Register No :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

I Semester (Full Time)

(2022 Regulations)

ECE/ELECTRICAL AND ELECTRONICS ENGINEERING

22PH102 - Materials Science for Engineering

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State Wiedemann - Franz law.
2. How does the Fermi function vary with temperature?
3. List any two properties of semiconductor.
4. Differentiate direct and indirect band gap semiconductors.
5. Relate electronic and orientational polarization mechanisms with temperature.
6. Write the uses of dielectric materials.
7. Compare properties of diamagnetic, paramagnetic and ferroelectric materials.
8. Mention a applications of superconductors.
9. List the application of nanotechnology in industry.
10. Classify the shape memory alloys.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive an expression for the density of energy states in metal. (16)

(OR)

b) Using the classical free electron theory, derive the expressions for the electrical conductivity and thermal conductivity of metals and hence deduce Wiedemann-Franz law. (16)

12. a) Find an expression for the Hall coefficient of a metal. Describe an experimental setup to study the Hall effect. What are the most important results obtained by the study of the Hall effect? (16)

(OR)

b) Discuss the formation of n-type and p-type extrinsic semiconductors. Derive an expression for the carrier of an intrinsic semiconductor. (16)

13. a) Discuss in detail the electronic and ionic polarization mechanisms in a dielectric material. (16)

(OR)

b) Derive an expression for internal field and deduce Clausius - Mosotti equation. (16)

14. a) Explain formation of domains in a ferromagnetic material and show how the hysteresis curve is explained on the basis of the domain theory. (16)

(OR)

b) Explain Meissner effect. Give the qualitative description of the BCS theory. (16)

15. a) Discuss Plasma arcing method and Sol-Gel technique for the preparation of nano particles. (16)

(OR)

b) Summarize the processing, characterization and applications of Shape Memory Alloys. (16)

Register Number :

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

CIVIL ENGINEERING

22CY201 – Environmental Science and Engineering

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between critical minerals and strategic minerals.
2. Identify the causes of soil erosion.
3. Define endemic and endangered species.
4. Discuss the components of ecosystem.
5. Give example for primary and secondary air pollutants.
6. Analyze BOD and COD.
7. State eutrophication.
8. Inspect the term biomagnification.
9. Interpret the term population explosion.
10. Mention the objectives of waste land reclamation.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Illustrate the impact of modern agriculture on the environment.	(10)
		ii)	Construct and explain hydrological cycle.	(6)
			(OR)	
	b)	i)	Summarize the environmental effects of extracting and using mineral resources.	(10)
		ii)	Examine the causes and impacts of deforestation.	(6)
12.	a)	i)	Discuss the conservation of biodiversity in terms of In-situ and Ex-situ methods.	(8)
		ii)	Write short note on ecological pyramid and their types.	(8)
			(OR)	
	b)	i)	Describe the various threats to biodiversity.	(8)
		ii)	Report the types and essential steps of ecological succession.	(8)

13. a) i) Elaborate the process of wastewater treatment. (12)

ii) Interpret the effects of noise pollution. (4)

(OR)

b) i) What are the major pollutants of water? List the adverse effects caused by these pollutants. (12)

ii) Evaluate the control measures of air pollution. (4)

14. a) i) Deduce the mechanism of ozone layer depletion and explain consequences of it. (10)

ii) Elucidate the various emergency management tips to be undertaken in case of any disaster. (6)

(OR)

b) i) Analyze the various methods adopted for solid waste management. (10)

ii) Examine the causes and effects of global warming. (6)

15. a) i) Explain the variation in population growth among the various nations with neat diagram. (12)

ii) How HIV is transmitted and explain the way to reduce AIDS? (4)

(OR)

b) i) Identify the objectives and ways to achieve sustainable development. (12)

ii) Predict the urban problems related to energy. (4)

Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

EEE/MECHANICAL/METALLURGICAL ENGINEERING

22NC201 – NCC Course -1

Time : 3 Hours | Maximum Marks : 100

Part A (40 x 0.5 = 20 Marks)

Choose the best Answer

1. Fuselage of the aircraft is designed to:
   a) Attach all the other ac components
   b) To provide a space for the freight and passenger
   c) To provide economical and easy for production
   d) All of these

2. Where are Rudders mounted:
   a) Trailing edge of vertical stabilizer
   b) Trailing edge of horizontal stability
   c) Leading edge of wing
   d) Trailing edge of wing

3. What controls pitching movement of an aircraft :
   a) Rudder
   b) Elevator
   c) Aileron
   d) All of these

4. YAW is controlled using
   a) Throttle control
   b) Rudder pedals
   c) Yoke control
   d) All of these

5. Undercarriage is also known as
   a) Alighting Gear
   b) Landing Gear
   c) a & b
   d) None

6. The air is compressed by
   a) Turbine
   b) Axial compressor
   c) Air intake
   d) Pump

7. The air fuel mixture burns inside the
   a) Combustion chamber
   b) Crank case
   c) Air intake
   d) Jet pipe

8. Natural disaster
   a) Water related
   b) Wind related
   c) Earth related
   d) All of these

9. Man made disaster
   a) Earthquake
   b) Accident
   c) Tsunami
   d) Wildfire

10. Primary controls
    a) Trim tab
    b) Flabs
    c) Rudder
    d) Spoiler

Fill in the blanks

11. HQ of western air command is located at _____.
12. What is the full form of award VM in Indian air force _____.
13. There are _____ functional commands in IAF.
14. The supreme commander of armed forces is_____.
15. Rank of Marshal of the air force was given to _____.
16. Rolling is controlled using _____.
17. Role of air intake is to assists in _____.
18. The _____burns inside the combustion chamber.
19. In the exhacest stroke _____ Sent Out.

20. M P I means _____.

True or False

21. Girls literacy is unnecessary for the process of the nation.
22. Child labour is one among the major social problem.
23. Blood donation is not a part of social work.
24. Bleaching powder is used in water to kill germs.
25. Malaria is a insect borne disease.
26. Good physical health required for good mental health.
27. Age limit for NCC Special entry is 19-23 years.
28. Indian air force is the oldest of the three services.
29. Indian air force training command is located at Bengaluru .
30. Indian air force anniversary is celebrated on 8th oct every year.

Match the Following

31.	Operation Vijay	-	Fighter Aircraft
32.	Padam Vibhushan	-	Rakesh Sharma
33.	Soyuz T-11	-	Elevator
34.	Hunter	-	Bomber Aircraft
35.	Dornier	-	1999 War
36.	Jaguar	-	Transport Aircraft
37.	Bandipur national park	-	Indore
38.	Cleanest City	-	1971 war
39.	Pitching of Aircraft	-	Karnataka
40.	Pak War	-	Arjan Singh

Part B (10 x 2 = 20 Marks)

Write Any ten out of twelve

41. What are the Basic Tools required for Aeromodelling?
42. What are the main substances from which aero models can we made?
43. What are the different types of radio control models?
44. What are the major effects of Natural calamities?
45. What are the essential services?
46. What NCC cadets can do in Disaster management?
47. What are the causes of fracture?
48. What are the benefits of obstacle training?

49. What are the internal classification of threat?

50. Explain "Unity in Diversity"

51. Write basic theory of Aero engine.

52. Define Radar and explain it's types.

Part – C (08 x 3 = 24 Marks)

Write Any eight out of ten

53. Write any Four Objectives of NCC.

54. What is Sense of Humors?

55. Describe any two types of Leadership style.

56. Write short notes on "Social service activities" undertaken by NCC cadets.

57. What are the Water Borne diseases? How do they spread and how they can be prevented?

58. What are the causes of Fracture?

59. What are the importance of Forests?

60. Explain the Principle of Flight.

61. Elaborate few ways in which Airmanship helps pilot.

62. What is Air Navigation? How does it differ from Surface Navigation?

Part-D (06 x 6 = 36 Marks)

Write Any six out of eight

63. Write a note on operation Safed Sagar.

64. Write a note on WG Cdr. Rakesh Sharma.

65. Describe Indo - Pak war 1971.

66. Write any Three types of Transport Aircraft of IAF and describe in short.

67. Write short note on Rafael, Tejas (LCA) and LCH inducted in IAF.

68. Explain about safety code while flying aero models.

69. What are the measures to develop personality?

70. What are the determinants of personality?

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B.E. Degree Examinations – April/May 2023

I & II Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES EXCEPT EEE

22CS101 – Problem Solving and C Programming

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Difference between compiler and assembler.
2. What will be output of the following program?

```
#include <stdio.h>
int main( )
{
int x = 4, y, z;
y = --x;
z = x--;
printf ("%d, %d, %d\n", x, y, z);
return 0;
}
```

3. Difference between while loop and do-while loop.
4. Identify the purpose of break and continue statements.
5. How do we declare and initialize pointer?
6. State the relationship between pointer and array.
7. List out the two parts of function definition.
8. What is meant by library functions? Give example.
9. How does the structure elements are accessed using pointers? Give example.
10. How does a structure differ from union?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Illustrate the various data types in C with example. (10)

ii) Explain about preprocessor directives of C and its types. (6)

(OR)

b) i) Examine the various types of operators used in C with example. (10)

ii) Write an algorithm and draw flowchart to find the greatest of three numbers. (6)

12. a) i) Elucidate conditional branching statements in C with example. (8)

ii) Explain about the looping statements in C with example. (8)

(OR)

b) i) Write a C program to check whether the given number is Armstrong or not. (8)

ii) Write a C program to find the grade of a student using switch case. (8)

13. a) Write the syntax for declaring and initializing two-dimensional array. Develop a C program to perform multiplication of two matrices. (16)

(OR)

b) Examine the various string handling functions with example programs. (16)

14. a) i) Illustrate call by value and call by reference with an example program. (10)

ii) Write short notes on various storage classes used in C. (6)

(OR)

b) i) Explain the different classification of user defined functions based on parameter passing and return type with examples. (10)

ii) What is recursive function? Write a C program to find the factorial of a given number using recursive function. (6)

15. a) i) Write a C program to accept details of 'n' employee (eno, ename, salary) and display the details of employee having highest salary. Use array of structure. (10)

ii) Write short notes on structure within a structure. (6)

(OR)

b) i) Write a C program to read data from a file and write into another file. (10)

ii) Explain about various file opening modes in C. (6)

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B.E. Degree Examinations – April/May 2023

