$, find the impulse response of the system.

13. a) i) Find the inverse Laplace transform of (10)

$X(s) = \dfrac{s^2+3s+4}{s^3+5s^2+7s+3}$.

ii) Estimate the initial and final values, if they exist of the signal with Laplace transform, $X(s) = \dfrac{s+4}{s^2+3s+5}$. (6)

b) i) A system is described by the differential equation (10)

$$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + x(t); \qquad \frac{dy(0)}{dt} = 3, y(0) = 1, x(t) = u(t)$$

Find the transfer function and the output signal y(t).

ii) Find the Laplace transform of $x(t) = te^{-2t}\sin2t\ u(t)$. (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 (8)
for

$x(t) = \text{sinc}(80\Pi t)\ \text{sinc}(120\Pi t)$

(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 (8)
reconstructed from the samples.

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.

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B.E. Degree Examinations – Nov/Dec 2024

III Semester (Full Time)

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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.
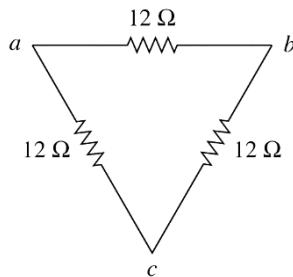
Figure.1

2. Write the mesh equations for the given circuit Shown in figure.2.
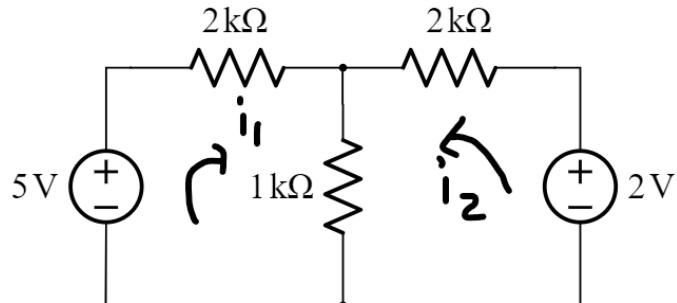
Figure.2

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.

11. a)   Find the Norton equivalent with respect to the terminals a, b in the   (16)
   circuit Shown in Figure.3.
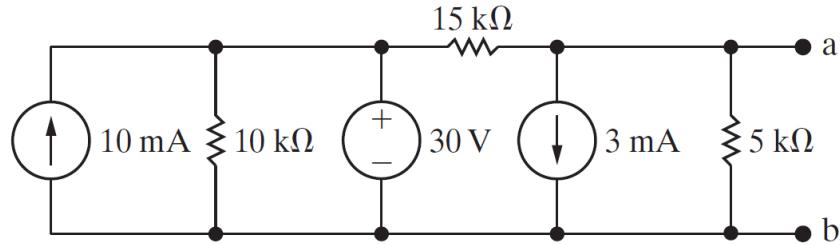
Figure.3

(OR)

  b)   Find the maximum power transferred to resistor R in the below circuit   (16)
   Shown in Figure.4.
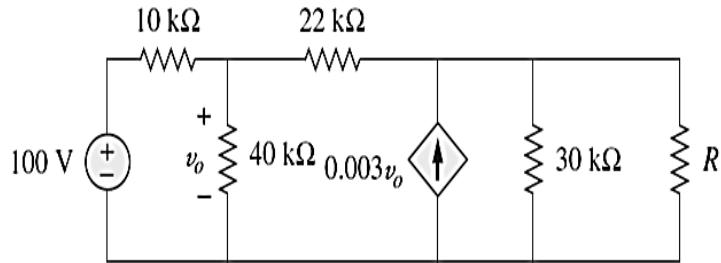
Figure.4

12. a)   In the circuit shown in Figure.5, at $t = 0^+$, the voltage across the coil is   (16)
   120V. Find the value of resistance R using the Laplace transforms.
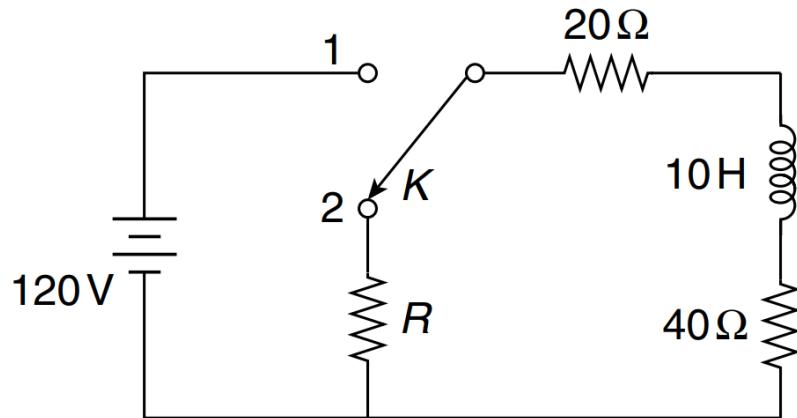
Figure.5

(OR)

b) Find the driving point admittance of the network shown in Figure.6. (16)
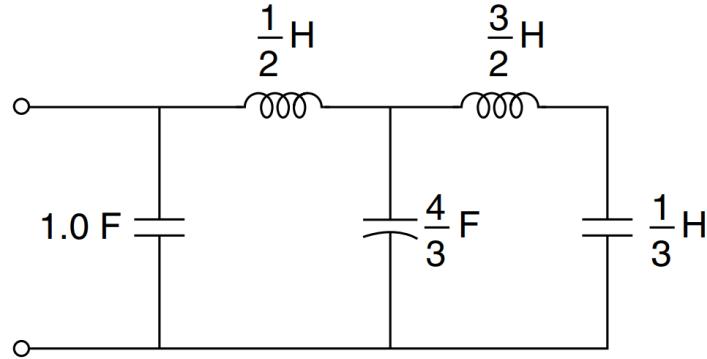
Figure.6

13. a) A circuit consisting of a coil with an inductance 10 mH and resistance (16) 20 Ω is connected in series with a capacitor and a generator with an rms voltage of 120 V. Find

(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)
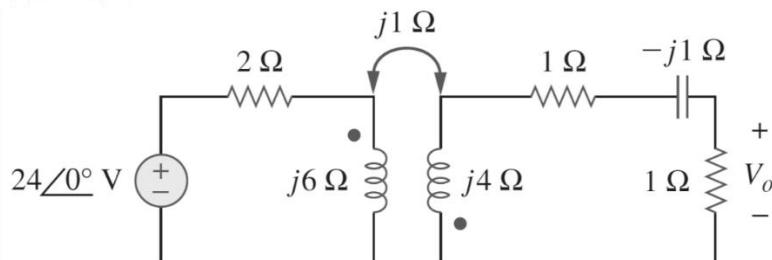
Figure.7

14. a) Find the Z-parameters for the symmetrical two-port network shown in (16) Figure.8 below
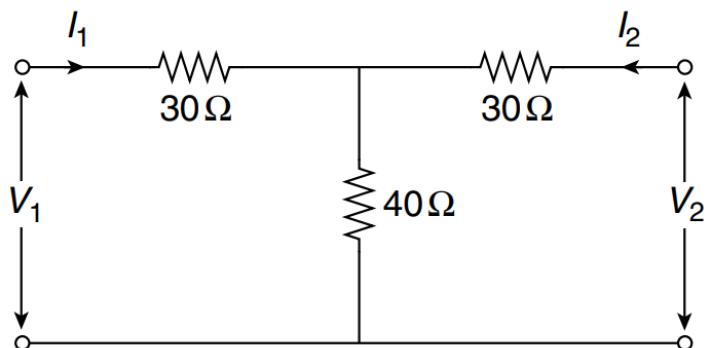

Figure.8

(OR)

b) Find the y-parameters for the symmetrical two-port network shown in Figure.9 below (16)
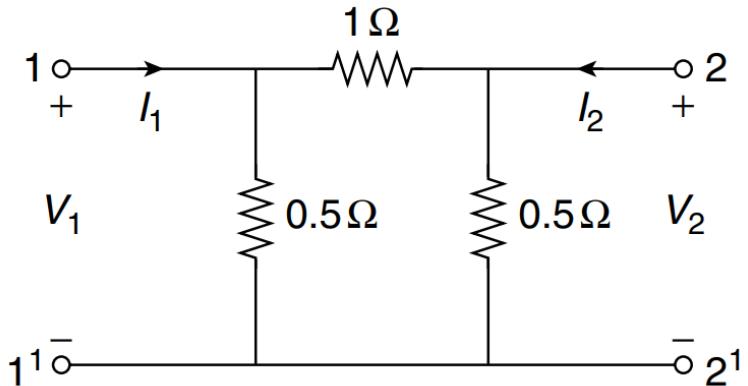
Figure.9

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)

$$Z(s) = \frac{(s+1)(s+3)}{s(s+2)}$$

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B.E. Degree Examinations – Nov/Dec 2024

IV Semester (Full Time)

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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   (16)
          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.

<div align="center">**(OR)**</div>

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)

<div align="center">**(OR)**</div>

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 a, multiply the coordinates with a) 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)

<div align="center">**(OR)**</div>

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)

<div align="center">**(OR)**</div>

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)

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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 (16) 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 / -

(OR)

b) A Circular queue is maintained in an array, and F and R are the front (16) location and rear location of the queue respectively.

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 ith element in the queue

3) Write an algorithm to insert an item X just after the ith element in the queue.

13. a) i) Create a B tree of order 5 by inserting the following elements 3, 14, 7, (10) 1, 8, 5, 11, 17, 13, 6, 23, 12, 20, 26, 4, 16, 18, 24, 25, 19

ii) Give the routine to implement Find_min and Find_max operation in a (6) Binary Search Tree.

(OR)

b) i) Write a routine for AVL tree insertion. Insert the following elements in (10) the empty tree and how do you balance the tree after each insertion. 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 (10) other nodes for the given below graph.
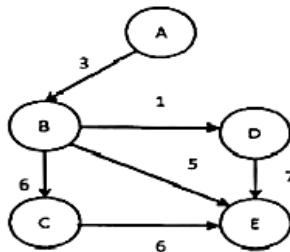
ii) Give the procedure for Depth First Traversal of a graph. (6)

(OR)

b) i) Demonstrate how minimum cost spanning tree can be obtained by (10) Kruskal algorithm with an example.

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 (16) using the following

1) Merge Sort

2) Quick Sort (Take First element as pivot)

b)   Consider a hash table with 9 slots. The hash function h(k)=k mod 9.   (16) 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

    1) Chaining

    2) Open addressing

    3) Double hashing(the second hash function h2(x)=7-(x mod 7)

Register Number :

Time : 3 Hours   Maximum Marks : 100

<div align="center">Part A   (10 x 2 = 20 Marks)</div>

<div align="center">Answer ALL Questions</div>

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?

<div align="center">Part B   (5 x 16 = 80 Marks)</div>

<div align="center">Answer ALL Questions</div>

11. a) i) Compare and contrast lossy and lossless compression.   (8)

    ii) Evaluate the importance of Algorithmic Information theory in coding.   (8)

<div align="center">(OR)</div>

   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   (8)
        "cabracadabrarrarrad". Assume a window size of 13 with look-ahead
        buffer size of 6 and search buffer of size 7.

<div align="center">(OR)</div>

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)

Government College of Engineering :: Salem

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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   (16)
         their basic requirements, and key performance indicators used to
         measure 5G effectiveness in these applications.

(OR)

    b)   How the architecture of 5G New Radio (5G NR) and 5G Core Network   (16)
         is designed to support a wider range of applications compared to its
         predecessors?

12. a) In what ways, mmWave MIMO systems enhances the capabilities of (16) 5G networks, and what specific channel models are most effective for these systems?

(OR)

b) Describe the primary spectrum challenges faced during the transition (16) from 4G to 5G, and how these challenges were addressed in the 5G implementation?

13. a) i) How does the basic requirement for transmission in 5G differ from (8) previous generations of mobile communication technologies?

ii) Analyze the fundamental mechanisms of Universal Filtered Multi- (8) Carrier (UFMC) that enhances spectral efficiency in 5G networks.

(OR)

b) i) Analyze specific scenarios where Filter Bank Multi-Carriers (FBMC) (8) demonstrates superior performance compared to OFDM in 5G environments.

ii) Compare and contrast the multiple access techniques of Orthogonal (8) Frequency Division Multiple Access (OFDMA) and Nonorthogonal Multiple Access (NOMA) in terms of resource allocation.