I & II Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES

22CY101 – Engineering Chemistry

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between chromophore and auxochrome with examples.
2. Calculate the molar absorptivity of a 0.15 M solution, which has an absorbance of 0.4, when the path length is 2.5 cm.
3. Why hardness expressed in terms of equivalents of $CaCO_3$?
4. Define carbon nanotubes and write their types.
5. Comment on Pattinson's process for the desilverisation of argentiferous lead.
6. Predict the values of P, C and F in the following system.
   $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$.
7. Examine the difference between electrolytic cell and electrochemical cell.
8. What is meant by stress corrosion? Give example.
9. Illustrate the causes and effects of knocking in IC engine.
10. Inspect the terms leaded and unleaded petrol? Give example.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the principle and instrumentation of vibrational spectroscopy. (12)

    ii) Discuss the flame photometric estimation of sodium with a neat graph. (4)

(OR)

    b) i) Explain the principle & instrumentation of electronic spectroscopy. (12)

    ii) How the concentration of nickel is determined by atomic absorption spectrometer? (4)

12. a) i) Show the diagram for the ion-exchange process of water softening and explain the reactions involved in it. (12)

    ii) Develop any two methods of synthesis of nanoparticles. (4)

(OR)

	b)	i)	Illustrate the EDTA method of estimation of hardness of water.	(12)
		ii)	Identify the causes and prevention of priming & foaming.	(4)
13.	a)	i)	Derive an expression for Langmuir's adsorption isotherm and interpret the results at low Pressure and high Pressure.	(10)
		ii)	Recall phase rule and condensed phase rule and explain the terms involved in it. What is the value of F at the eutectic point for a two-component system?	(6)
			(OR)	
	b)	i)	Draw a neat phase diagram of one component system and explain in detail.	(10)
		ii)	Mention the factors which influence the adsorption of a gas on a solid and explain.	(6)
14.	a)	i)	Interpret the term single electrode potential and derive Nernst equation for single electrode potential.	(8)
		ii)	State electrochemical series and explain its applications.	(8)
			(OR)	
	b)	i)	Inspect the control of corrosion by the use of sacrificial anode and by impressed current cathodic protection.	(8)
		ii)	Elucidate the mechanism of differential aeration corrosion.	(8)
15.	a)	i)	Evaluate the determination method of calorific value of fuel by bomb colorimeter.	(10)
		ii)	Write the preparation, properties and uses of a) Nylon–6, 6 b) PHBV.	(6)
			(OR)	
	b)	i)	Elaborate the fluidized catalytic cracking method of petroleum.	(10)
		ii)	Report the free radical mechanism of addition polimerization.	(6)

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I Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22MA102 – Matrices, Calculus and Differential Equations

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the Eigen values of $A^2 - 5I$ if $A = \begin{pmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{pmatrix}$.
2. Determine the nature of the quadratic form $x_1^2 + 2x_2^2$.
3. Find the stationary values for $x^2 + y^2 + 6x + 12$.
4. Evaluate $\int_1^2 \int_0^{x^2} x\, dy\, dx$.
5. Find the Particular integral of $(D^2 + 1)y = \sin x$.
6. Solve: $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + y = 0$.
7. Form the partial differential equation from $z = (x + a)(y + b)$ by eliminating the arbitrary constants.
8. Find the complete solution of $z = px + qy + p^2 + q^2$.
9. If $\vec{F} = (x + 3y)\vec{\imath} + (y - 2z)\vec{\jmath} + (x + cz)\vec{k}$ is solenoidal, then find the value of 'c'.
10. State Stoke's theorem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Obtain Eigen values and Eigen vectors of the matrix (10)
$A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$.

ii) Using Cayley Hamilton theorem find inverse of the matrix (6)
$A = \begin{pmatrix} 2 & 1 \\ 1 & -5 \end{pmatrix}$.

(OR)

b) Reduce the Quadratic form $3x_1^2 + 2x_2^2 + 3x_3^2 - 2x_1x_2 - 2x_2x_3$ to Canonical form by an Orthogonal transformation. Also find the rank, index and signature of the Quadratic form. (16)

12. a) i) Find the volume of the greatest rectangular parallelopiped inscribed in the ellipsoid whose equation is $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$. (8)

ii) Change the order of integration in $I = \int_0^a \int_y^a \frac{x}{x^2+y^2}\, dx\, dy$ and hence evaluate. (8)

(OR)

b) i) Find the area of the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$. (8)

ii) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dx\, dy\, dz}{\sqrt{1-x^2-y^2-z^2}}$. (8)

13. a) i) Solve: $(D^2 - 2D + 5)y = e^x cos\, 2x$. (8)

ii) Solve: $\frac{d^2y}{dx^2} + 4y = 4\, tan\, 2x$ using method of variation of parameter. (8)

(OR)

b) i) Solve: $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = sin(logx)$. (8)

ii) Solve: $\frac{dx}{dt} + 2y = sin\, 2t$, $\frac{dy}{dt} - 2x = cos\, 2t$. (8)

14. a) i) Form the partial differential equation by eliminating the arbitrary functions f and g from $z = f(x + cy) + g(x - cy)$. (8)

ii) Solve: $p + q = pq$. (8)

(OR)

b) i) Solve: $(3z - 4y)p + (4x - 2z)q = (2y - 3x)$. (8)

ii) Solve: $p(1 + q) = qz$. (8)

15. a) Verify Green's theorem in the XY Plane for $\int_C (xy + y^2)dx + x^2 dy$, where C is the closed curve of the region bounded by $y = x$ and $y = x^2$. (16)

(OR)

b) Verify the 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)

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I Semester (Full Time)

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ELECTRICAL AND ELECTRONICS ENGINEERING

22CM101 – Basic Civil and Mechanical Engineering

Time : 3 Hours | Maximum Marks : 100

Part –I (4 x 2 = 8 Marks)

Basic Civil Engineering

Part A

Answer ALL Questions

1. State Hooke's Law.
2. What are the tests done on bricks?
3. Write any four types of Foundation.
4. What are the functions of Multipurpose Reservoir?

Part B (2 x 16 = 32 Marks)

Answer ALL Questions

5. a) i) Explain in detail about the properties of Stones and requirements of good Building Stone. (8)

   ii) What is the types of Surveying? Explain. (8)

   (OR)

   b) i) What are the types of cement? Explain. (8)

   ii) What are methods of using Prismatic Compass and explain in detail. (8)

6. a) i) What are the types of Footing? Explain. (8)

   ii) What are the advantages and disadvantages of Brick Masonry Over Stone Masonry? (8)

   (OR)

   b) i) Write down the types of Flooring and explain. (8)

   ii) What are types of dams? Explain. (8)

Part - II (6 x 2 = 12 Marks)

Basic Mechanical Engineering

Part A

Answer ALL Questions

7. Differentiate between boiler mountings and accessories.
8. What is the use of surge tank in hydropower plants?

9. State any four differences between two stroke and four stroke cycle engine.

10. Write short notes on crank case compression.

11. Write the principle of an air conditioner used in our homes.

12. Define refrigerant.

Part B (3 X 16 = 48 Marks)

Answer ALL Questions

13. a) With the help of a neat sketch explain the working of impulse turbine. (16)

(OR)

b) With a neat sketch, explain the construction and working principle of a double acting reciprocating pump. (16)

14. a) Explain the working principle of four stroke cycle engine neat sketch. (16)

(OR)

b) Discuss the working of two stroke cycle petrol engine with help of neat sketch. (16)

15. a) Explain in detail all the four stages of vapour compression refrigeration cycle. (16)

(OR)

b) Compare room air conditioner and split air conditioner with respect to construction, comfort, working and cost considerations. (16)

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II Semester (Full Time)

(2022 Regulations)

METALLURGICAL ENGINEERING

22EE203 – Basics of Electrical Engineering for Metallurgy

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Calculate the current and resistance of a 100 W, 200V electric bulb.
2. Determine the total amount of power in the series circuit in the Figure.1.

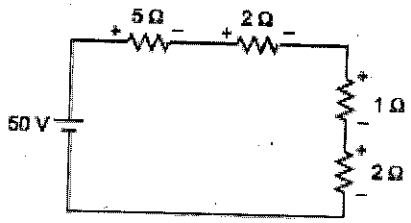

Figure.1.

3. Draw the phasor diagrams of RL and RC circuit.
4. Compare series and parallel resonance.
5. Draw the BH characteristics of a transformer.
6. A 60 kVA transformer has a core loss of 500 watts, full load copper loss of 950 watts. If the power factor is 0.9, calculate the full load efficiency.
7. Write about the nature of magnetic fields in 3 phase induction motor.
8. Specify few applications of single phase induction motor.
9. Compare ELCB and MCCB.
10. Mention the different types of wires and cables.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find Thevenin's equivalent circuit for the circuit shown in Figure.2 (8)

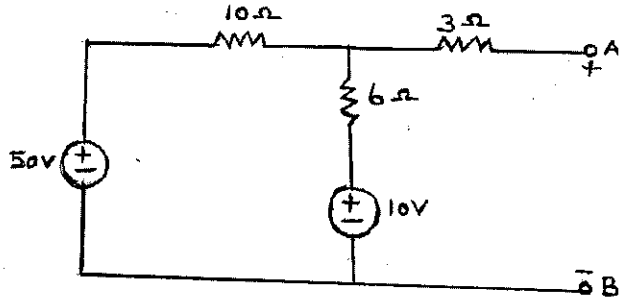

Figure.2.

ii) Find the current through 3 ohm resistor by Norton's Theorem for the network shown in Figure.3 (8)

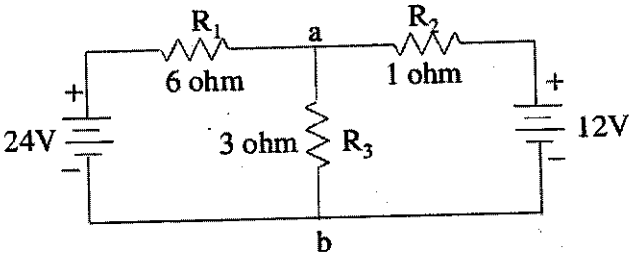

Figure.3.