14. a) i) Describe the transition from 4G D2D standards to 5G impacting the (8) efficiency of mobile broadband communications.

ii) List the primary challenges in implementing radio resource (8) management for mobile broadband D2D communications in a 5G environment.

(OR)

b) i) In what ways, multihop D2D communication can enhance network (8) reliability and coverage in urban areas?

ii) How multi-operator D2D communications can facilitate improved (8) service delivery in densely populated environments?

15. a) How does beamforming enhance the performance of millimeter-wave (16) communication systems compared to traditional techniques?

(OR)

b) Describe the effects of imperfect channel state information (CSI) on (16) the performance of massive MIMO systems, and how can these effects be mitigated?

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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)
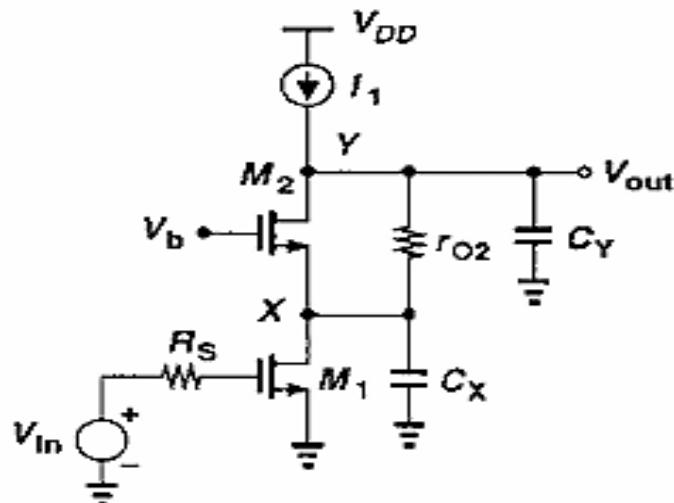

Figure.1.

(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
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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   (16)
           in Valuation.
                                    (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 (16) applications.

(OR)

b) Explain the negative values consequent on environmental impacts (16) relate to the building materials valuations.

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Government College of Engineering :: Salem
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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)

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Government College of Engineering :: Salem
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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   (8)
        inspection.

12. a) i) Describe how to ensure the quality assurance in concrete   (8)
        construction works.

    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
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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   (16)
        sketch.

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 (16)
        each of them.

14. a) Explain the concept of Array with their types; Also give the syntax for (16)
        declaration and initialization of Arrays with an example.
        (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   (16)
        and accessing details with an example.

(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)

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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 <u>an arm and a leg,</u> 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 <u>pros and cons</u> 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 <u>once in a blue moon</u> since she lives across the country.

    A) frequently
    B) every day
    C) occasionally
    D) rarely

4) The extremists were <u>fishing in troubled waters</u> 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 <u>painted the town red</u> 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

<div align="center">Part B   (5 x 10 = 50 Marks)</div>

<div align="center">Answer ALL Questions</div>

11.   a)   Read the following passages carefully and choose the best answer (10) from options given below:

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)

Government College of Engineering :: Salem
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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   (10)
           computing.

       ii) Illustrate in detail about different Benefits and Disadvantages of cloud   (6)
           computing.
                                  (OR)
    b) i) Demonstrate in detail about trends towards distributed systems.   (10)

       ii) Illustrate in detail about parallel and distributed programming   (6)
           models.

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)

Government College of Engineering :: Salem
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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 (16)
           the following crusher/mill
           1) Gyratory Crusher and
           2) Vibratory mills.

(OR)

     b)   Describe the physical, chemical, mechanical properties, uses and (16)
           occurrence in India of the following minerals
           1)   Pyrolusite and
           2)   Magnetite.

12. a) i) Explain 'froth floatation'. Illustrate the use of various reagents used in (8)
             this process.

         ii) Briefly discuss about the working mechanism of induced roll (8)
             magnetic separator.

    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)

    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)

    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)

    b) i) Write short notes on fire clay and graphite refractories. (8)

        ii) Explain the general method for manufacturing of refractories. (8)

Register Number :

(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   (16) specifications:

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 from 15 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 (16) 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.

15. a) A power of 20 kW is to be transmitted through a cone clutch at (16) 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.

(OR)

b) An internal expanding shoe brake has the following dimensions: (16) 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.

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)
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)

Government College of Engineering :: Salem

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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)

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Government College of Engineering :: Salem
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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)

Government College of Engineering :: Salem

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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)

<div align="center">**(OR)**</div>

b)   Explain the working of RFID and discuss how it will be useful for IoT   (16)
applications.

14. a) i) Explain how arguments are passed to a function in Python with small   (8)
program.

        ii) Define class and write a python program for implementing simple   (8)
inheritance.

<div align="center">**(OR)**</div>

b) i) How Raspberry Pi is used for developing IoT projects? Explain the   (8)
components of Raspberry Pi Board with neat diagram.

      ii) Explain how Raspberry Pi is used to interact with LED and a Switch   (8)
with python code.

15. a) Explain the deployment of sensors for the smart parking IoT system   (16)
with necessary python codes.

<div align="center">**(OR)**</div>

b) Explain the deployment design of the weather monitoring IoT system   (16)
with sample python code.

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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
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   (8)
           system.

       ii) With neat sketches, explain the working of Direct Memory Access   (8)
           (DMA).
                                (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 I²C bus and explain (8)
         about the data transmission using I²C format.

      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 (16)
       available in RTOS with suitable example.

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)

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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. (16)
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.

(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 (16) sludge process with neat sketch. Write its advantages and disadvantages.

(OR)

b) Describe the steps involved in the design of septic tank. And also (16) explain the working of a septic tank with neat sketch.

14. a) A waste water treatment plant produces sludge of 1000 kg dry solids (16) 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.

(OR)

b) Explain the 'one' and 'two' pipe system of plumbing and state the (16) conditions under which they are adopted.

15. a) Explain briefly about the methods of sewage disposal. (16)

(OR)

b) Summaries the principle of the self-purification process of river and (16) the various stages of oxygen sag curve.

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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   (16)
         schematic diagram.
(OR)
    b)   Explain the main components of a measurement system using block   (16)
         diagram.

12. a)   Derive the mathematical model for the fluid power system.   (16)
(OR)
    b)   Write the mathematical equations to model for the given system   (16)
         Shown in Figure.1
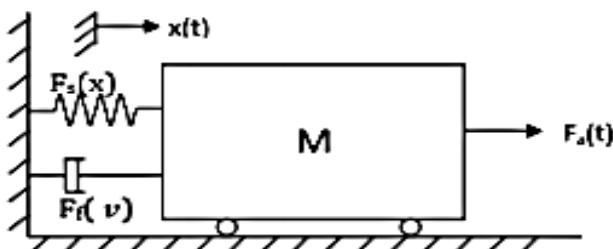
Figure.1

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)

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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)

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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.
   $(x + 2)^2 \frac{d^2 y}{dx^2} - (x + 2)\frac{dy}{dx} + y = 3x + 4$.

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 $\vec{F} = (x + 3y)\vec{i} + (y - 2z)\vec{j} + (x + az)\vec{k}$ 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 $(x^2 D^2 + xD - 9)y = 10 + \frac{5}{x^2}$.   (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 $2\vec{i} + 2\vec{j} - \vec{k}$. (8)

ii) Show that $\vec{F} = (y^2 + 2xz^2)\vec{i} + (2xy - z)\vec{j} + (2x^2z - y + 2z)\vec{k}$ is irrotational and hence find its scalar potential. (8)

(OR)

b) Verify Gauss divergence theorem for $\vec{F} = 4xz\,\vec{i} - y^2\,\vec{j} + yz\,\vec{k}$ 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)

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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 (12)
8085 microprocessor.

   ii) Develop an assembly language program to do the addition using the (4)
numbers 09H and 0AH with 8085 processor.

(OR)

b) i) Explain the operations carried out when 8085 executes the following (12)
instructions with appropriate examples.

   (i) MOV M, A (ii) XCHG (iii) RAL (iv) DAA.

   ii) Compare I/O mapped I/O and Memory mapped I/O in 8085 (4)
processor.

12. a) i) Explain the architecture of the 8051 microcontroller. (12)

   ii) Analyze the mode 0 operation of the timer in 8051 microcontroller. (4)

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)

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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   (10)
             and the slope of the bed is 1 in 1500. The area of the section is 40 m².
             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.

                                   (OR)
     b) i) Derive Chezy's formula.   (6)

         ii) A 3 m wide rectangular channel conveys 12 m³/sec of water at a   (10)
             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.

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 (8) 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.

(OR)

   b) i) Describe the Standard step method of surface water profile (8) determination.

   ii) Determine the slope of the free water surface in a rectangular channel (8) of width 20 m, having depth of flow 5 m. The discharge through the channel is 50 m³/sec. The bed of the channel is having a slope of 1 in 4000. Assume of Chezy's constant C = 60.

13. a) A 75 mm diameter jet having a velocity of 30 m/sec strikes a flat (16) plate, the normal of which is inclined at 45⁰ 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.

(OR)

   b) A jet of water of 60 mm diameter strikes a curved vane at its centre (16) 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 165⁰, 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.

14. a) A Pelton wheel is running under a head of 150 m at the speed of 300 (16) 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.

(OR)

   b) The hub diameter of a Kaplan turbine, working under a head of 10 m (16) 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 15⁰ and the flow ratio is 0.5. Find diameter of the runner, diameter of the hub and the discharge through the runner.

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   (16)
Reciprocating Pump with neat sketches.

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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   (16)
        smelting furnaces in detail.

(OR)

    b) With neat sketch explain salient features of Ellingham diagram. Write   (16)
        its advantages and disadvantage.

12. a) What is Bioleaching/Microbial leaching? Explain. Mention factors   (16)
        affecting Bioleaching/Microbial leaching.

(OR)

    b) Discuss the methods of Recovery of metal from leach liquor with an   (16)
        example.

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   (16)
        advantages and disadvantages.

14. a) What is the main function of smelting and what is the product of (16) smelting? Elaborate fire refining of copper.

(OR)

b) Explain the direct Carbo-thermic Reduction of Aluminium Oxide ore (16) and mention the advantages over the Hall-Heroult process.

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 (16) process of Titanium from its halide ore.

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V Semester (Full Time)
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MECHANICAL ENGINEERING
22ME501 – Design of Machine Elements

(Design data book to be Permitted)

Time : 3 Hours   Maximum Marks : 100

Part A   (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by Preferred number?

2. Give the different failure theories and the type of materials for which these theories are applicable.

3. What is critical speed of shafts?

4. What is the difference between a key and cotter joint?

5. Why V-thread is preferred in fasteners?

6. Where do we use riveting?

7. Distinguish between close coiled and open coiled springs.

8. What types of stresses are induced in a Crank shaft?

9. What is bearing stress?

10. What do you understand by the team 'hydrostatic test pressure' in pressure vessels?

Part B   (5 x 16 = 80 Marks)

Answer ALL Questions

11. a)   Determine the wall thickness of a cylinder vessel closed at both ends,   (16) according to a) Maximum shear stress theory, b) Maximum distortion energy theory, and c) Maximum strain theory. The data are: Internal pressure = 20 N/mm^2, Internal diameter of the vessel = 250 mm, Allowable tensile stress = 100 N/mm^2, Poisson's ratio = 0.3.

(OR)

b)   Determine the thickness of a 100 mm wide plate for safe continuous   (16) operation when it is subjected to a tensile load that has a maximum value of 200 kN and a minimum value of 100 kN. Take, σ_{-1} = 200 N/mm^2, σ_y = 300 N/mm^2, n= 2, A = 0.7, B = 0.8, C = 0.75. Assume no notch (i.e., K_f = 1).

12. a) A solid shaft is required to be replaced by a hollow shaft to save 75% (16) of the weight. If the diameter of the solid shaft is 'd' and the hollow shaft are 'd_0' and 'd_i'. Find the relation between the diameters so as to have the same torsional strength.

(OR)

b) It is required to design a bushed pin type flexible coupling to connect (16) the output shaft of the electric motor to the shaft of the centrifugal pump. The motor delivers 20 kW power at 700 rpm. The starting torque of the motor can be assumed to be 150% of the rated torque. Design the coupling and specify the dimensions of its components.

13. a) In an air cylinder assembly 8 bolts are used to hold the tube and (16) covers. Gaskets are used between the tube and covers. A preload of 15 kN is given to the gasket to prevent air leakage. The maximum force developed by the cylinder is 20 kN. Material of the bolt is C45. Assuming stiffness of the connected parts to be equal to two times the stiffness of bolt, determine the size of the bolt.