(OR)

b) i) Use mesh-current analysis to determine the loop currents I_1, I_2 and I_3 flowing in the circuit shown Figure.4 (8)

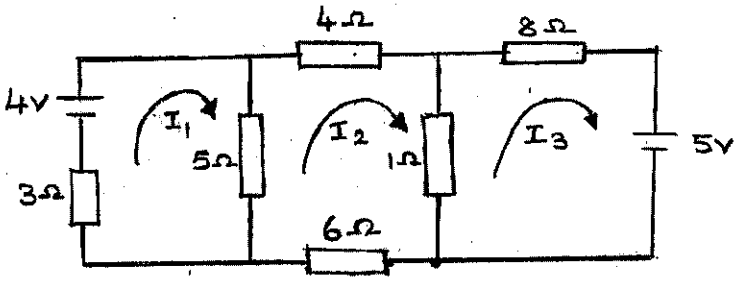

Figure.4.

ii) Determine the current delivered by the source in the circuit shown in Figure.5 (8)

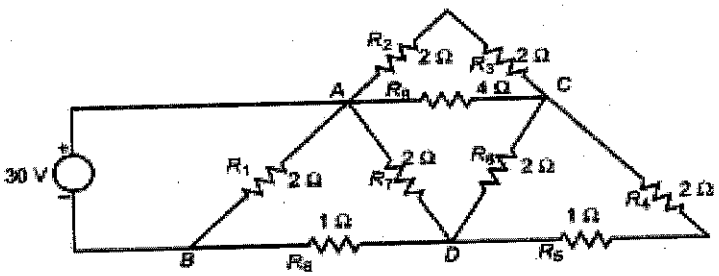

Figure.5.

12. a) i) A single-phase sinusoidal AC supply voltage defined as: $V_{(t)} = 240 \sin(314t - 20°)$ is connected to a pure AC capacitance of 200 uF. Determine the value of the current flowing into the capacitor and draw the resulting phasor diagram. (8)

ii) Obtain the delta-connected equivalent for the star-connected circuit shown in Figure.6 (8)

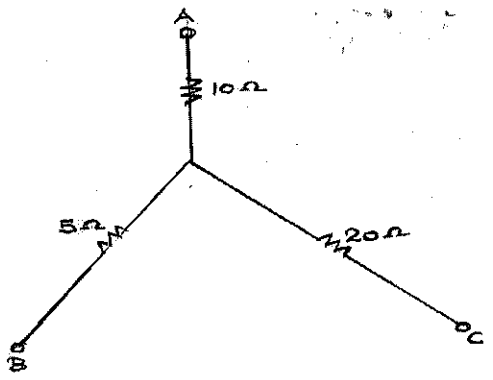

Figure. 6

(OR)

b) Figure. 7 shows a series RLC circuit containing a resistance of 12 Ω, an inductance of 0.15 H and a capacitor of 100 uF are connected in series across a 100V, 50Hz supply. Calculate the total circuit impedance, the circuits current, power factor and draw the voltage phasor diagram. (16)

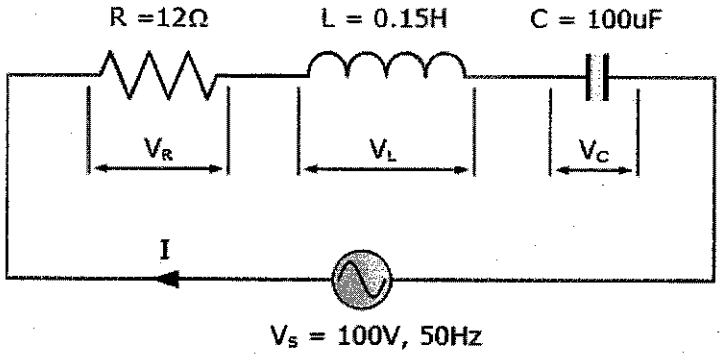

Figure.7.

13. a) i) Draw the shell type transformer and Compare Ideal and Practical transformer. (8)

ii) Deduce the Equivalent circuit of the transformer with relevant circuit diagrams. (8)

(OR)

b) i) Discuss the Core and Copper Losses in a transformer. (8)

ii) Derive the condition for maximum efficiency in a transformer. (8)

14. a) i) Elaborate the Construction and working of DC shunt motor. (8)

ii) Discuss the different speed control methods of DC shunt motor. (8)

(OR)

b) i) Explain the Construction and working of three phase induction motor. (8)

ii) Discuss the starting methods adopted in three phase induction motor. (8)

15. a) Discuss the different types of Batteries and its characteristics. (16)

(OR)

b) Discuss the various methods of Power factor Improvement. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22EE201 – Principles of Electrical Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare the important properties of inductor and capacitor.
2. State 'Maximum power transfer theorem' as applied to DC circuits and write its applications.
3. Write this expression for 'Reactive power and its significance.
4. Write the relationship between currents, and the relationship between voltages in a Delta connected system.
5. Draw the phasor diagram of an ideal transformer on no-load.
6. List the applications of Autotransformers.
7. What is the function of commutator in a DC machine?
8. Why a single phase induction motor is not self-starting?
9. Distinguish between MCCB and SFU.
10. List the disadvantages of low power factor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Using Kirchhoff's laws, find the current in various resistors in the circuit shown in Figure.1 (8)

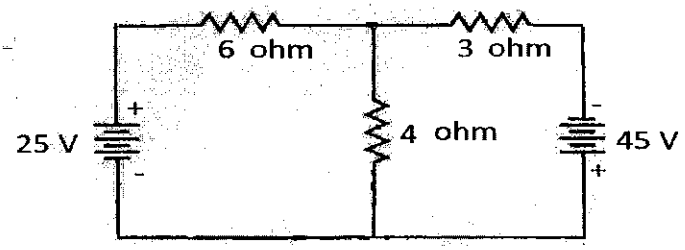

Figure.1.

ii) Derive the expression for $i(t)$ through a R-C series circuit excited by a DC voltage source of emf 'E' through a switch 'S' and also derive the capacitor voltage $e_c(t)$. (8)

(OR)

b) i) Find the current through 1 Ω resistor for the network shown in Figure.1 by applying Mesh current method. (8)

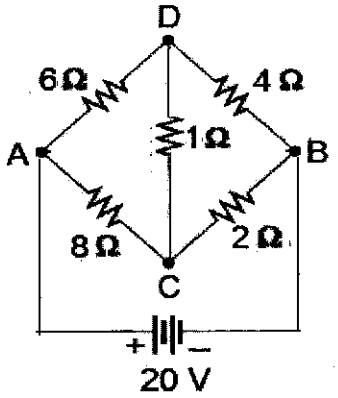

Figure.1.

ii) In the circuit of Figure.2 find the current I_1 through 1.5 Ω using the Superposition theorem. (8)

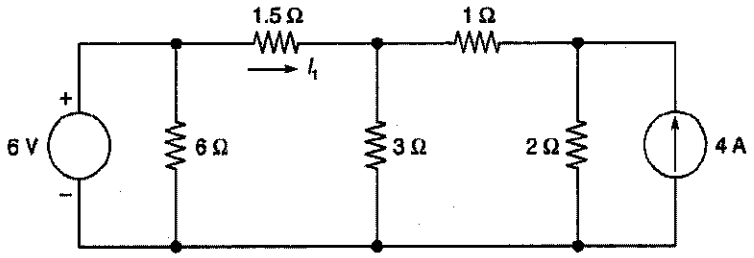

Figure.2.

12. a) i) Derive the expressions for i) RMS value, ii) Average value, iii) Form factor, and iv). Peak factor of a pure sinusoidal current waveform of peak value I_m. (10)

ii) A 440 V, 3-phase, 50-Hz AC supply is given to a balanced star connected load of impedance $(5+j3)$ Ω in each branch. Find the line current, power factor and total power. (6)

(OR)

b) i) A resistor of 100 Ω resistance is connected in series with a 50 μH inductor to a supply at 200 V, 50 Hz. Find the impedance, current, power factor, and voltage across resistor and inductor, real power, reactive power, and apparent power. Draw the phasor diagram. (10)

ii) Derive the expression for resonant frequency of a series RLC circuit. (6)

13. a) i) Explain briefly the working principle and derive the EMF equation of a transformer. (10)

ii) Write a brief note on 'Losses, Efficiency, and Regulation' of a transformer. (6)

(OR)

b) i) Draw the equivalent circuit of a transformer and explain how the parameters are obtained. (10)

ii) Explain how the saving in copper is achieved in an autotransformer? (6)

14. a) i) Explain briefly any two methods of speed control of DC shunt motor. (10)

ii) With neat diagram, describe the constructional details of any one type of rotors in synchronous generators. (6)

(OR)

b) i) With neat diagram, explain the construction and working of 3-phase induction motor. (10)

ii) With the help of a neat diagram, explain briefly the working of a star-delta starter for a 3-phase induction motor. (6)

15. a) i) Describe the types of wires and cables for internal wiring. (10)

ii) Explain briefly about elementary calculation of energy consumption. (6)

(OR)

b) i) Explain the following: (10)
1) Earthing and its necessity.
2) Any two categories of secondary batteries.

ii) Explain how the power factor of an inductive load can be improved using static capacitor. (6)

Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

I & II Semester (Full Time)

(2022 Regulations)

CIVIL/CSE/MECHANICAL ENGINEERING

22EE101 – Basic Electrical and Electronics Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Four of equal values resistors are connected in parallel to a supply voltage of 5 V. The current drawn by the source is 2.5 mA. What is the value of each resistor?
2. List two limitations of the superposition theorem in circuit analysis.
3. Two impedances (15-j10) Ω and (10+j15) Ω connected in series. Calculate the equivalent impedance of the circuit.
4. A three phase motor can be regarded as a balanced star connected load. A three phase motor draws 5.6 kW when the line voltage is 220 V and the line current is 18.2 A. Determine the power factor of the motor.
5. What happens if induction motor runs at synchronous speed?
6. List four characteristics of ideal transformer.
7. Compare PN junction diode and Zener diode.
8. Draw the circuit diagram of non-inverting amplifier using OP-AMP.
9. List the types of cables.
10. Compare UPS and SMPS.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Calculate R_{AB} for the resistive network shown in Figure.1 (8)

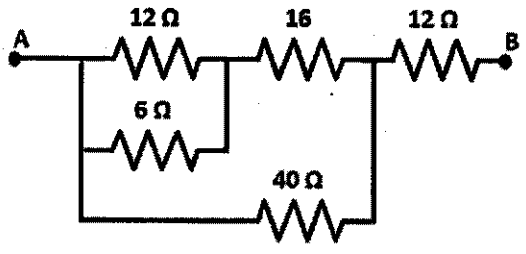

Figure.1.

ii) Reduce the circuit shown in Figure.2 to have a circuit with single current source connected in parallel to a resistance. (8)

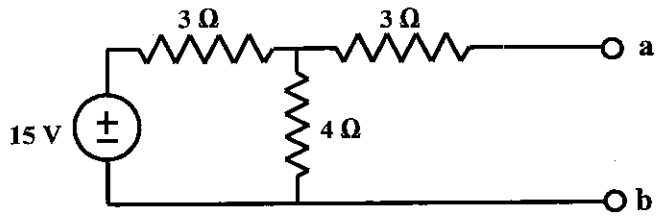

Figure.2.

(OR)

b) i) Find I in the circuit of Figure.3 using Kirchhoff's voltage law. (8)

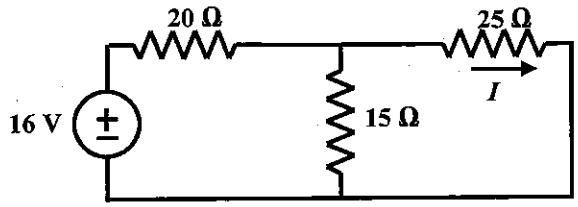

Figure.3.

ii) Find I in the circuit of Figure.4 using superposition theorem. (8)

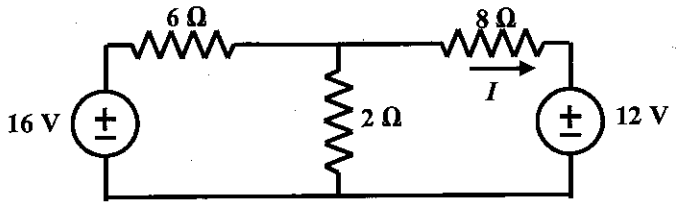

Figure.4.

12. a) i) Derive the expression for RMS value of sinusoidal waveform. (8)

ii) A coil having a resistance of 6 Ω and an inductance of 0.03 H is connected across a 100 V, 50 Hz supply. Calculate the following (8)

a) The current

b) The phase angle between the current and the voltage.

c) Power dissipated in the resistance

(OR)

b) i) Prove that line current is equal to $\sqrt{3}$ times phase current in Delta connection. (8)

ii) Two impedances (15 - j10) Ω and (10 + j15) Ω connected in parallel. (8)
The supply voltage is 200 V, 50 Hz. Calculate the following

1) Admittance of the circuit

2) The total current

13. a) i) Explain the working principle of DC motor with a neat sketch. (8)

ii) Describe the concept of rotating magnetic fields and how they induce rotor currents, leading to the generation of torque. (8)

(OR)

b) i) Explain the operation of single phase capacitor start – capacitor run induction motor. (8)

ii) Explain the losses that occur in a transformer and their significance in determining the overall efficiency of the transformer. (8)

14. a) i) Explain the operation of full wave rectifier using diodes with neat sketch. (8)

ii) Obtain the input and output characteristics of a current controlled device in which emitter terminal is common in both input and output side and explain with characteristics. (8)

(OR)

b) i) Describe the working principle and characteristics of voltage regulating diode (Zenor). (8)

ii) Design an OP-AMP circuit which produces the cosine output for the sinusoidal input signal. (8)

15. a) i) Compare MCBs with traditional fuses and highlight the advantages of using MCBs in modern electrical systems. (8)

ii) Explain the concept of earthing in electrical systems and its significance in ensuring electrical safety. (8)

(OR)

b) i) Discuss the various types of wiring used in electrical installations and highlight their characteristics. (8)

ii) Compare and contrast rechargeable (secondary) and non-rechargeable (primary) batteries. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

I Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES EXCEPT EEE

22MA101 – Matrices, Calculus and Ordinary Differential Equation

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Two eigenvalues of the matrix $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ are 3 and 6. Find the eigenvalues of A^{-1}.
2. When quadratic form said to be singular? What is its rank then?
3. Find the value of $\lim_{x\to\infty}\left[\sqrt{(x+1)}-\sqrt{(x-1)}\right]$.
4. What is the necessary condition for extreme values of a single variable function?
5. Find $\frac{dy}{dx}$, when ysinx = xcosy.
6. Find the nature of the stationary point (1,1) of the function $f(x,y)$, if $f_{xx} = 6xy^2, f_{xy} = 9x^2y^2$ and $f_{yy} = 6x^3y$.
7. Plot the region of integration to evaluate the integral $\iint_D f(x,y)dxdy$, where D is the region bounded by the line $y = x - 1$ and the parabola $y^2 = 2x - 6$.
8. Evaluate $\int_0^{2\pi}\int_0^{\pi}\int_0^{a} r^4 sin\varphi \, dr d\varphi d\theta$.
9. Convert the differential equation $x^2y'' - xy' + y = logx$ into a differential equation with constant coefficients.
10. Solve $(D^2 + 1)y = 0$ given $y(0) = 1, y\left(\frac{\pi}{2}\right) = 0$.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the diagonalize of the matrix $A = \begin{pmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{pmatrix}$ by an orthogonal transformation. (8)

ii) Use Cayley-Hamilton theorem to find the value of the matrix given by $A^8 - 5A^7 + 7A^6 - 3A^5 + 8A^4 - 5A^3 + 8A^2 - 2A + I$, if the matrix $A = \begin{pmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{pmatrix}$. (8)

(OR)

b) Reduce the quadratic form $2x^2 + 6y^2 + 2z^2 + 8xz$ to canonical form by orthogonal transformation. Find also index, signature, rank and nature of the quadratic form. (16)

12. a) i) Show that the function $f(x) = \sin^2 x$ is continuous for every value of x. (8)

ii) a) If $x^y = e^{x-y}$, prove that $\frac{dy}{dx} = \frac{logx}{(1+logx)^2}$. (4)

b) Find $\frac{dy}{dx}$ if $y = \sin^{-1}\frac{2x}{1+x^2}$. (4)

(OR)

b) i) If $f(x) = x|x|$ and show that $f(x)$ is derivable at the origion. (8)

ii) Show that the maximum value of $\left(\frac{1}{x}\right)^x$ is $(e)^{1/e}$. (8)

13. a) i) Expand e^{xy} in powers of $(x-1)$ and $(y-1)$ as far as the terms of the third degree in Taylor's series. (8)

ii) Discuss the maxima and minima of the function$f(x,y) = x^3 + y^3 - 3axy$. (8)

(OR)

b) i) If we transform from three dimensional Cartesian co-ordinates (x,y,z) to spherical polar co-ordinates (r,θ,ϕ), show that the Jacobian of x,y,z with respect to r,θ,ϕ is $r^2\sin\theta$. (8)

ii) Find the shortest and the longest distance from the point $(1,2,-1)$ to the sphere $x^2 + y^2 + z^2 = 24$. (8)

14. a) i) Find the area between the circle $x^2 + y^2 = a^2$ and the line $x + y = a$ lying in the first quadrant, by double integration. (8)

ii) Evaluate $\iiint_D (xy + 2yz)dV$, where $D = \{(x,y,z): 2 \le x \le 4, 1 \le y \le 3, -2 \le z \le 4\}$. (8)

(OR)

b) i) Change the order of integration in $\int_0^1 \int_{x^2}^{2-x} xy\, dydx$ and then evaluate it. (8)

ii) Evaluate $\iiint_R \frac{1}{x^2+y^2+z^2} dx\, dy\, dz$ where R is the solid sphere $x^2 + y^2 + z^2 \le a^2$ by transforming to spherical polar coordinates. (8)

15. a) i) Solve $(D^2 - 4D + 4)y = e^{2x} + \cos 2x$. (8)

ii) Solve $(x+1)^2\frac{d^2y}{dx^2} + (x+1)\frac{dy}{dx} + y = 4\cos[\log(x+1)]$. (8)

(OR)

b) i) Solve $(D^2 + 4)y = \sec 2x$ by the method of variation of parameters. (8)

ii) Solve the simultaneous equation $\frac{dx}{dt} + y = sin2t$; $\frac{dy}{dt} - x = \cos 2t$. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

I & II Semester (Full Time)

(2022 Regulations)

CIVIL /METALLURGICAL ENGINEERING

22CE101 – Engineering Mechanics

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Determine the Resultant of the two forces of magnitude 12 N and 9 N acting at a point when the angle between the two forces is 30°.
2. State Parallelogram law of forces.
3. A force F=5i+3j-2k N acts at point A (1, 4, -5) m. What is the moment of the force about the point B (8, 6, 4) m?
4. Define Free body diagram.
5. State Parallel Axis Theorem.
6. What is the moment of inertia of a circular section of diameter 'd'?
7. A car is travelling at a constant speed of 25 m/s on a curve. If the normal acceleration is 1.25 m/s^2, determine the radius of the curve.
8. A stone is projected vertically upwards with a velocity of 25 m/s. In what time it will reach the maximum height?
9. A ball dropped from a height of 1.6 m on a floor rebounds to a height of 0.9 m. Determine the co-efficient of restitution.
10. Define general plane motion of a rigid body.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Three like parallel forces 10 N, 30 N and 50 N are acting at points A, B and C respectively on a straight line ABC. The distances are AB = 4 m and BC = 5 m. Determine the resultant and also the distance of the resultant from point A on line ABC. (16)

(OR)

b) The resultant of two forces when they act at right angles is 10 N, whereas when they act at an angle of 60°, the resultant is $\sqrt{148}$ N. Determine the magnitude of the two forces. (16)

12. a) A simply supported beam of length 10 m carries a uniformly distributed load 5 kN/m for a distance of 2 m, starting from a point which is at a distance of 1m from the left end. Determine the reactions at the supports. (16)

(OR)

b) State and Prove Varignon's Theorem. (16)

13. a) Determine the moment of inertia of a Channel section about yy axes through the centre of gravity of the section. The section has Top and Bottom flange 10 mm X 1 mm and web 12 mm X 12 mm. (16)

(OR)

b) State and prove the Perpendicular Axes Theorem. (16)

14. a) A ball is thrown from the top of a building of height 20 m at an angle of elevation of 30° with a speed of 50 m/s. Determine (i) the maximum elevation reached by the ball above the ground level and (ii) the velocity with which the ball hit the ground. (16)