(OR)

b) A welded connection, as shown in Figure.1 is subjected to an (16) eccentric force of 7.5 kN. Determine the size of welds if the permissible shear stress for the weld is 100 N/mm². Assume static conditions.
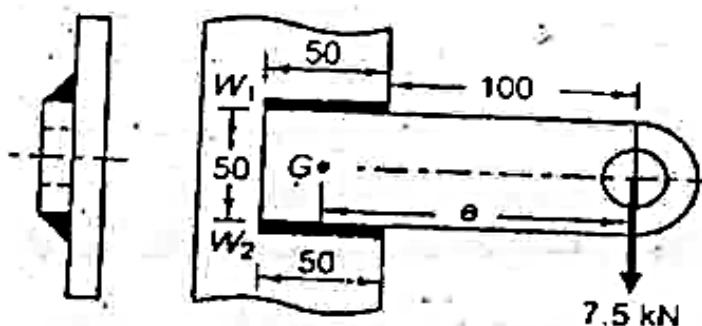
Figure.1.

14. a) The turning moment diagram for a petrol engine is drawn to the (16) following scale: Along x-axis crank angle is taken with a scale as 1mm=1° and along y-axis, turning moment is taken with a scale 1mm=10Nm. The areas above and below the mean turning moment line, taken in order, are -400, +800, -340, +900, and -650 mm². The nominal speed of the engine is 300 rad/s. Determine a) the mass of the flywheel, b) dimension of rim if width is twice of the thickness. Assume diameter of flywheel rim is 300 mm, density of wheel rim material = 7000 kg/m³, C_s = 0.3%.

b)   Design a cast-iron piston for a single acting four stroke I.C. engine for   (16) the following specifications: Cylinder bore = 100 mm, stroke length = 120 mm, maximum gas pressure = 6 MPa, brake mean effective pressure = 0.7 MPa, fuel consumption = 0.24 kg/kW/hr, speed = 2200 rpm.

15.   a)   A single-row deep-groove ball bearing is subjected to a radial force of   (16) 8kN and a thrust force of 3 kN. The shaft rotates at 1200 rpm. The expected life L_{10th} of the bearing is 20000 hr. The minimum acceptable diameter of the shaft is 75 mm. Select a suitable ball bearing for the application.

b)   A hand lever for a brake is 0.8 m long from the center of gravity of the   (16) spindle to the point of application of the pull of 300 N. The effective overhang from the nearest bearing is 100 mm. If the permissible stress in tension, shear and crushing is not to exceed 66 N/mm², design the spindle, key and lever. Assume the arm of the lever to be rectangular having width twice of its thickness.

Register Number :

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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 $x^2 u_{xx} = (y^2 - 1)u_{yy} + xu_x + 3$, 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 30ºC & 80ºC respectively until steady state conditions prevail. The temperature at A is suddenly raised to 40º C and at the same time temperature at B is lowered to 60º 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 (16)
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.

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 (8)
   convolution theorem.

(OR)

b) i) Find the Laplace transform of the function $f(t) = \begin{cases} 1 & in\ 0 \le t \le a \\ -1 & in\ a \le t \le 2a \end{cases}$, (8)
   where $f(t) = f(t + 2a)$ for all 't'.

   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, (16)
   $f(x) = \begin{cases} 1 & if\ |x| < a \\ 0 & if\ |x| > a > 0 \end{cases}$. Hence find the values of the followings:
   i) $\int_0^\infty \left(\frac{\sin t}{t}\right) dt$ & ii) $\int_0^\infty \left(\frac{\sin t}{t}\right)^2 dt$.

(OR)

b) Show that the function $e^{-\frac{x^2}{2}}$ is self-reciprocal with respect to Fourier (16)
   transform.
   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 (8)
   theorem.

(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 $y_0 = 0$, (8)
   and $y_1 = 1$ using Z – transform.

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II Semester (Full Time)

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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 $x^2 u_{xx} = (y^2 - 1)u_{yy} + xu_x + 3$, 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   (8)
             range $(0,3)$.

        ii) Find the half range cosine series of $f(x) = (\pi - x)^2$ in the interval $(0, \pi)$.   (8)
             Hence find the value of the series $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \cdots$.

12. a)   A bar 10 cm long with insulated sides has its ends A & B maintained   (16)
             at the temperature 30⁰C & 80⁰C respectively until steady state
             conditions prevail. The temperature at A is suddenly raised to 40⁰ C
             and at the same time temperature at B is lowered to 60⁰ C. Find the
             temperature distribution in the bar, $u(x,t)$.

(OR)

b) An infinitely long rectangular plate with insulated surface is 10 cm (16) 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.

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 (8) convolution theorem.

(OR)

b) i) Find the Laplace transform of the function $f(t) = \begin{cases} 1 & in\ 0 \le t \le a \\ -1 & in\ a \le t \le 2a \end{cases}$, (8) where $f(t) = f(t + 2a)$ for all 't'.

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, (16) $f(x) = \begin{cases} 1 & if\ |x| < a \\ 0 & if\ |x| > a > 0 \end{cases}$. Hence find the values of the followings:

i) $\int_0^\infty \left(\frac{\sin t}{t}\right) dt$ & ii) $\int_0^\infty \left(\frac{\sin t}{t}\right)^2 dt$.

(OR)

b) Show that the function $e^{-\frac{x^2}{2}}$ is self-reciprocal with respect to Fourier (16) transform.

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 (8) theorem.

(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 $y_0 = 0$, (8) and $y_1 = 1$ using Z – transform.

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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 $\|\alpha + \beta\| \le \|\alpha\| + \|\beta\|$ 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 $L[e^{-5t} cos3t]$.

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 (8) 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.

   ii) Let V be a vector space and let $S_1 \subseteq S_2 \subseteq V$. If S_2 is linearly (8) independent, then prove that S_1 also linearly independent.

(OR)

   b) i) Let V be a vector space with dimension n. Prove that any linearly (8) independent subset of V that contains exactly n vectors is a basis for V.

   ii) Let $T : R^3 \to R^3$ be defined by $T(x, y, z) = (2x - 3y + 4z, 5x - y + 2z, 4x + 7y)$. (8) Find the matrix relative to the usual basis of R^3.

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 $\dfrac{e^{-at} - e^{-bt}}{t}$. (8)

(OR)

b) i) Find $L^{-1}\left[\dfrac{s-2}{s(s+2)(s-1)}\right]$ (8)

   ii) Solve $\dfrac{d^2y}{dt^2} - 3\dfrac{dy}{dt} + 2y = 2$, given $y = 0$ and $\dfrac{dy}{dt} = 5$ 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)

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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 $\|\alpha + \beta\| \le \|\alpha\| + \|\beta\|$ 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 (8) 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.

   ii) Let V be a vector space and let $S_1 \subseteq S_2 \subseteq V$. If S_2 is linearly (8) independent, then prove that S_1 also linearly independent.

(OR)

   b) i) Let V be a vector space with dimension n. Prove that any linearly (8) independent subset of V that contains exactly n vectors is a basis for V.

   ii) Let $T : R^3 \to R^3$ be defined by $T(x, y, z) = (2x - 3y + 4z, 5x - y + 2z, 4x + 7y)$. (8) Find the matrix relative to the usual basis of R^3.

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 :

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 $\dfrac{a.b}{a.a}$

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

		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	

Destination (column header over A B C)

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	

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 (8)

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 $y = \begin{bmatrix} -4 \\ 3 \\ h \end{bmatrix}$

   ii) Consider the vectors S_1 = { (1,0,0), (2,2,0), (5,7,2)} is a minimal (8)
generating set of R^3.

(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 (8)
S = {V_1, V_2, V_3} is a basis of R^3.

12. a) i) Find the linear transformation $T:V_3 \to V_3$ determined by the matrix (8)
$\begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$ with respect to the standard basis.

   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||, (8)
||Y|| and ||X+y||

   ii) State and prove triangle inequality. (8)

(OR)

   b) Use Gram-schmidt process, find an orthonormal basic for (16)
(1, 0, 1), (0, 1, 1), (1, 3, 3).

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

$x_1 + 4x_2 \leq 420$

$3x_1 + 2x_3 \leq 460$

$x_1 + 2x_2 + x_3 \leq 430$

$x_1, x_2, x_3 \geq 0$

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
	A	18	24	28	32
Jobs	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
	A	-	46	16	40
From	B	41	-	50	40
	C	82	32	-	60
	D	40	40	36	-

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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
   $\vec{F} = (x + 2y + az)\vec{i} + (bx - 3y - z)\vec{j} + (4x + cy + 2z)\vec{k}$ 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 $p^2 y(1 + x^2) = qx^2$. (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 $(D^2 + DD' - 6D'^2)z = x^2 y$. (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 (8)
irrotational vector and find the scalar potential such that $\vec{F} = \nabla\phi$.

(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 (16)
surface of the cuboid bounded by the planes
$x = 0, x = a, y = 0, y = a, z = 0, z = a$.

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 (8)
$e^x(x\cos y - y\sin y)$.

(OR)

b) i) Find the image of the infinite strip $\frac{1}{4} \leq y \leq \frac{1}{2}$ under the transformation (8)
$w = \frac{1}{z}$.

ii) Find the bilinear transformation that maps the points $z = 0,1,\infty$ onto (8)
the points $w = i, 1, -i$ respectively.

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 $\int_C \frac{z^2}{(z-1)^2(z+2)}\, dz$, (8)
where C is $|z| = 3$.

(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
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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   (16)
          in detail?
                                    (OR)
    b)   Explain the principle of reduction of certain oxide ores using carbon   (16)
          as the reducer with the support of Ellingham's diagram.

12. a)   Explain the recovery of metallic values from the leach liquor by   (16)
          solvent extraction process with required sketches and block diagrams.
                                    (OR)
    b)   Explain the principle and practice of gaseous reduction of metallic   (16)
          values in aqueous leach solutions with required schematics.

13. a) Explain the extraction of aluminium metal form the fused bath of (16) alumina through electrolytic processes.

(OR)

b) With neat sketches explain electrolytic refining and zone refining (16) processes in detail.

14. a) With a flow sheet, explain the extraction and refining of copper from (16) its sulfide ores.

(OR)

b) Explain the Pidgeon's process of producing magnesium from dolomite (16) ore.

15. a) With a flow sheet, explain the Kroll's process of titanium extraction (16) from illmenite ore.

(OR)

b) Explain the different methods of extraction of silver from its ore. (16)

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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   (10)
           P-V and T-S Diagrams.

(OR)

    b) i)   Write short notes on practical applications of refrigeration.   (6)

      ii) An air refrigerator used for food storage provides 50 tons of   (10)
           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.

12. a) Vapour compression refrigerator works between the pressure limits of (16) 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.

Pressure Bar	Temper ature °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 m³/min of air is supplied to the room. (16)

15. a) What is meant by infiltration and explain air change and crack length (16) method in detail?

(OR)

b) Explain the various types of air distribution systems with a neat (16) sketch.

Register Number :

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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

Part A   (10 x 2 = 20 Marks)

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 (8)
of V.

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 (8)
backward formula.

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 (8)
square method.

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 $\int_0^\pi \sin x \, dx$ (8)
using Simpson's $1/3^{rd}$ rule.

(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 $\frac{dy}{dx} = x^2 y - 1$, $y(0) =$ (8)
1.

ii) Apply fourth order Runge-Kutta method, to find an approximate value (8)
of y when $x = 0.2$ given that $y' = x + y$, $y(0) = 1$ with $h = 0.2$.

(OR)

b) i) Find $y(2)$ by Milne's method $\frac{dy}{dx} = \frac{x+y}{x^2-y^2}$, given $y(0) = 2$, $y(0.5) = 2.636$, (8)
$y(1.0) = 3.595$ and $y(1.5) = 4.968$.

ii) Find the values of y at $x = 0.1$ given that $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$ by (8)
modified Euler's method.

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 $h =$ (8)
1 (for 4 times steps).

   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)
$8 + 2y, u(x,0) = x^2/2, u(x,4) = x^2$ taking $h = k = 1$, correct of 1 decimal.

(OR)

b) i) Solve by Crank-Nicolson's method $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ For $0 < x < 1, t > 0$, $u(0,t) =$ (8)
$0, u(1,t) = 0, u(x,0) = 100(x - x^2)$. Compute u for one time step with $h =$
$\frac{1}{4}$.

   ii) Solve $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$ subject to the following conditions $u(0,t) = 0$, (8)
$u(1,t) = 0, t > 0$ 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.