(OR)

b) Two bodies of weight 80 N and 50 N are connected to the two ends of a light inextensible string. The string is passing over a smooth pulley Determine: (i) the acceleration of the system and (ii) the tension in the string. (16)

15. a) A ball moving with a speed of 9 m/sec strikes an identical ball at rest such that after collision the direction of each ball makes an angle of 30° with the original line of motion (i) Determine the speed of the two balls after collision. (16)

(OR)

b) A wheel rotating about a fixed axis of 20 revolutions per minute is uniformly accelerated for 70 s during which it makes 50 revolutions. Determine the (i) angular velocity at the end of this interval and (ii) time required for the velocity to reach 100 revolutions per minute. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22CS201 – Digital Principles and System Design

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State De Morgan's law.
2. Write the truth table of two input XOR and XNOR logic gates.
3. Write the truth table of half adder.
4. Using 2's complement subtraction, execute 9 – 3 = 6.
5. For a multiplexer of 32 inputs, determine the number of select lines and output required.
6. Draw the realization of D flip flop from JK flip flop.
7. Compare Programmable logic array with Programmable array logic.
8. When four flip flops are used, then determine the number of states in Johnson counter and Ring counter.
9. What is the importance of reduction of states?
10. What is a hazard in digital circuits?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Convert the following numbers from the given base to the bases indicated: (8)

a) decimal 225.225 to binary, octal, and hexadecimal

b) binary 11010111.110 to decimal, octal, and hexadecimal

ii) Express the following switching circuit in binary logic notation figure.1 (8)

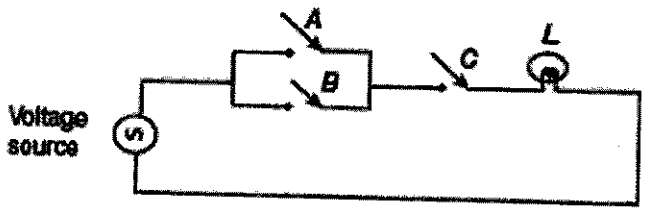

Figure.1.

(OR)

b) i) Determine the Boolean expression for the output F3 as a function of input x, y and z Figure.2 (8)

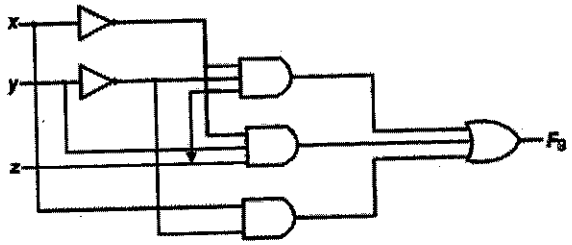

Figure.2.

ii) Simplify the Boolean function using K map (8)
$F(w, x, y, z) = \Sigma(0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14)$

12. a) i) Implement full adder circuit using half adder and other gates. (8)

ii) Design a two-bit magnitude comparator. (8)

(OR)

b) i) Explain the working of carry look ahead adder. (8)

ii) Design a four bit binary to gray code convertor circuit. (8)

13. a) i) Design a 8 to 3 bit priority encoder circuit. (10)

ii) Realise sum and carry of full adder using 8:1 multiplexer. (6)

(OR)

b) i) Design a 3 bit synchronous counter for the sequence 0, 2, 4, 6, 0, 2, 4, 6, 0, 2..... using D flip flop. Also draw the state table and state diagram. (10)

ii) Write the truth table and state table of JK, D and T flip flops. (6)

14. a) Design a four bit ripple up counter using D flip flop. (16)

(OR)

b) A combinational circuit is defined by the functions: (16)

$F1 (A, B, C) = \Sigma (3, 5, 6, 7)$

$F2 (A, B, C) = \Sigma (0, 2, 4, 7)$

Implement the circuit with a PLA having three inputs, four product terms, and two outputs.

15. a) For the give state diagram figure.3 (16)

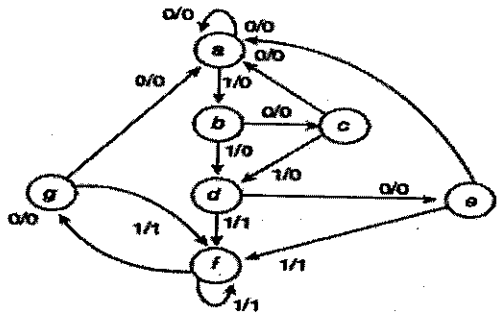

Figure.3.

Write the state table, reduced state table and reduced state diagram

(OR)

b) Reduce the number of states in the following state table and tabulate the reduced state table figure.4 (16)

Present state	Next state		Output	
	$x=0$	$x=1$	$x=0$	$x=1$
a	f	b	0	0
b	d	c	0	0
c	f	e	0	0
d	g	a	1	0
e	d	c	0	0
f	f	b	1	1
g	g	h	0	1
h	g	a	1	0

Figure.4.

Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22ES101 - Engineering Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between Coplanar and Non-Coplanar system of forces.
2. What are the conditions for equilibrium of a Rigid Body?
3. State Varignon's Theorem.
4. What is the moment of a Couple due to forces F, the distance between the forces being d?
5. State Pappus-Guldinus Theorem.
6. What is the Moment of Inertia of a square of side 'a'?
7. Define coefficient of friction.
8. A body of weight 200 N is placed on a rough horizontal plane If the coefficient of friction between the body and the horizontal plane is 0.3 determine the horizontal force required to just slide the body on the plane.
9. What is the Kinetic Energy of a body of mass 'm' moving with velocity 'v'?
10. State Impulse Momentum principle.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What are the types of Forces? Explain. (8)

ii) A rope 9 m long is connected at A and B, two points. On the same level 5 m apart. A block of weight 500 N is suspended from the point C on the rope, 3 m from A. What load connected to a point D, on the rope 2 m from B is necessary to keep portion CD parallel to AB. (8)

(OR)

b) i) How do you resolve Forces? Explain. (8)

ii) Three coplanar forces are acting at a point as shown in Figure.1 below. Determine the magnitude and direction of the Resultant. (8)

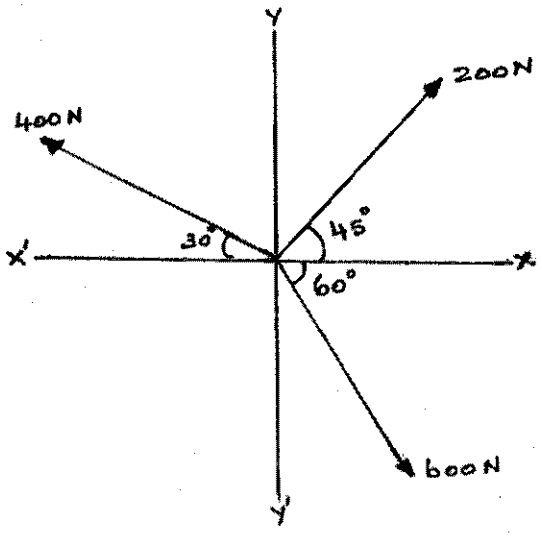

Figure.1.

12. a) i) What are the types of Beams? Explain with sketches. (8)

ii) A simply supported beam AB of span 4.5 m is loaded as shown in Figure.2 Determine the support reactions at A and B. (8)

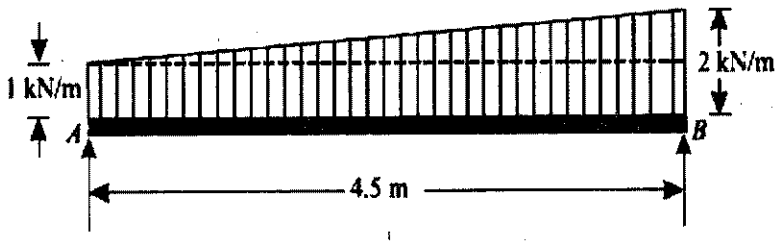

Figure.2.

(OR)

b) i) What are the different types of Supports in a Beam? Explain. (8)

ii) A beam ABCDE hinged at A and supported on Rollers at D is loaded as shown in Figure.3 Determine the reactions at A and D. (8)

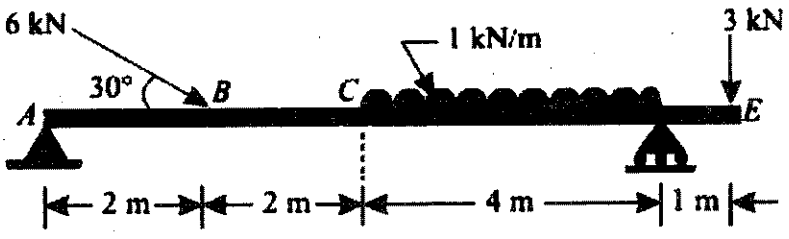

Figure.3.

13. a) i) Derive an expression to determine the position of centroid of semi-circle of diameter `d' from the first principles. (8)

ii) Determine the centroid of the area shown in Figure.4 below (8)

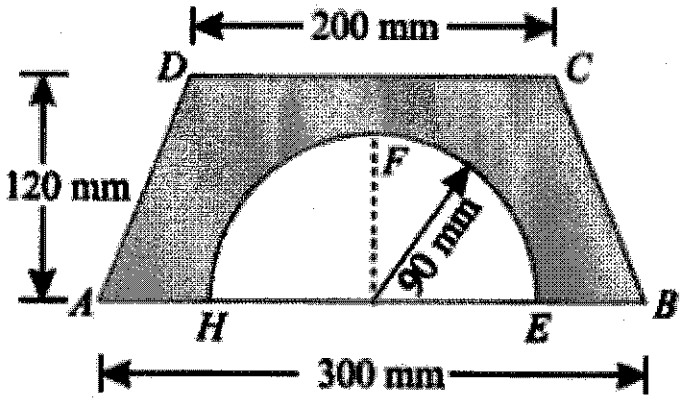

Figure.4.

(OR)

b) i) State and prove Parallel Axis Theorem. (8)

ii) Determine the Polar Moment of Inertia of the I - section with the following dimensions (8)

Top flange : Width – 80 mm and Thickness 10 mm

Web : Depth – 130 mm and Thickness 10 mm

Bottom Flange: Width 120 mm and Thickness 10 mm

14. a) i) State Couloumb`s law of Dry Friction. (8)

ii) An effort of 2000 N is required to just move a certain body up a 15° inclined plane, the force acting parallel to the plane. If the angle of inclination is changed from 15° to 20°, the effort required to move the body is 2300 N. Determine the weight of the body and the coefficient of friction. (8)

(OR)

b) i) Describe briefly about (8)
1) Wedge Friction
2) Rolling Resistance

ii) A uniform ladder of length 10 m and weighing 20 N is placed against a smooth vertical wall with its lower end 8 m from the wall. The ladder is about to just slip in this position. Determine (8)

1) The coefficient of friction between the ladder and the floor

2) Frictional force acting on the ladder at the point of contact between ladder and floor.

15. a) i) The motion of a particle moving in a straight line is given by the expression $S = t^3 - 3t^2 + 2t + 5$ (8)

Where `s' is the displacement in meters and `t' is the time in seconds. Determine

1) Velocity and acceleration after 4 seconds

2) Maximum and minimum velocity and corresponding displacement

3) Time at which velocity is zero.

ii) Two trains A and B leave the same station on parallel lines. Train A starts with a uniform acceleration of 0.15 m/s^2 and attains the speed of 24 km/hr after which its speed remains constant. Train B leaves 40 s later with uniform acceleration of 0.3 m/s^2 to attain a maximum of 48 km/hr, its speed also becomes constant thereafter. When will Train B overtake Train A? (8)

(OR)

b) i) Explain briefly about Law of Conservation of Energy with example. (8)

ii) A ball of mass 500 g moving with a velocity of 1 m/sec impinges on a ball of mass 1 kg moving with a velocity of 0.75 m/sec. At the time of impact, the velocities of the balls are parallel and inclined at 60° to the line joining their centres. Assume coefficient of restitution as 0.6. Determine the velocities and directions of the balls after impact. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

I & II Semester (Full Time)

(2022 Regulations)

CIVIL /CSE /MECHANICAL /METALLURGICAL ENGINEERING

22PH101 – Engineering Physics

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Piezoelectric effect.
2. List out the basic requirements for the acoustically good auditorium.
3. Justify the necessity for population inversion in a LASER system.
4. What is critical angle of an optical fiber?
5. Write short notes on modes of heat transmission.
6. Design a scheme for effective thermal insulation of buildings.
7. What is matter waves?
8. Write down schroedinger's time independent and time dependent wave equations.
9. Classify different defects in a crystal.
10. Analyze number of atoms per unit cell of SC, BCC and FCC structures.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the how ultrasonic wave can be used for drilling, welding, soldering, and cleaning. (16)

(OR)

b) i) What are the factors affecting acoustics of building? (8)

ii) Explain reverberation and reverberation time. (8)

12. a) Discuss the principle, construction, working and applications of CO_2 LASER. (16)

(OR)

b) Draw and interpret each block diagram of fibre optic communication system. (16)

13. a) i) Derive an expression for thermal conductivity of metals. (8)

ii) Derive an expression for thermal conduction through compound media in series. (8)

(OR)

	b)	Explain how Lee's disc method can be employed to determine thermal conductivity of a bad conductor with experiment.	(16)
14.	a)	What is Davisson and Germer experiment and explain its significance?	(16)
		(OR)	
	b)	Analyze the working of Electron microscope in terms of matter waves.	(16)
15.	a)	Identify different types of crystal imperfections and explain in detail.	(16)
		(OR)	
	b)	Compare and contrast Bridgman and Czochralski techniques in crystal growth.	(16)

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PH202 - Physics - Waves, Optics and Quantum Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Simple Harmonic Motion.
2. Distinguish between progressive and stationary waves.
3. State the conditions to achieve total internal reflection.
4. A astronomical telescope tube 80 cm long provides a magnification of 19. calculate the focal length of the objective lens and eyepiece.
5. State Huygens principle.
6. A grating with 2500 lines per cm is illuminated at normal incidence by light of wavelength $5500A^{\circ}$. Find the maximum order of diffraction.
7. Distinguish between homojunction and heterojunction laser diodes.
8. List out different methods of pumping in laser.
9. State the de Broglie hypothesis.
10. Write the physical significance of wave function.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Derive the equations of motion of a simple harmonic system. (12)

ii) Write short note on progressive wave. (4)

(OR)

b) i) Derive an expression for velocity of a transverse wave along a stretched string. (12)

ii) Equation of a wave moving on a string is $y = 8\,sin\,\pi\,(0.02x - 4.00t)$. Here y and x in cm and t in second. Find the frequency of the wave. (4)

12. a) Derive the law of reflection and refraction from Fermat's principle. (16)

(OR)

b) Explain the Propagation of light ray from effect of refraction by matrix method. (16)

13. a) Explain Newton's rings method of determining the wavelength of monochromatic light. (16)

(OR)

b) Draw a neat labeled diagram of Michelson's interferometer and explain how it can be used to find the wavelength of monochromatic light. (16)

14. a) For atomic transitions, derive Einstein relations and hence deduce the expressions for the ratio of spontaneous emission rate to the stimulated emission rate. (16)

(OR)

b) Explain the lasing schemes and working of Nd: YAG laser. (16)

15. a) i) Derive Schrödinger time independent wave equation. (6)

ii) Explain Davisson-Germer experiment to verify matter waves. (10)

(OR)

b) Discuss the application of Schrodinger equation for particle in a one dimensional box. (16)

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

22PH201 - Physics - Electromagnetism

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Compute the electric field intensity at a point 20 cm away from an electric charge of 4 x 10^{-9} C.
2. Define electric field intensity ($\vec{E}$). Give its unit.
3. Define the capacitance of a condenser.
4. Distinguish between polar and non-polar molecules.
5. State Biot-Savart's law.
6. Calculate the magnetic field at a point 50 mm from a long straight wire carrying a current of 3 A.
7. State Lenz's law.
8. In a material for which $\varepsilon_r = 1$, the electric field intensity is $\vec{E} = 250 \sin 10^{10} t \, \mathrm{Vm}^{-1}$. Find the displacement current density.
9. An electromagnetic plane wave in vacuum has electric field given by $\vec{E}_z = 10 \, sin\pi(2 \times 10^6 x - 6 \times 10^{14} t), \vec{E}_x = \vec{E}_y = 0$. Find its frequency and direction of propagation.
10. Write the properties of electromagnetic waves.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) State Gauss's law. Using gauss's theorem, prove that the electric field due to infinite line charge. (16)

(OR)

b) Obtain an expression for energy density in an electrostatic field. (16)

12. a) Derive an expression for Electric field at a point due to an electric dipole and their special cases. (16)

(OR)

b) Derive an expression for the capacitance of a coaxial capacitor and spherical capacitor. (16)

13. a) Obtain an expression for the magnetic induction at a point due to an infinitely long straight Conductor carrying current and discuss their special cases. (16)

(OR)

b) State the boundary conditions satisfied by $\vec{B}$ and $\vec{H}$ at the interface of two magnetic media of different magnetic permeabilities assuming no free current. (16)

14. a) i) Derive the expression for mutual inductance of two tightly wound solenoids. (10)

ii) Write down Maxwell's equations and discuss its physical significance. (6)

(OR)

b) i) Define self-inductance. Derive the expression for self-inductance of a long solenoid. (10)

ii) Derive modified Ampere's law. (6)

15. a) Derive the expression for electromagnetic wave equations for free space and prove that the electromagnetic waves are transverse in nature. (16)

(OR)

b) State and Prove Poynting's theorem. (16)

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B.E. Degree Examinations – April/May 2023

I & II Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES

22ME101 – Engineering Graphics and Design

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is projection, projector and plane of projection?
2. Mention the quadrant of point and draw the projection of point A, which is 40 mm below HP and 60 mm in front of VP.
3. What do you mean by generator of cone?
4. What are solids of revolution?
5. Name the methods used for obtaining development of prism and pyramid.
6. Define Frustum and truncated solid.
7. Draw the orthographic views of the given object. (Free hand sketch) figure.1

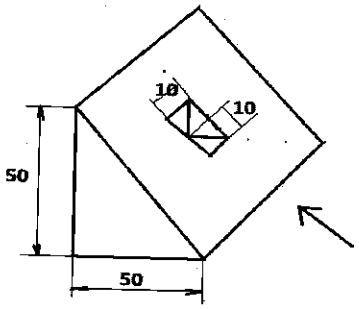

Figure.1.

8. Differentiate between the isometric projection and isometric views.
9. Name the different elements of perspective view.
10. Classify perspective projections.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A straight-line AB of true length 100 mm has its end A 20 mm above HP and 30 mm in front of VP. The top view of the line is 80 mm and front view is 70 mm. Draw the projections (Top View and Front View) of the line AB and obtain the true inclinations of the line AB with HP and VP. (16)

(OR)

b) A square lamina with a 50 mm side rests on the H.P., on one of its corners, such that the diagonal through that corner is parallel to the V.P. and inclined at 30° to the H.P. Draw its projections when the lamina is perpendicular to the V.P. Measure the distance of the topmost corner from the H.P. (16)

12. a) Draw the projections of a pentagonal prism, base 25 mm side and axis 70 mm long resting on one of its rectangular faces on the H.P., with the axis inclined at 60° to the V.P. (16)

(OR)

b) A hexagonal pyramid of base side 20 mm and axis height 70 mm has one of the corners of its base in the HP and the axis is inclined at 45° to the HP and parallel to VP. Draw the front view and top view of the solid. (16)

13. a) A Cube of 65 mm long edges has its vertical faces equally inclined to the V.P. It is cut by a section plane, perpendicular to the V.P., so that true shape of the section is a regular Hexagon. Determine the inclination of the cutting plane with the H.P. and draw the sectional top view and true shape of the section. (16)

(OR)

b) The cone of diameter of base 50 mm and axis height 60 mm is resting on its base on H.P. as shown in the figure.2 below. One square hole of size 20 mm is cut through the cone as per the figure given below. Develop the surface of the cone. (16)

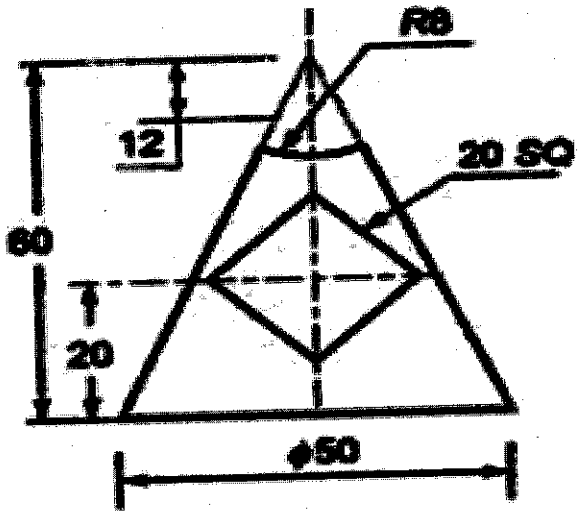

Figure.2.