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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   (8)
        the data given below:

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 (8) following data:

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 (8) the range into six equal parts.

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 (8) $y(0.1) \& y(0.2)$ correct to four decimal places.

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 (8) mesh with sides $x = 0, y = 0 , x = 3 , y = 3 \ and \ u = 0$ on the boundary. Assume mesh length $h = 1$ unit.

ii) Solve by Bender-Schmidt formula, $u_{xx} = 2u_t$ when $u(0, t) = 0, u(4, t) = 0$ (8) and with initial condition $u(x, 0) = x(4 - x)$ upto t=5 sec, taking $h = 1$.

(OR)

b) i) Solve the boundary value problem, $y'' - y = 0$ with $y(0) = 0$ and $y(2) =$ (8) 4 by taking $h = 0.5$.

ii) Solve by Crank-Nicholson's scheme: $16u_t = u_{xx}, 0 < x < 1 , t > 0$ with (8) $u(x, 0) = 0. \ u(0, t) = 0, u(1, t) = 100t$. Compute u for one-step, taking $h = \frac{1}{4}$.

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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 %
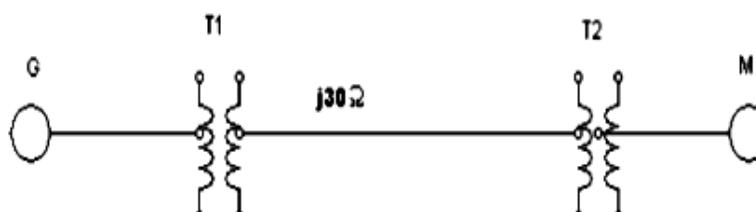
Figure.1

b) Explain in detail about the working of single line diagram in Power (16) system.

12. a) Figure.2 shows a three bus power system. (16)

Bus 1: Slack bus, V=1.05∟0⁰p.u.

Bus 2: PV bus, |V|=1.0 p.u., Pg=3p.u.

Bus 3: PQ bus, PL=4p.u., QL=2p.u.
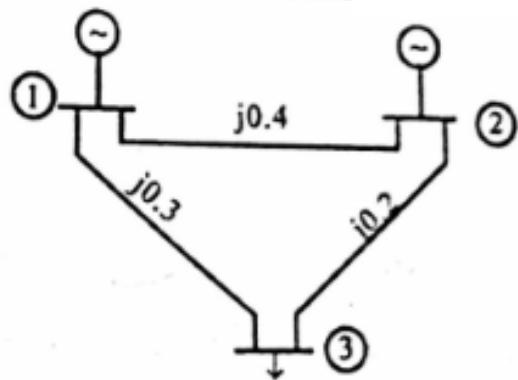
Figure.2

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 (16) for implementing this algorithm.

13. a) For the radial network shown figure.3, a 3Ø fault occurs at F. (16) Determine the fault current and the line voltage at 11 KV bus under fault condition.
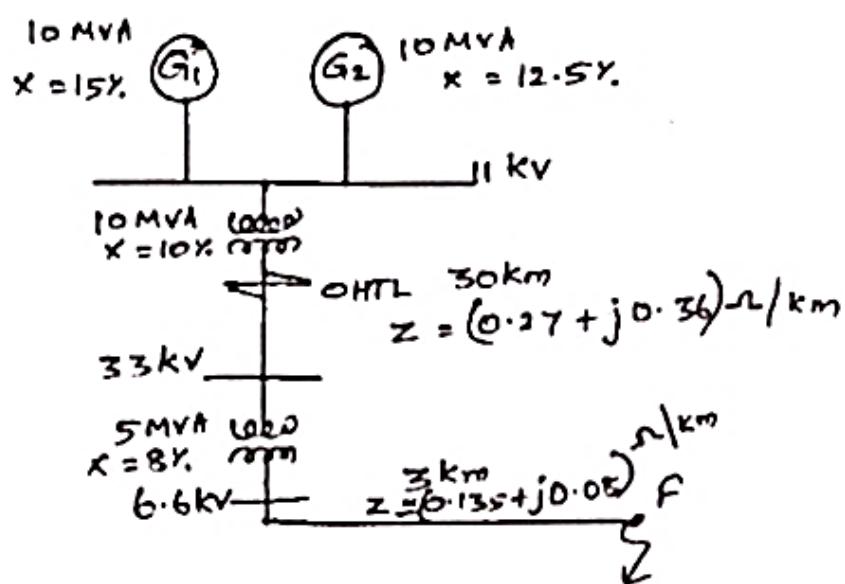
Figure.3.

(OR)

b) With the help of a detailed algorithm and explain how a symmetrical (16) fault can be analyzed using Z_{bus}.

14. a) A 3-phase transmission line operating at 10 kV and having a (16) 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

(i) at the load end of transmission line

(ii) at the high voltage terminals of the transformer.

Shown in figure.4.
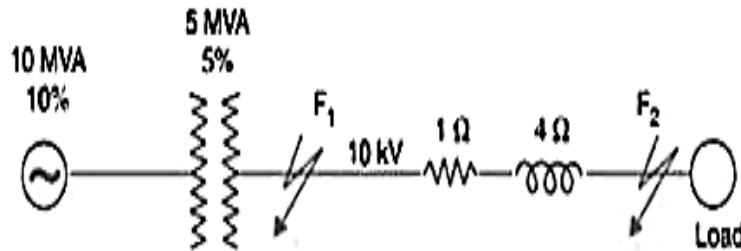
Figure.4

(OR)

b) Obtain the expression for fault current for a line to line fault taken (16) place through impedance Z_b in a power system.

15. a) Derive the equation for solution of swing equation by Runge- Kutta (16) method.

(OR)

b) Describe in detail about the critical clearing angle and time factor (16) affecting stability analysis with necessary diagram.

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B.E. Degree Examinations – Nov/Dec 2024
VI & VII Semester (Full Time)
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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 (16)
relationship for output voltage at different region in the transfer
characteristics.

(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 (16) subsystems.

(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)

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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 $\rightarrow$ aBcC | aBb | aB | a
    B $\rightarrow \varepsilon$
    C $\rightarrow \varepsilon$

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   (16)
    each phase for the following input:

    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 (16) Thomson's construction. Convert to equivalent DFA using subset construction algorithm and finally derive the minimized DFA.

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 (8) grammar. Show the shift reduce actions for the string **ibibtaea.**

$S \rightarrow iEts$

$S \rightarrow iEtSeS$

$S \rightarrow a$

$E \rightarrow b$

(OR)

b) Check whether the following grammar is a SLR (1) grammar or not. (16) Justify your answer with reasons.

$S \rightarrow AS / b$

$A \rightarrow SA / a$

13. a) i) Describe S-attributed and L-attributed definition. (8)

ii) Write semantic actions for the following assignment statement and (8) also generate three address codes using annotated syntax tree.

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 (16) patching and also derive the three address code generated for the expression "(a < b) and not (c < d)" with and without back patching.

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)
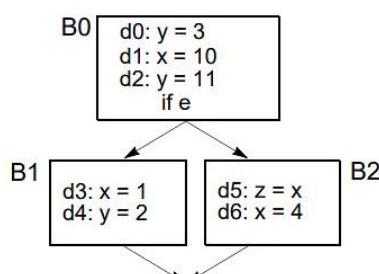
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B.E. Degree Examinations – Nov/Dec 2024
VI & VII Semester (Full Time)
(2018 Regulations)
CIVIL ENGINEERING
18CE601 – Advanced Structural Analysis

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   (16)
          continuous beam ABC by slope deflection method. EI is constant.
          Shown in Figure.1.
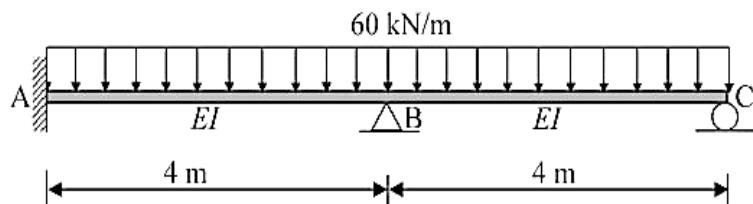
Figure.1

(OR)

b) Analyse the portal frame ABCD shown in Figure.2. below by slope (16)
deflection method and also sketch the bending moment diagram.
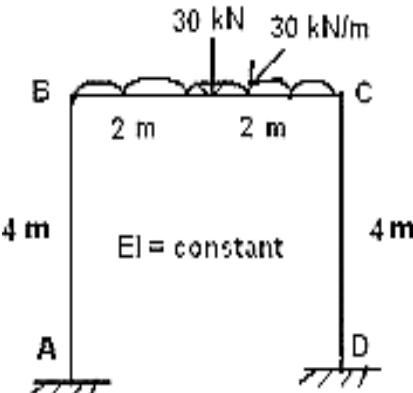
Figure.2.

12. a) Calculate the moment at B for the two-span continuous beam ABC by (16)
Moment distribution method. EI is constant. Shown in Figure.3
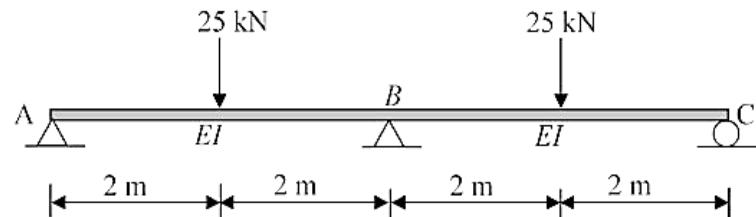
Figure.3

(OR)

b) Analyze the portal frame shown in the figure.4 below using moment (16)
distribution method and draw the bending moment diagram. EI
Constant.
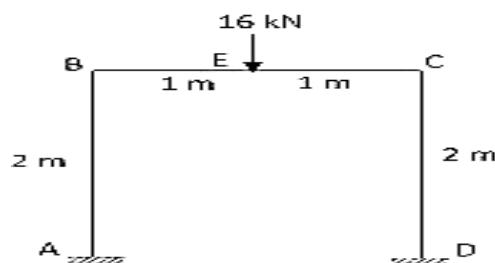
Figure.4

13. a) Analyze the continuous beam ABC shown in Figure.5. by flexibility (16)
matrix method and draw the bending moment diagram
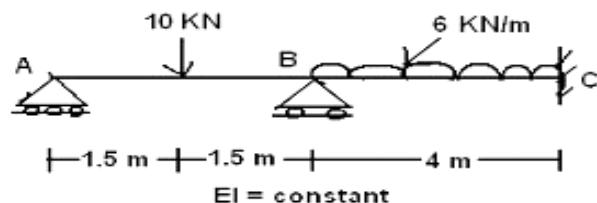
Figure.5

(OR)

b) Briefly explain the step by step procedure of determining bending (16) moment in a portal frame by flexibility method.

14. a) A two span continuous beam ABC is fixed at A and simply supported (16) 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.

(OR)

b) Explain in detail about the procedure of determining the forces in the (16) members of pin-jointed frames (Truss) by stiffness method.

15. a) A fixed beam AB of length 6 m is carrying a uniformly distributed load (16) of 6 kN/m over the left half of the span. Determine support moments and reactions using finite element method.

(OR)

b) Explain in detail on the step by step procedure of solving a 2D truss (16) using finite element method.

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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 (16) considering the purchase of a motorbike.

(OR)

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

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

(OR)

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

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

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 (12) located in your city with proper justification.

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 (16) efficiency.

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

(OR)

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

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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)

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   (8)
            communications.
                                    (OR)

b) i) If a total of 20 MHz of bandwidth is allocated to a particular FDD (8)
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.

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 (8)
index of 0.5.

ii) With neat block diagram, explain the simplified communication (8)
system using an adaptive equalizer at the receiver.

(OR)

b) i) Explain the performance of digital modulation in slow, fading (8)
channels.

ii) Arrange the various types of equalizer under linear and non- linear (8)
groups.

14. a) i) Consider a GSM system, which is a TDMA/FDD system that uses (8)
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.

ii) Summarize the selection process to be followed for the selection of (4)
speech codes for mobile communication.

iii) Design a simple USDC speech decoder block diagram with three code (4)
books.

(OR)

b) i) Explain the process of Linear predictive coding system with neat block (8)
diagram.

ii) Summarize the various cellular systems used in worldwide with (4)
corresponding multiple access system.

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)

Government College of Engineering: Salem

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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

B.E. Degree Examinations – Nov/Dec 2024
I Semester (Full Time)
(2012 Regulations)

MECHANICAL ENGINEERING

12MA101 – Mathematics - I

Time : 3 Hours   Maximum Marks : 100

Part A   (10 x 2 = 20 Marks)

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 $\int_1^3 \int_2^4 \int_1^2 xyz \, dz \, dy \, dx$.