14. a) Draw the front view, Top view and side view of the following figure.3. All dimensions are in mm. (16)

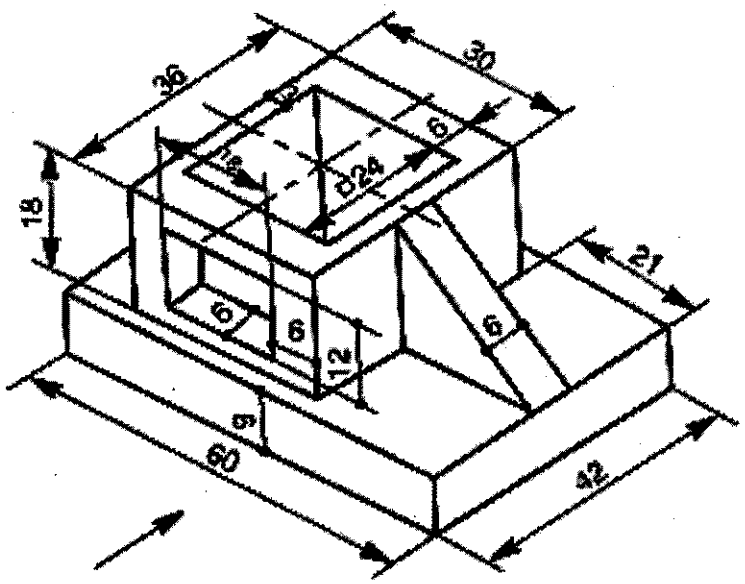

Figure.3.

(OR)

b) A cylinder, with diameter of base 60 mm and axis 70 mm long, is resting on its base on HP. A section plane, perpendicular to VP and inclined at 45° to HP, passes through the axis at a distance of 20 mm from its top end. Draw the isometric projection of the truncated cylinder. (16)

15. a) A square prism of base side 40 mm and height 70 mm rests with its base on the ground such that one of its rectangular faces is parallel and 10 mm behind picture plane. The station point is 60 mm in front of picture plane, 90 mm above the ground plane and lies in a central plane 40 mm to the right of the corner of the prism. Draw the perspective projection of the prism. (16)

(OR)

b) A square pyramid of base edge 40 mm and altitude 50 mm, rests with its base on the ground plane such that all the edges of the base are equally inclined to the PP. One of the comers of the base is touching the PP. The station point is 60 mm in front of the PP, 80 mm above the ground plane and lies in a central plane which passes through the axis of the pyramid. Draw the perspective projection by using vanishing point method. (16)

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B.E. Degree Examinations – April/May 2023

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. Write a dialogue of five exchanges between an employee and the manager on the working atmosphere in the sales department..

2. Fill in the following blanks using suitable articles or prepositions.
"Ecommerce" or "electronic commerce" is ___(i)__ trading ___(ii)__ goods and services __(iii)__ the internet. __(iv)__ estimated 2.14 billion people worldwide buy goods and services online. An ecommerce business is __(v)__ company that generates revenue from selling products or services online.

3. List out any 5 do's in a personal interview.

4. Write synonyms for the following official terms!
   a) Fired
   b) Asset
   c) Bond
   d) Commodity
   e) Margin

5. Use the correct form of the verbs and complete the following sentences.
   a) If you think positive, you ____ (succeed)
   b) Had I known the fact, I ____ (help) him.
   c) If you worked hard, you ____ (get) promotion.
   d) If I were the HR, I ____ (fire) him.
   e) If the manger had realised the truth, he _____ (feel) sorry.

6. Match the following terms with their collective words.
   a) Chair - a team
   b) Lead - a deadline
   c) Meet - a product
   d) Brand - a meeting
   e) Launch - name

7. Combine the following statements using the given conjunctions.
   a) You did not study well. You would fail.(if)
   b) Ravi will not come to office. He is travelling this week. (So)
   c) I posted a request last week. I wanted to work from home. (Since)
   d) Kumar is on leave. He is sick. (So)
   e) Raju attended the meeting. He could not explain the details. (though)

8. Fill in the blanks to complete the following conversation.
   A) Hi, how are you doing today?
   B) _____(a)_____
   A) Oh, I see. In that case you could have taken leave for work.
   B) _____(b)_____
   A) Yes, I forgot that we need to submit the project today. _____(c)_____
   B) No, I could not complete it. _____(d)_____
   A) I am sure that the manager will understand. _____(e)_____
   B) Thanks for your concern. See you later. Bye!

9. Choose the correct option that is similar in meaning to the following statements
   a) One who is not addicted to anything (Teetotaler/ Non-Drinker/ Virtuous)
   b) A state of disorder due to the absence of any controlling systems (Anarchy / Monarchy / Aristocracy)
   c) A collection of historical documents or records (Aviary / Archives/ Cartography)
   d) The one who looks at the brighter side of everything (Oncologist / Opportunist / Optimist)
   e) Someone who is wrongly blamed for things that others have done (White horse / Scape goat/Black sheep)

10. Use the following idioms in sentences of your own
   a) Light years ahead
   b) Reinvent the wheel
   c) On the same wavelength
   d) Once in a blue moon
   e) Round the clock

Part B (5 x 10 = 50 Marks)

Answer ALL Questions

11. a) Look at the following messages, notices, statements and charts and choose the option closest in meaning to the given statement. (10)

   1) "Products will be delivered free of transportation charge." (The products are free/Delivery is free)
   2) "You can save money in flight if You travel in economic class." (Flight travel is economical/Economic tickets are cheaper)
   3) "Always wear ID cards inside the office campus" (ID card is a compulsory for all/ID card is to be kept in the office while leaving)
   4) "Cafeteria premises must be kept clean" (Cleanliness is really important/Spilling coffee should be avoided)
   5) "Discussion in progress – Do not enter" (Do not attend the discussion/Do not disturb the discussion)
   6) "To succeed, work hard." (Success needs hard work/Hard work needs success)

7) "Aftersales service is necessary to attract customers" (Products must be serviced once sold/customers need service options for products)

8) "New recruits are to report to HR on their first day" (New employees should meet HR on the first day/New Employees should complain about their problems on the first day)

9) "Elevator under maintenance, use the stairs" (Using stair case is good for health/Since elevator cannot be accessed, stairs to be used)

10) "Employees can use the cab service in the company cost free" (Workers won't be charged for using the office cab/Customers also can use the cab without any charge)

(OR)

b) Choose the sentence that is without any error. (10)

1) I wishes to join the company/I wish to join the company.
2) He has been wait for the meeting to start/He has been waiting for the meeting to start.
3) The manager did not attend the conference last week/The manager did not attended the conference last week.
4) As there was a COVID outbreak, so the company declared holiday/As there was a COVID outbreak, the company declared holiday.
5) The people who came for the show has left/The people who came for the show have left.
6) It is a bit early, isn't it? / It is a bit early, is it?
7) Though he is rich, but he wants to earn by working/Though he is rich, he wants to earn by working.
8) If you had listened to me, you would have passed/If you had listened to me, you would passed.
9) The HR discussed about the problem in detail/The HR discussed the problem in detail.
10) One of the committee members is my father/One of the committee member is my father.

12. a) Write a set of 10 recommendations on professional ethics to the recently recruited employees of your company. (10)

(OR)

b) Prepare a checklist of 10 items to help you for attending an interview at Chennai. (10)

13. a) Provide 10 instructions that are to be followed by the new employees in the company. (10)

(OR)

b) There is going to be a presentation on the project status soon. As the team leader, draft an e-mail to your teammates on how to get ready for the presentation. (10)

14. a) Write an essay on the scope for online studies in the post COVID era. (10)

(OR)

b) As the student representative, prepare a report on the recent industrial visit that the students of your class took part. (10)

15. a) Prepare a Cover Letter and a Resume for the following job advertisement. (10)

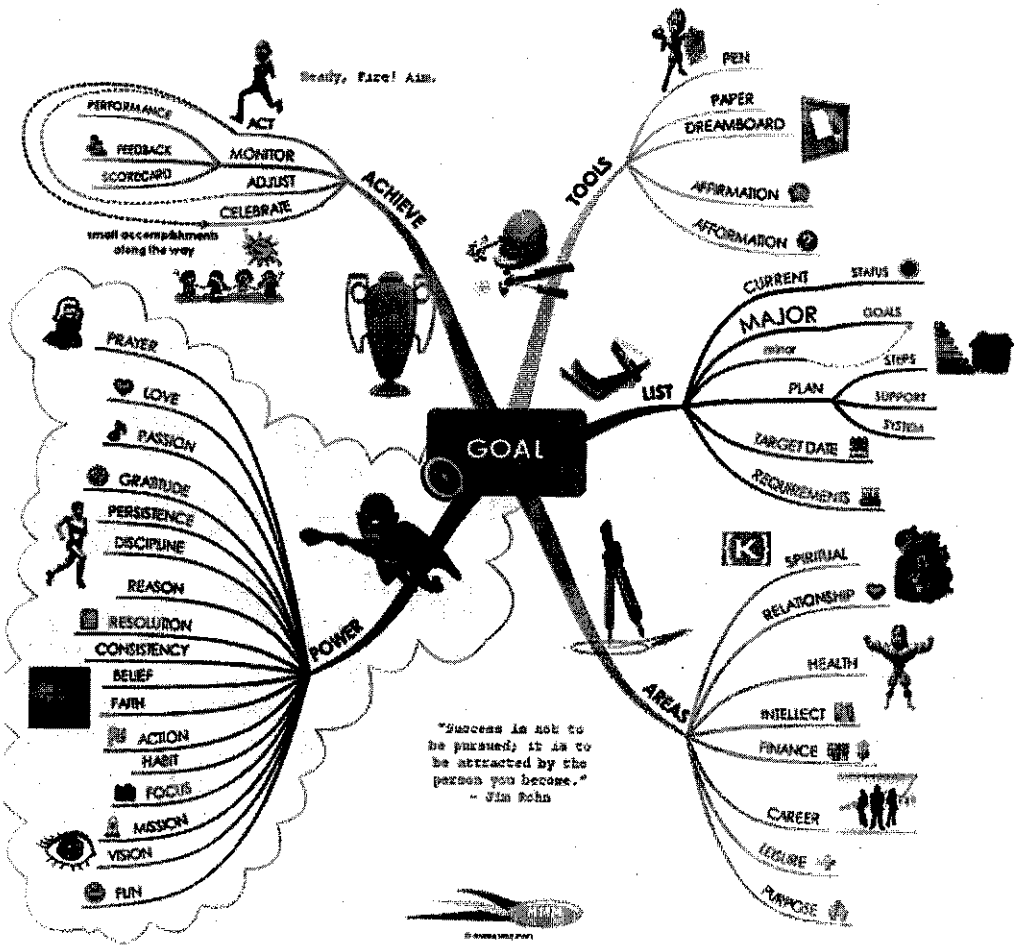
Wanted

Engineering Graduates (Fresh/ Experienced) with certification in Python, for the post of Software Developer.