Part B   (5 x 16 = 80 Marks)

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   (16)
    transform $3x^2 - 3y^2 - 5z^2 - 2xy - 6yz - 6xz$ and hence find rank,
    index, signature, nature.

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 (8)
   $x^9 + 5x^8 - x^3 + 7x + 2 = 0$.

(OR)

   b) i) Find the equation whose roots are less by 2, than the roots of the (8)
   equation $x^5 - 3x^4 - 2x^3 + 15x^2 + 20x + 15 = 0$.

   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 (8)
   $x = a(\theta + \sin\theta)$, $\quad y = a(1 - \cos\theta)$.

   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 $\frac{x}{a} + \frac{y}{b} = 1$ (8)
   with the condition on the parameters $a + b = c$ for a constant c.

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 - $ (8)
   $12y + 20$.

(OR)

   b) i) Expand $f(x, y) = e^x \cos y$ at $\left(0, \frac{\pi}{2}\right)$ upto 3rd term using Taylor's series. (8)

   ii) A rectangular box open at the top is to have a volume of 32cc. Find (8)
   the dimensions of the box requiring, the least material for the
   construction.

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 (8)
   $x^2 = 4ay$.

(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)
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   (16)
       applied in optimization.
                              (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 $Z = 4 x_1 + 10 x_2$

Subject to

$2 x_1 + x_2 \leq 50$

$2 x_1 + 5 x_2 \leq 100$

$2 x_1 + 3 x_2 \leq 90$

and $x_1, x_2 \geq 0$.

(OR)

b) What are the assumptions used while solving LP models? Explain in (16) detail about elementary operations in graphical method for two variable optimization problem.

14. a) Elaborate constrained optimization and convex programming with (16) suitable examples.

(OR)

b) Explain Geometric and non-convex programming with suitable (16) examples.

15. a) Explain in detail about neural network based optimization. (16)

(OR)

b) Explain with suitable statistics about particle swarm optimization. (16)

Government College of Engineering :: Salem

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Ph.D. Degree Examinations – Nov/Dec 2024

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PEE63 – Energy Storage Technologies

Time : 3 Hours   Maximum Marks : 100

Part A   (10 x 2 = 20 Marks)

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) |

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   (16)
        optimize the process using either linear or nonlinear technique.
                                (OR)
    b) Apply the process selection chart for any product manufacturing by (16)
        selecting suitable materials and explain in details.

12. a) Design manufacturing features to avoid in rotational parts that   (16)
        require special drill to machine radial hole and to machine internal
        recess then discuss the features in details.
                                (OR)
    b) Apply redesigning concept for ease machining of components with   (16)
        suitable example and explain how it is economic in details. .

13. a) Design weld length for strength and stability for any one application (16)
        and explain how it prevents any tendency of the welded elements to
        rotate when subjected to mechanical loads.

<div align="center">**(OR)**</div>

b) Analyze the pre and post treatment of welds in details and explain (16) how to help the thermal stress management and strength improvement.

14. a) Design sand casting for any one component by considering different (16) typical gating system and explain how casting tolerances considered in the design.

<div align="center">**(OR)**</div>

b) Design the forging sequence of a connecting rod by considering mass (16) distribution stages and blocker cross-sections in details.

15. a) Analyze any two design of power saw for assembly in terms of number (16) of parts and assembly time then conclude which one is best as per design for assembly.

<div align="center">**(OR)**</div>

b) Analyze the various stages of total life cycle materials management of (16) design for environment in details with necessary diagram.

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.
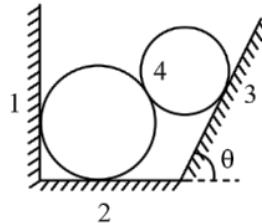
Figure.1.

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   (16)
          console given in figure.1.
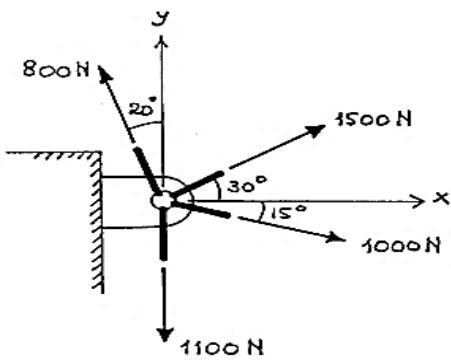
Figure.1.

(OR)

b)   A rectangular plate is supported by three cables as shown in figure.2.   (16)
       The tension in cable AC = 60 N, determine the weight of the plate.
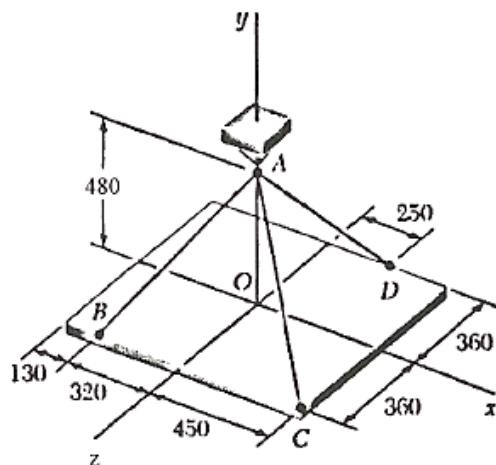
Figure.2.

12.   a)   Two smooth balls A and B having mass of 2 kg and 5 kg respectively   (16)
             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.
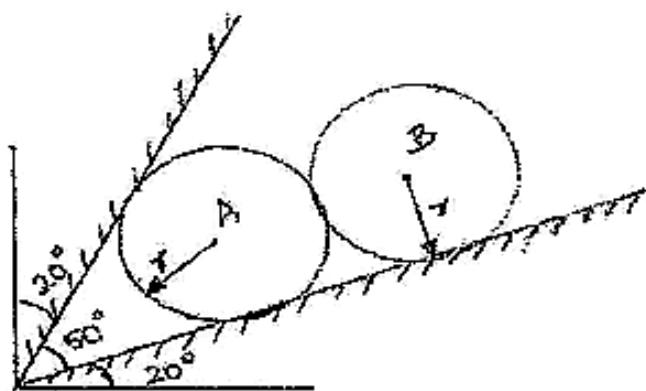
Figure.3

(OR)

b) A force couple system acting on a rectangular plate is shown in (16) 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.
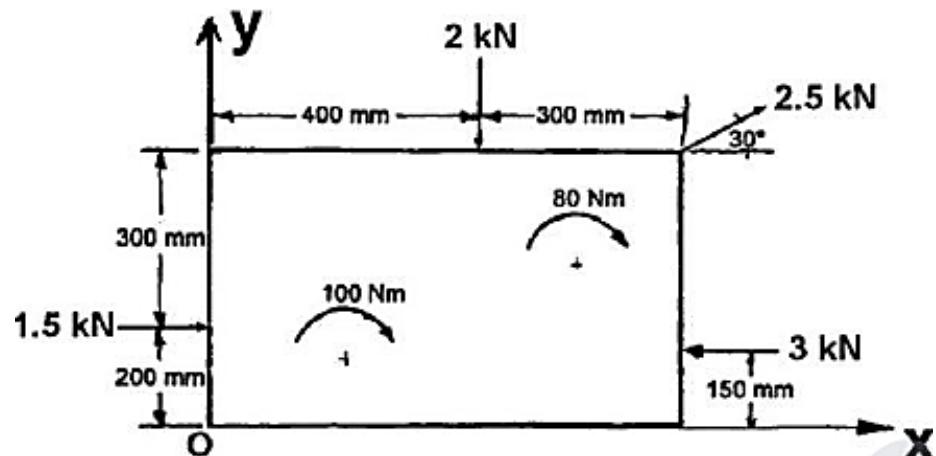
Figure.4.

13. a) Find the centroid of the lamina shown in figure.5 about the base and (16) the 250 mm edge.
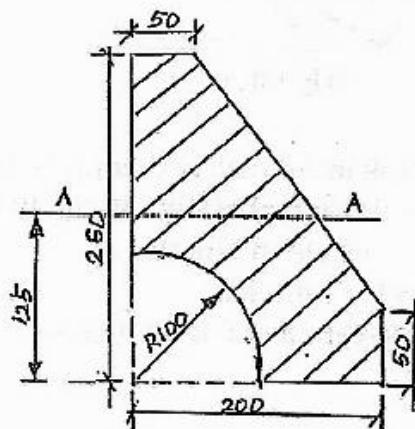
Figure.5

(OR)

b) Find the moment of inertia for the shaded area shown in figure.6 (16) about the edge AB' and AA'.
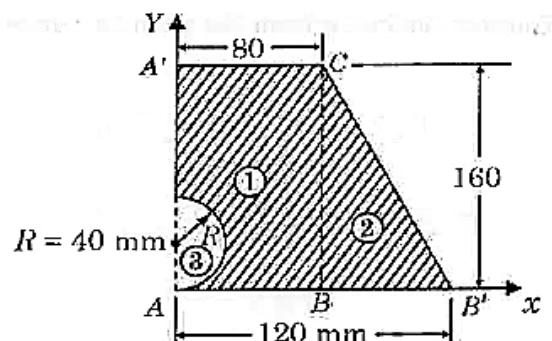
Figure.6

14. a) Block A of mass 30 kg rests on block B of mass 40 kg as shown in (16) 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.
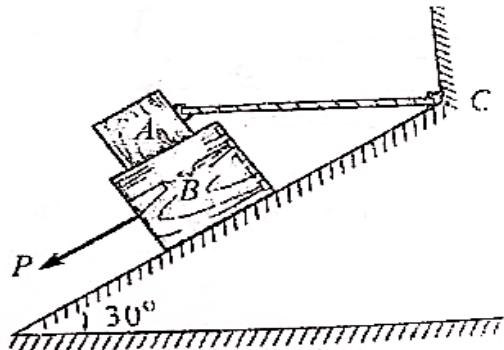
Figure.7.

(OR)

b) A block of weighing 1500 N is overlying on a horizontal floor and (16) 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.
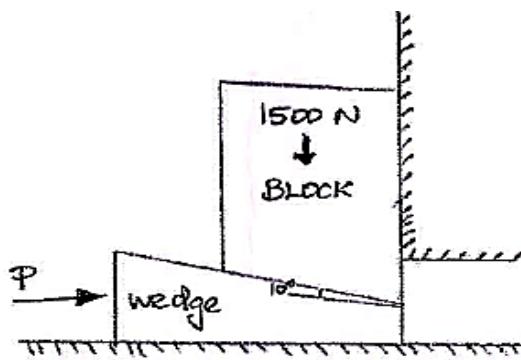
Figure.8.

15. a) Three perfectly elastic balls A, B and C of masses 4 kg, 8 kg and 16 kg (16) 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.

(OR)

b) Two rough planes inclined at 30° and 60° to horizontal are placed (16) 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.
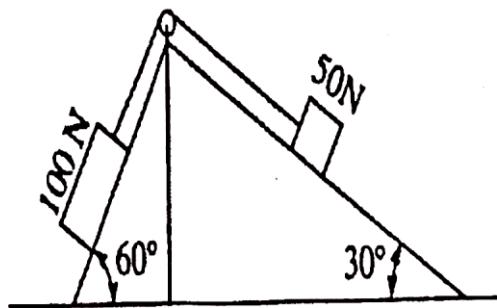
Figure.9.

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   (10)
           phases and reactions.

    ii) Difference between substitution and interstitial solid solutions with   (6)
        examples.

(OR)

    b) i) Discuss the effect of alloying elements (Mn, Si, Cr, Mo, V, Ti, and W)   (10)
           on the properties of steel.

    ii) What are the characteristics and applications of bearing alloys?   (6)

12. a) i) Explain the heat treatment process of hardening and tempering and   (10)
           discuss their effects on the properties of steel.

    ii) What is the principle of the Jominy end quench test and how is it   (6)
        used to measure the hardenability of steel?

(OR)

b) i) Explain the processes of Carburizing, Cyaniding and Nitriding. (10) Discuss their advantages and applications in industrial components.

   ii) Describe the heat treatment of HSS tools and mention how it (6) improves machining performance.

13. a) Explain the fracture mechanics and defects typically found in (16) ceramics. Discuss their impact on the strength, reliability and lifespan of ceramic components in engineering applications.

(OR)

b) Discuss the manufacturing processes, mechanical properties and (16) specific applications of fiber and particulate-reinforced composite materials.

14. a) Discuss the causes, characteristics, and failure mechanisms of each (16) type of fracture, along with real-world examples of material failures.

(OR)

b) Explain the Izod and Charpy impact tests in detail. Describe the test (16) setup, procedure and interpretation of results and applications.

15. a) i) Describe the principle and working procedure of ultrasonic testing. (10) How does this method help in detecting flaws in materials?

   ii) Discuss the basic principle of Non-Destructive Testing. (6)

(OR)

b) i) Explain the concept of elastic contact mechanics and its significance (10) in surface engineering, especially in relation to wear and fatigue.

   ii) What are the differences between high and low energy beam methods (6) in surface engineering?

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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 (16) Capstan lathe.

(OR)

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

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 (16) forming process and explain the step by step procedure to fabricate the same.

(OR)

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

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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   (16)
         performance parameters.

(OR)

    b)   Draw and explain the power flow in series and parallel hybrid drive   (16)
         train in HEVs.

12. a)   Describe the components of PHEV and explain the operating principle   (16)
         along with its control strategies.

(OR)

    b)   Discuss the fuel cell based EV configuration with its control strategy.   (16)
         Point out the drawbacks of fuel Cell based EV.

13. a)   Discuss in detail the vector control theory of induction motor drives   (16)
         used in EVs.

(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)

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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.
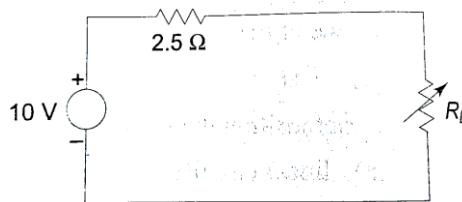
Figure.1

5. Using dot conversion, write the voltage equations for the coils shown in Figure.2.
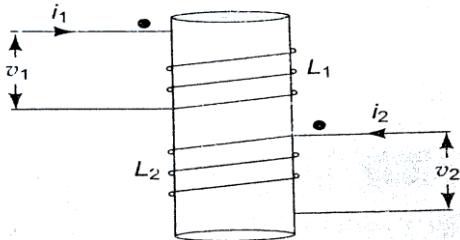
Figure.2

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.

Answer ALL Questions

11. a) i) A sinusoidal alternating current with 50 Hz frequency has an RMS   (8)
             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.

     ii) For the circuit shown in Figure.2. Determine the value of the   (8)
          impedance if the source delivers a power of 200 W and the power
          factor 0.71. Also find the apparent power.
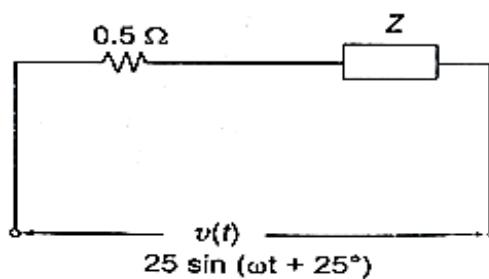
Figure.2

(OR)

     b) Write the node voltage equations and determine the currents I_1, I_3, I_5,   (16)
         and I_{10} for the circuit shown in Figure.6.
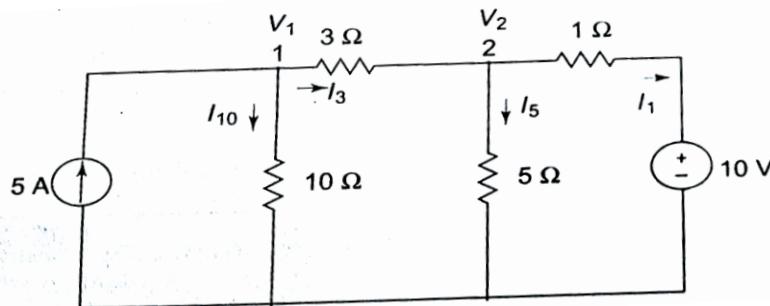
Figure.6

12. a) Determine the Star – Delta and Delta – Star equivalent parameters   (16)
         with circuit diagrams.

(OR)

     b) Find the Thevinin's and Norton's equivalents for the circuit shown in   (16)
         Figure.7 with respect to terminal ab.
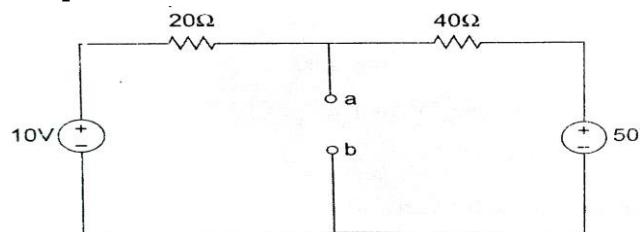
Figure.7.

13. a) i) For the circuit shown in Figure.8, determine (8)
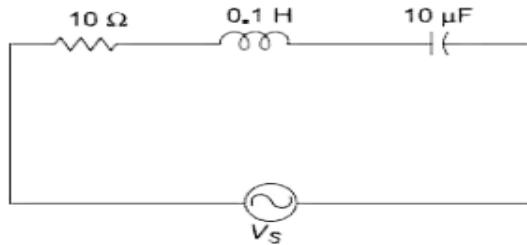
Figure.8

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 (8) of R = 10 Ω, L = 0.1 H and C = 10μF. Also find impedance and power factor.

(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
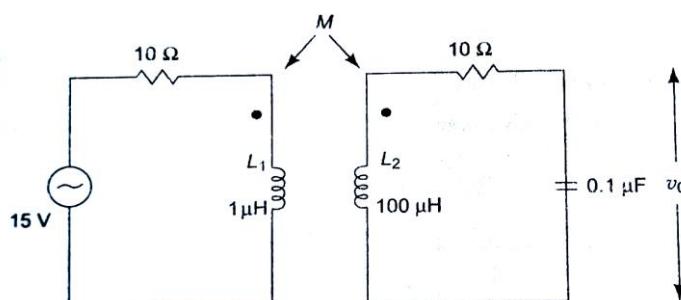
Figure.9

14. a) For the RC circuit shown in Figure.10, find the current transient hen (16) the switch I closed at t = 0.
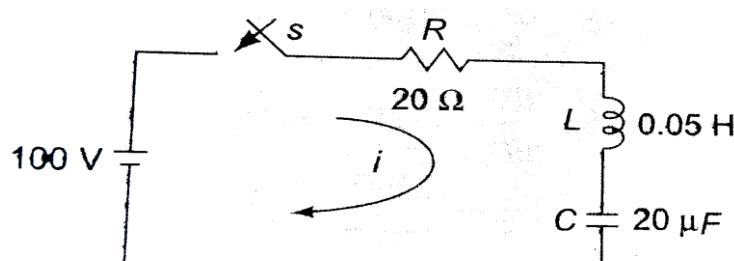
Figure.10

(OR)

b) Illustrate the transient response of R-L circuit for a sinusoidal input (16) and obtain the solution for the current.

15. a) A three phase delta connected RYB system with an effective voltage of (16) 400 V, has a balanced load with impedance $3+j4$ Ω. Calculate
   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 (16) 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.

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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   (8)
           from traditional one?
                                    (OR)
    b) i) Elaborate in detail about elasticity feature in cloud.   (8)

       ii) Investigate and describe how can a company benefit from cloud   (8)
           computing.

12. a) i) List and discuss different types of virtualization with necessary   (8)
           representation.

       ii) Outline with a short note about the problems in virtualizing in CPU,   (8)
           I/O and memory devices.
                                    (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 :

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 (16) $F(a, b, c, d) = \sum(0, 2, 6, 8, 9, 10, 13, 15) + d(11)$ using K-Map and express the solution in SOP and POS forms.

(OR)

b) Simplify the Boolean expression (16) $F(a, b, c, d) = \sum(0, 1, 5, 10, 11, 15) + d(4, 14)$ using Quine-Mc-Cluskey method and draw the logic circuit for the simplified expression.

12. a) Design a 6-bit carry look-ahead adder and draw the circuits for carry (16) generation and addition.

(OR)

b) Explain magnitude comparator with a suitable example. (16)

13. a) Design a 8-bit priority encoder with priority granted for low (16) magnitude numbers.

(OR)

b) Explain different types of flip-flops. (16)

14. a) Explain how timing signals can be generated using a 6-bit Johnson (16) Counter.

(OR)

b) Illustrate the use of programmable logic array in realizing a set of (16) Boolean expressions with an example.

15. a) Describe the analysis procedure of an asynchronous sequential (16) circuit with an example.

(OR)

b) Explain the hazards in designing the asynchronous sequential (16) circuits and discuss a procedure to eliminate them.

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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   (8)
              1 in 500. Find the velocity and flow for conditions of Maximum
              velocity and Maximum discharge.

          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   (8)
              C = 55 and slope of bed 1 in 2000 and the apex angle as 60° and
              depth of flow = 4 m.

ii) The trapezoidal channel of bottom width of 3 m side slope 1.5 h and   (8)
1v carries discharge of 10 m³/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.

12. a) i) Draw specific energy head diagram and mention the salient points.   (8)

ii) Calculate the critical depth corresponding to a discharge of   (8)
7.5 m³/sec for the following cases
   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   (8)
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.

13. a) i) A jet of water having a velocity of 40 m/sec impinges without shock   (16)
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.

(OR)

b) i) In a jet propelled boat water is drawn amid-ship and discharged at   (16)
the back with an absolute velocity of 20 m/s. If the cross-sectional
area of the jet is 200 cm² and the boat is moving in sea water with a
speed of 8.33 m/s determine:
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   (16)
       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.

15. a) A three - stage centrifugal pump has impeller 400 mm in diameter   (16)
       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 m³ 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 %.

(OR)

   b) A single acting reciprocating pump has a plunger of diameter 150 mm   (16)
       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.

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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   (10)
          neat sketch.

      ii) Explain the offset slider crank mechanism.   (6)

(OR)

    b) i) Sketch the Peaucellier straight-line motion mechanism and prove that   (10)
          the generating points move in a straight line.

      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 (16) and O_2A = 60 mm. The crank O_2A rotates at 300 rpm in the CCW direction. Find

    a) the angular speed of link O_1A, and

    b) the velocity of slider.
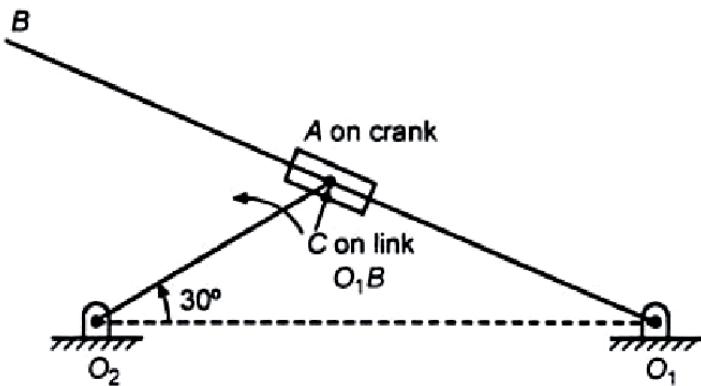
Figure.1.

(OR)

b) A link AB of a four-bar mechanism ABCD revolves uniformly at 120 (16) rpm in a clockwise direction. Find the angular acceleration of links BC and CD and the acceleration of point E in link BC. Given: 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 (16) Figure.2.Determine the lengths of various links.

$$\theta_2 = 60°; \theta_4 = 90°$$
$$\omega_2 = 3 \text{ rad/sec}; \omega_4 = 2 \text{ rad/sec}$$
$$\alpha_2 = -1 \text{ rad/sec}^2; \alpha_4 = 0$$
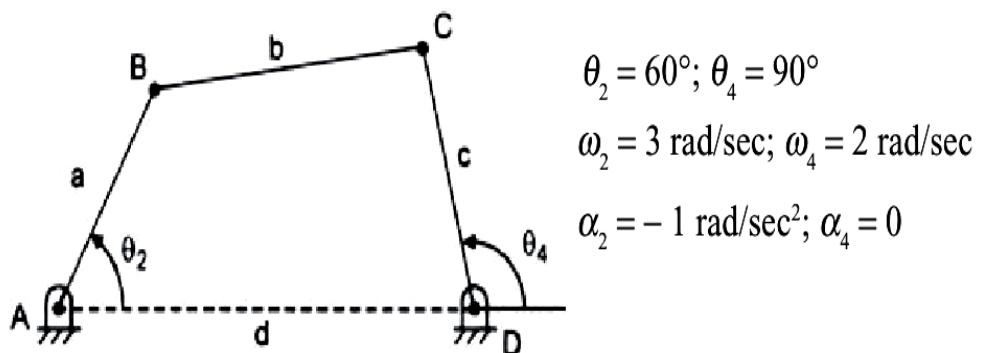
Figure.2.

(OR)

b)   Derive Freudenstein's equation for a four-bar linkage as shown in   (16)
Figure.3.
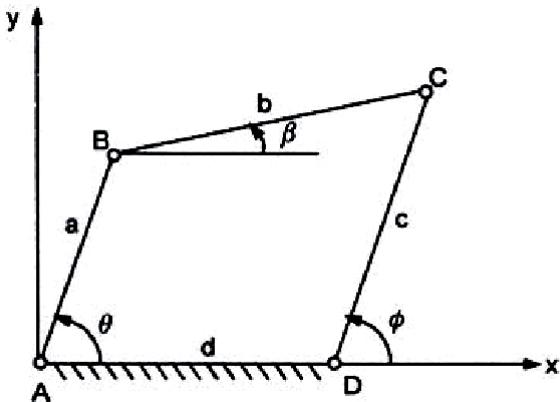
Figure.3.

14. a)   Draw the profile of a cam operating a knife-edge follower when the   (16)
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.

(OR)

b)   The following data refers to a tangent cam operating a radial roller   (16)
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.

15. a)   A pair of involute spur gears having 20 and 40 teeth are in mesh, the   (16)
speed of the smaller wheel being 2000 rpm. Calculate the sliding
velocity between gear teeth faces.

    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   (16)
gears A, B, and C is 50, 25, and 55 respectively. The arm rotates at
450 rpm clockwise. Calculate.
   1) the speed of gear C when A is fixed, and
   2) the speed of gear A When C is fixed.
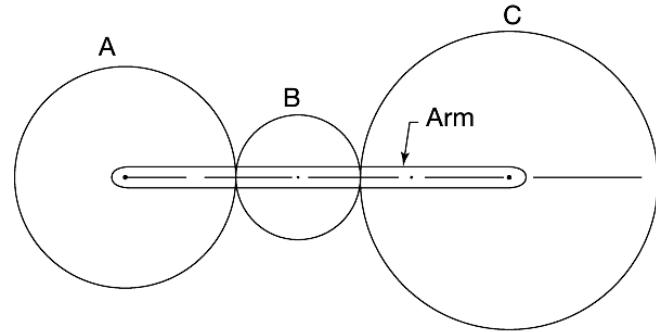
Figure.4.

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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   (16)
          eliminated in instrumentation.
                              (OR)
     b)   Explain the static and dynamic characteristics of an instrument in   (16)
          detail.

12. a)   Explain with suitable sketch about flow measurement sensors.   (16)
                              (OR)
     b)   Explain with suitable sketch about torque and power measurement   (16)
          Sensors.

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   (16)
          diagram.

14. a) Explain the arrangement and functions of data acquisition system (16) with suitable block diagram.

(OR)

b) Explain data logging, data conversion and digital transmission (16) systems with suitable diagrams.

15. a) Explain the architecture of virtual instrumentation with suitable (16) block diagram.

(OR)

b) Explain the VI programming, loops, charts, arrays and clusters with (16) necessary diagrams.

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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   (16)
         explain any three.

(OR)

    b) i) Discuss about the geotechnical problems in alluvial soil and laterite   (12)
            soil.

        ii) How will you select the suitable ground improvement techniques for a   (4)
            particular type of soil?

12. a)   Describe about the various drainage techniques.   (16)

(OR)

b) i) State the principle of electro osmosis method. List any four (12) advantages of electro osmosis method. Brief the factors influencing the electro osmosis.

   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, (8) apparent opening size, mass) of the geo-textiles.

    ii) Discuss about the functions and applications of geo-textiles in earth (8) reinforcement.

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 (10) grout.

    ii) Brief about compaction grouting and jet grouting. (6)

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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 $\vec{a_x}$ + xz $\vec{a_y}$ + xy $\vec{a_z}$ is both solenoidal and irrotational.   (8)

    ii) Given A = $5\vec{a_x}$ and B = 4 $\vec{a_x}$ + t $\vec{a_y}$. 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 $\vec{a_r}$ + r cosθ $\vec{a_\theta}$ + $\vec{a_\varphi}$ 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 (16) current I, with N turns and the radius of toroid 'r'. And Formulate the expression for inductance of a coaxial cable.

13.   a)   Analyze Capacitance, Electrostatic Energy, and Boundary Conditions (16) for Electric Fields.

(OR)

     b)   Discuss Inductance, Mutual Inductance and Energy in Magnetic (16) Fields.

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 (16) varying from fundamental laws of electric and magnetic fields.

15.   a)   Explain the condition under which the magnitude of the reflection (16) coefficient equals that of the transmission coefficient for a uniform wave at normal incidence on an interface between two lossless dielectric medium.

(OR)

     b)   Evaluate the amplitudes of reflected and transmitted fields (16) (electric and magnetic both) at the interface of two regions, if $E_i = 1.5$ mV/m in region 1 for which $\varepsilon r1 = 8.5$, $\mu r = 1$ and $\sigma = 0$ and region 2 is a free space.

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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 (10) 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.

     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 (6) 300 µC at (2, 0, 0) m.

12. a) At an interface separating dielectric 1$(\mathcal{E}_{r1})$ and dielectric 2$(\mathcal{E}_{r2})$, show (16) that the tangential component of $\bar{E}$ is continuous across the boundary, whereas the normal component of $\bar{E}$ is discontinuous at the boundary.

(OR)

b) Explain briefly the polarization in dielectrics. Derive laplace's and (16) poisson's equations from gauss law for a linear material medium.

13. a) i) Obtain the expression of flux density produced by an infinitely long (10) straight wire carrying a current I, at any point distant 'a' normal to the wire.

ii) Calculate the inductance of a ring-shaped coil of mean diameter (6) 20 cm, wound on a wooden core of 2 cm diameter containing 200 turns.

(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 (16) differential and integral form.

(OR)

b) Explain the relationship between the field theory and circuit theory (16) using a simple RLC series circuit.

15. a) State and prove Poynting Vector and Poynting Theorem. (16)

(OR)

b) Deduce the wave equations for conducting medium. (16)

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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   (6)
        examples.

(OR)

    b) i) Compare and contrast the different loading conditions and their   (10)
           impact on the performance of drive motors.

    ii) Analyze how the classes of duty affect the energy efficiency of electric   (6)
        drives?

12. a) Compare and contrast the speed-torque characteristics of DC shunt   (16)
        and series electrical motors with neat sketches. Explain the
        characteristics.

(OR)

b) Discuss the dynamic braking and regenerative braking in electrical (16)
machines.

13. a) i) Describe the working principles of 3-point DC motor starter with (8)
diagram.

ii) Explain the operation of Star-Delta starter. (8)

(OR)

b) i) Explain the starting methods of squirrel cage motor with relevant (8)
circuit diagram.

ii) Analyze the impact of starting torque on motor performance in (8)
various starting methods for three-phase induction motors.

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 (16)
with neat diagrams.

15. a) i) Describe the V/f control method for AC motor drives and illustrate its (10)
working with relevant equations and graphs.

ii) Compare the performance of V/f control and slip power recovery (6)
scheme.

(OR)

b) i) Discuss the working principles of the slip power recovery scheme and (10)
mention its advantages over conventional speed control methods.

ii) Outline the role of AC voltage regulators in the speed control of AC (6)
drives.

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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)
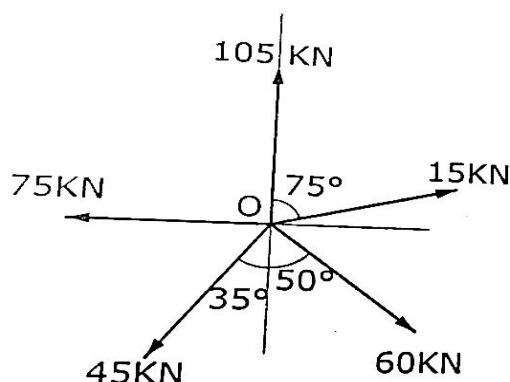
Figure.1

(OR)

b) Determine the resultant of a system of three concurrent forces (16) 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.

12. a) Find the support reaction of the beam as shown in the figure.2. (16)
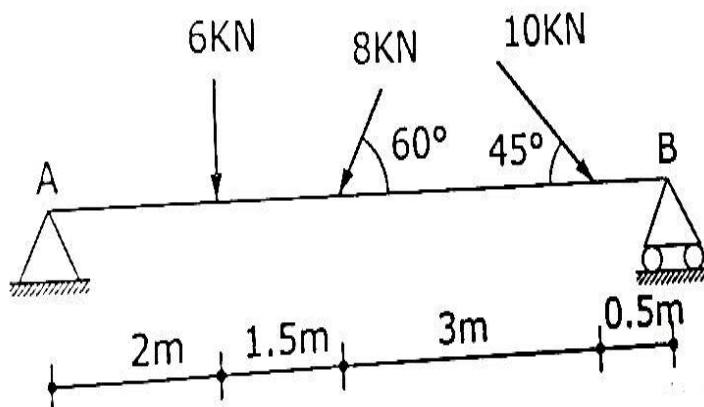
Figure.2

(OR)

b) Four forces of magnitude and direction acting on a square ABCD of (16) 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.
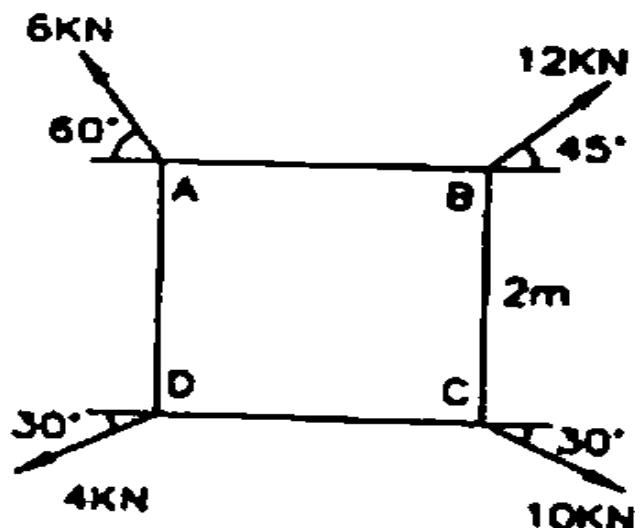
Figure.3

13. a) For a given composite section, find the centroidal axis. Shown in figure.4 (16)
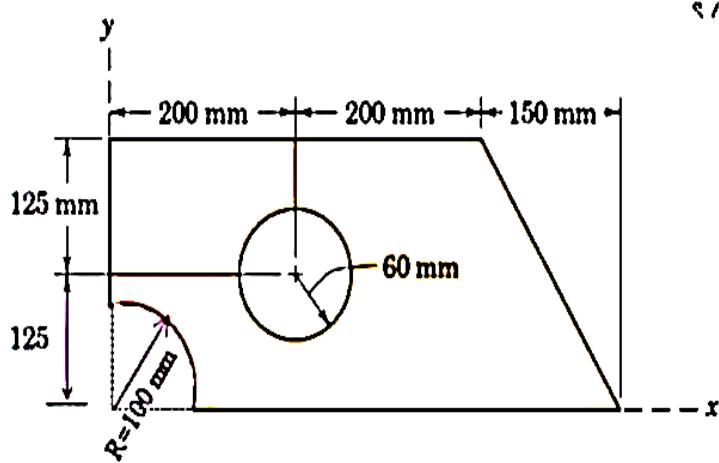
Figure.4

(OR)

b) Determine the Ixx and Iyy about centroidal axis for the given section below. Shown in figure.5 (16)
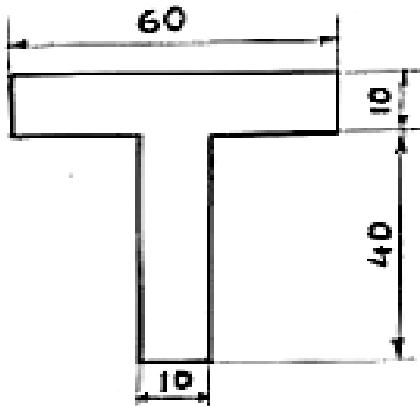
ALL DIMENSIONS ARE IN mm

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 (16) 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.
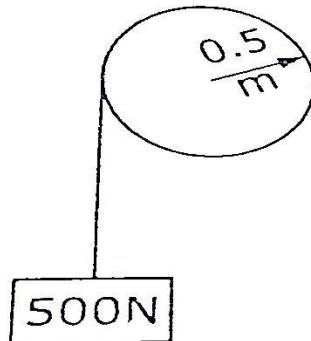

Figure.6

(OR)

b) The speed of a flywheel rotating at 200 rpm is uniformly increase to (16) 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.

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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 (16) and explain the steps involved to repair those damages.

(OR)

b) Detail about the demolition Techniques for Controlled blasting. (16)

15. a) Explain in detail of ultrasonic testing principle, components and its (16) applications with neat sketch.

(OR)

b) Write short notes on Destructive testing and non Destructive testing (16) procedure on Structures.

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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   (16)
         smart structures.

(OR)

    b)   Discuss in detail about the use of smart materials in structures with   (16)
         its advantages.

12. a)   Write in detail about the techniques used in the measurement of   (16)
         strain using strain gauges.

(OR)

    b)   Briefly explain on the role of Wheatstone bridge and Pressure   (16)
         transducer in measuring instruments.

13. a)   List the sensor types. Explain any two of the sensors with its working   (16)
         principles and application.

(OR)

    b)   What are fiber optic techniques? Explain in detail the fiber optic   (16)
         chemical sensing systems and distributed measurements.

14. a) What are the different actuator materials used in smart structures? (16) Explain any two of them with its advantages.

(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 :

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 (16)
        scenario.

(OR)

    b) What are the security mechanisms provided by secured socket layer (16)
        and transport layer? Explain in detail.

12. a) Discuss about the Comprehensive Lightweight Application Security (16)
        Process with neat diagram.

(OR)

    b) Explain Software Assurance Maturity Model for secure software (16)
        development with neat sketch.

13. a) Discuss the security measures against different threats with (16)
        examples.

(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 (16)
    based vulnerability scanners.

(OR)

b) Explain external and internal penetration testing with suitable (16)
    examples.

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)

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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   (16)
       acquisition.

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 :

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.
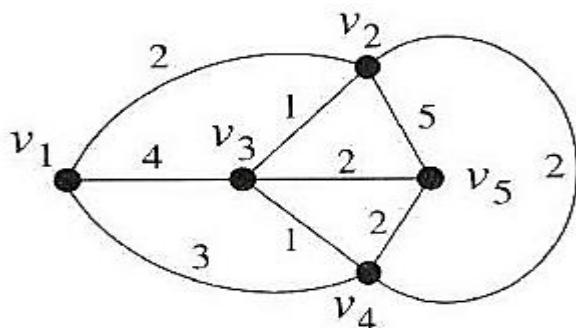

Figure.1

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   (16)
          VLSI design automation tools.

(OR)

    b)   Briefly mention the most relevant tools used in VLSI design   (16)
          automation.

12. a) Explain the steps in Depth First search and Breadth First Search (16) algorithms using an example graph. Compare their Complexities and give their applications in VLSI design automation tools.

(OR)

b) Explain the concepts of linear programming with suitable (16) expressions.

13. a) Explain the bellman ford algorithm for constraint graph compaction. (16)

(OR)

b) Discuss about the Kernighan-Lin partitioning algorithm along with (16) pseudo code. Also apply the algorithm to partition the following graph in Figure.2
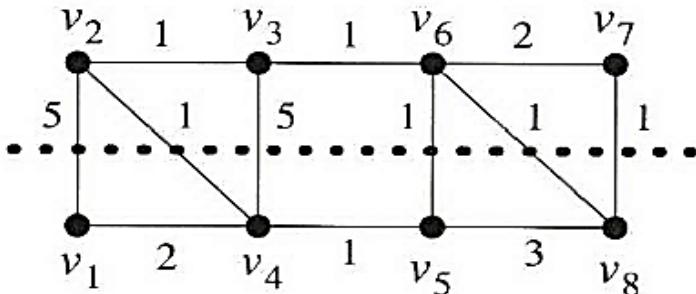

Figure.2

14. a) Given a floorplan consisting of four-leaf cells A, B, C, and D with the (16) following dimensions:

1) A: 2 x 2
2) B: 1 x 3
3) C: 1 x 4
4) D: 2 x 4
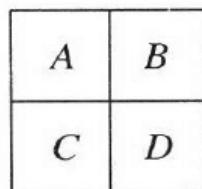

Figure.3

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 (16) codes.

15. a) Explain the principles and implementation of ROBDD in detail. (16)

(OR)

b) Explain the hardware models used for high level synthesis by (16) considering a synchronous system as an example.

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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 :

(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 $f(x) = \begin{cases} ke^{-2x} & 0 \leq x \leq \infty \\ 0 & otherwise \end{cases}$. 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 %   (8)
            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.

ii) A continuous random variable X has the distribution function (8)

$$F(x) = \begin{cases} 0 & x \le 1 \\ k(x-1)^4 & 1 < x \le 3. \\ 1 & x > 3 \end{cases}$$

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 (8)
generating function and hence find the Mean and Variance of X.

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 (8)
drawn at random with replacement, find the probability of
distribution of the number of fused bulbs drawn.

ii) In the manufacture of glassware, bubbles can occur in the glass (8)
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.

(OR)

b) i) An electric firm manufactures light bulbs that have a length of life (8)
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?

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   (8)
variable are $1, 16$ and -40 respectively. Find the values of the first
three moments about the origin.

      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   (8)
18.75. Find coefficient of skewness and kurtosis.

      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   (8)
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?

      ii)   A survey on cars had conducted in 2011 and determined that 60 % of   (8)
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.

(OR)

b)   i)   A normal population has a mean of 6.48 and standard deviation of 1.5.   (8)
In a sample of 400 members mean is 6.75. Is the difference significant?

      ii)   1000 students at college level were graded according to their I.Q. and   (8)
their economic conditions. What conclusion can you draw from the
following data:

Economic conditions	I.Q. Level	
	High	Low
Rich	460	140
Poor	240	160

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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 (16) drive-train with the help of suitable diagrams. State your views on the present challenges involved.

13. a) Discuss how you can select the drives for electrical vehicles, whether (16) AC or DC, with proper justification in terms of performance characteristics.

(OR)

b) Explain the working of a switched reluctance motor drive with a neat (16) sketch and discuss its torque-speed characteristics.

14. a) Analyze how energy storage devices contribute to the overall efficiency (16) and performance of electric vehicles, and briefly describe how they are integrated into EV drivetrains.

(OR)

b) Examine the integration of an internal combustion engine with (16) electrical drives in hybrid vehicles with a suitable configuration diagram. State the present challenges involved in it.

15. a) Describe the rule-based and optimization-based energy management (16) strategies for electric vehicles and make a performance comparison with suitable examples.

(OR)

b) Elaborate on your understanding of the deep-reinforced learning (16) strategy of energy management and describe their performance with dynamic programming.

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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 (16)
         briefly with suitable examples.

                              (OR)

    b)   Discuss the selection criteria for choosing the type and location of a (16)
         power plant.

12. a)   Explain the Organic Cycle, its components, and its advantages for (16)
         low-temperature solar applications.

                              (OR)

    b)   Compare the Ericsson cycle with the Brayton cycle, highlighting their (16)
         differences in efficiency and operation.

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)

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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   (16)
         of brazing in detail.

(OR)

    b)   Explain the terms capillary action, wetting, and surface tension and   (16)
         contact angles when a liquid is spread over a solid surface?

12. a)   Elaborate the grouping and applications of fluxes and atmospheres in   (16)
         brazing and soldering.

(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
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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)

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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   (16)
           briefly.

12. a) i) The speed of overtaking and over taken vehicles are 70 kmph and   (8)
             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.

        ii) National highway passing through rolling terrain of heavy rainfall   (8)
             area, R = 500 m. Design length of transition curve.

(OR)

   b) i) A vehicle travels at a speed of 60 kmph. Find the super elevation to be   (8)
             provided if the radius of curvature is 220 m.

        ii) A vehicle travels in a 2-lane road with a design speed of 80 kmph.   (8)
             Find the amount of extra widening for a radius of curvature of 210 m.

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)

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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 (16) analysis and bayesian data analysis

(OR)

b)   Discuss the various data transformation techniques used in EDA.   (16)

12. a)   Explain the following operations in EDA: Concat, Append, Merge and (16) Join.

(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 (16)
analysis.

(OR)

b) Explain the methods of measuring inequality in EDA with suitable (16)
example.

14. a) Explain the process of creating percentages in bivariate analysis with (16)
suitable example.

(OR)

b) Explain the process of handling several batches in bivariate analysis (16)
with suitable example.

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 (16)
group data for a real - world example.

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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 (16) digital forensics process.

(OR)

b) Explain in detail about Examination, Analysis and presentation (16) phases.

12. a) Elucidate about various Investigation methods for collecting digital (16) evidence.

(OR)

b) Describe about International Cooperation used to collect Digital (16) Evidence.

13. a) Elaborate the frameworks, standards and methodologies of digital (16) forensic readiness.

(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:

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   (8)
             paradigm write the major applications of OOPs.
                                   (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)
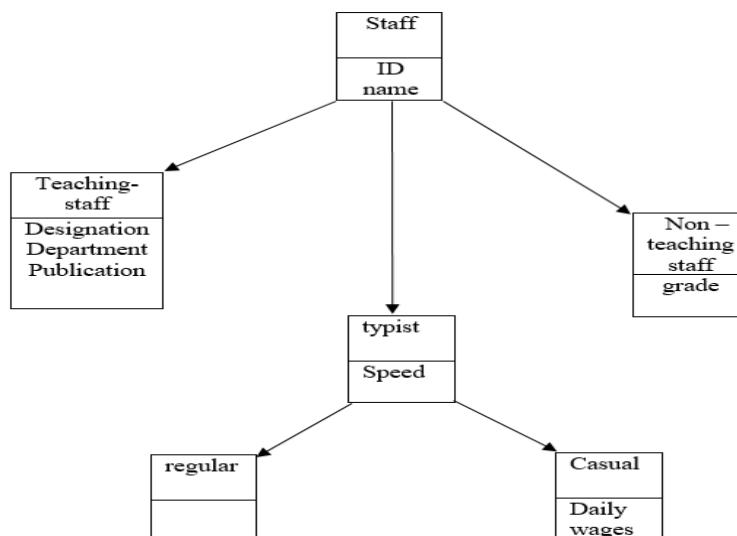
An educational institution wishes to maintain a data of its employees. The hierarchical relationship of related classes are as shown in figure. Define all the classes to represent above hierarchy and define functions to retrieve individual information as and when required.

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)

b) i) Write a program that illustrates the application of multiple catch (8) statements.

ii) Write a C++ program using function template to find the product of (8) two integer or floating point type of data.

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 (10) each employee.

(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 (10) 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.

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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 (16) Energy conversion system. Also discuss about its characteristics.

(OR)

b) Discuss about the power converter used in wind generation (16) generators. Also explain the control of converter.

15. a) Discuss in detail about the solar PV and wind farm behavior during (16) grid disturbances. Also discuss the rectifying action for it.

(OR)

b) Explain the main features of solar PV and wind hybrid generating (16) systems.

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Government College of Engineering :: Salem
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)

$$V = 3ti + xzj + ty^2 k$$

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 $20 \times 10^{-6}\, m^2/s$ and density 800 kg/m³ is contained between two parallel plates 15 cm apart. The lower plate is fixed. A positive pressure gradient of 12.5 N/m³ 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)

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   (16)
         suitable diagrams.
                                    (OR)
    b)   Analyze the mechanisms and impact of hydrogen embrittlement on   (16)
         high-strength steels.

12. a)   Describe the different types of surface coatings and their applications   (16)
         in industrial processes.
                                    (OR)
    b)   Discuss the impact of advanced ceramic coatings in reducing wear   (16)
         and corrosion in marine environments.

13. a)   Explain the classification and heat treatment methods for aluminum   (16)
         and its alloys.
                                    (OR)

b)   Compare the heat treatment processes of titanium and nickel alloys (16) for aerospace applications.

14.   a)   Explain the manufacturing and uses of refractory ceramics in high- (16) temperature applications.

(OR)

b)   Describe the properties and industrial applications of superalloys like (16) Hastelloy and Inconel.

15.   a)   Explain the importance of Maraging steel and cryogenic steels in (16) advanced engineering applications.

(OR)

b)   Analyze the role of Al7075 and Al6061 in the aerospace and (16) automotive industries.

Register Number :

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)