Contact – HR manager, InfoTech Solutions, Guindy, Chennai - 11

(OR)

b) Write an essay on 200 words on Goal Setting using the following mind map. (10)



Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

CIVIL/MECHANICAL/METALLURGICAL ENGINEERING

22MA201 – Partial Differential Equations, Vector Calculus and Complex Variables

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Form the PDE from $z = (x^2 + a)(y^2 + b)$ by eliminating the arbitrary constant.
2. Find the complete solution of the equation $pq = y$
3. Find the complementary function of $(D^3 - 7DD'^2 - 6D'^3)z = \sin(x + y)$.
4. Solve: $(D - D' - 1)(D - D' - 2)z = 0$.
5. Find the directional derivative of $\varphi = xyz$ at (1, 1, 1) in the direction of $\vec{i} + \vec{j} + \vec{k}$.
6. Prove that $curl(grad\phi) = 0$.
7. Show that $u = e^x(cosy - isiny)$ is nowhere differentiable.
8. Find the critical points for $w^2 = (z - \alpha)(z - \beta)$.
9. Evaluate: $\int_C \frac{dz}{z+4}$ where C is the circle $|z| = 2$.
10. Find the residue $of\ f(z) = cotz \ \ at\ z = \pi$.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the complete and singular solutions of $z = px + qy + p^2 - q^2$. (8)

ii) Solve: $p - x^2 = q + y^2$. (8)

(OR)

b) i) Solve: $9(zp^2 + q^2) = 4$. (8)

ii) Find the general solution of $(2z - y)p + (x + z)q + 2x + y = 0$. (8)

12. a) i) Solve: $(D^3 + D^2D' - DD'^2 - D'^3)z = e^x cos2y$. (8)

ii) Solve the equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial y} + 2u$ by the method of separation of variables. (8)

(OR)

b) i) Solve: $(D^2 + 3DD' + 2D'^2)z = x + y$. (8)

ii) Use the method of separation of variables to solve the equation $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = u$ subject to $u(0,t) = 0, u(\pi,t) = 0$. (8)

13. a) i) Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ *and* $z = x^2 + y^2 - 3$ at the point $(2,-1,2)$. (8)

ii) Show that $\vec{F} = (6xy + z^3)\vec{i} + (3x^2 - z)\vec{j} + (3xz^2 - y)\vec{k}$ is irrotational and hence find its scalar potential. (8)

(OR)

b) i) Find the work done by the force $\vec{F} = (2xy + z^3)\vec{i} + x^2\vec{j} + 3xz^2\vec{k}$ which moves a particle from (1, -2, 1) to (3, 1, 4) along any path. (8)

ii) Evaluate $\iint_S \vec{F}.\hat{n}dS$, where $\vec{F} = ax\vec{i} + by\vec{j} + cz\vec{k}$, S is $x^2 + y^2 + z^2 = 1$. (8)

14. a) i) Prove that $u = \frac{1}{2}\log(x^2 + y^2)$ is harmonic and find its harmonic conjugate. (8)

ii) Find the bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = i, 0, -i$ (8)

(OR)

b) i) If $f(z)$ is analytic 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 images of the following under the map $w = \frac{1}{z}$ (8)

1) $1 < x < 2$

2) $\frac{1}{4} < y < \frac{1}{2}$.

15. a) i) Using Cauchy's integral formula, evaluate $\int_C \frac{e^{2z}}{(z+1)^4} dz$. Where $C: |Z| = 2$. (8)

ii) Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in a Laurent's series if $1 < |z| < 3$. (8)

(OR)

b) Evaluate $\int_0^{2\pi} \frac{d\theta}{5+4sin\theta}$ by using method of contour integration. (16)

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMPUTER SCIENCE AND ENGINEERING

22MA202 – Linear Algebra and Linear Programming Problem

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Show that intersection of any two subspaces of a vector space is also a subspace.
2. Show that the set $S = \{(1,2,1),(3,1,5),(3,-4,7)\}$ is a basis for $V_3(R)$.
3. Define : Kernel of the linear transformation T.
4. State the Dimension theorem.
5. Define : Inner product space.
6. If x_1 & x_2 are orthogonal to y then prove that $x_1 + x_2$ is also orthogonal to y.
7. What is the difference between transportation and assignment problem?
8. Define : Balanced and unbalanced Transportation Problems.
9. Solve by graphically : Maximize $Z = 0.75\,x + 1y$
   subject to :
   $1x + 1y \geq 0$
   $-0.5x + 1y \leq 1$ and both x and y are ≥ 0.
10. Define : Surplus and Slack variables in LPP.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Show that the set $W = \{x,y,z) \in R^3 : 2x - 7y + z = 0\}$ is a sub space o $V = R^3$. (8)

    ii) Show that the set $\{1, x, x^2, \ldots x^n\}$ form a basis for the set of all polynomial of degree less than or equal to n. (8)

    (OR)

    b) i) Let V be a vector space over a field R and S be a non empty subset of V .Then show that L(S) is a sub space of V. (8)

    ii) Show that set of real number is a vector space over R. (8)

12. a) i) Let $T: R^2 \to R^3$ defined by $T(x,y) = (x + 3y, 0, 2x - 4y)$. Compute the matrix of the transformation with respect the standard bases for R^2 and R^3. (8)

    ii) Let $T: R^3 \to R^2$ defined by $T(x,y,z) = (2x - y, 3z)$. Prove that T is a linear transformation and hence verify dimension theorem. (8)

(OR)

b) i) Let $T: P_2(R) \rightarrow P_3(R)$ defined by $(T(x)) = xf(x) + f'(x)$. Find the rank of T and nullity of T. (8)

ii) Let $V = R^3$ and the linear operator on V is defined by $T(a,b,c) = (7a - 4b + 10c, 4a - 3b + 8c, -2a + b - 2c)$. Find the Eigenvalues of T. (8)

13. a) Let V be the Vector space of polynomial with inner product is given by $\langle f,g\rangle = \int_0^1 f(t)g(t)dt$ where $f(t) = t + 2$ *and* $g(t) = t^2 - 2t - 3$. Find $(i)\ \langle f,g\rangle$ $(ii)\ \|f\|$ $(iii)\ \|g\|$. (16)

(OR)

b) Let R^3 have the Euclidean inner product with the basis $\{v_1, v_2, v_2\}$ where $v_1 = (1, 1, 1)$, $v_2 = (0, 1, 1)$, $v_3 = (0, 0, 1)$. Use Gram- Schmidt process to construct an orthonormal basis. (16)

14. a) Solve the following by simplex method. (16)

Maximize $Z = x_1 + 2x_2$

subjectto : $-x_1 + 2x_2 \leq 8,$

$x_1 + 2x_2 \leq 12,$

$x_1 - 2x_2 \leq 3\ ,\ x_1, x_2 \geq 0$

(OR)

b) Solve the following by using Big- M method. (16)

Minimize $Z = 4x_1 + 3x_2$

subject to : $2x_1 + x_2 \geq 10$

$-3x_1 + 2x_2 \leq 6$

$x_1 + x_2 \geq 6\ \ x_1, x_2 \geq 0$

15. a) A transportation problem involving three sources and four destinations is shown in the below table. The cell entries represent the cost of transportation per unit. Determine the initial basic feasible solution by using the following methods. (16)

i) North west corner method.

ii) Least Cost method.

iii) Vogel's approximation method.

		Destination				
Source		1	2	3	4	supply
	1	3	1	7	4	300
	2	2	6	5	9	400
	3	8	3	3	2	500
	Demand	250	350	400	200	1200

(OR)

b) Five jobs are to be assigned to five workers in a job shop. The number of hours each worker would take to accomplish the job are shown in the below table. Determine the optimal assignment to minimize the time. (16)

Workers	Job				
	1	2	3	4	5
1	16	13	17	19	20
2	14	12	13	16	17
3	14	11	12	17	18
4	5	5	8	8	11
5	5	3	8	8	10

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B.E. Degree Examinations – April/May 2023

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. Find b_n for $f(x)= x \sin x$ in $(-\pi, \pi)$.
2. If $f(x) = x^2$, in $(-\pi, \pi)$, find the root mean Square value of $f(x)$.
3. Classify the partial differential equation $(1+x)u_{xx} - 2(x+2)u_{xy} + (x+3)u_{yy} = 0$.
4. Write the initial conditions of the wave Equation if the string has an initial displacement.
5. Find $L(\frac{1-\cos t}{t})$
6. Find $L^{-1}\left[\cot^{-1}(k/s)\right]$
7. If F(s) is the Fourier Transform of $f(x)$, then find the Fourier transform of $f(x-a)$.
8. If F(s) is the Fourier transform of $f(x)$ then show that

   $F[f(x) \cos ax] = \frac{1}{2}[\ F(s+a) + F(s-a)\ ]$

9. Prove that $Z(a^n) = \frac{z}{z-a}$
10. State the initial and final value theorem in Z-transform.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the *Fourier* series for the function $f(x) = \begin{cases} -\pi & ; -\pi < x < 0 \\ x & ; \quad 0 < x < \pi \end{cases}$ (8)

    ii) Find the half-range sine series for $f(x) = x$ in $(0, \pi)$. (8)

    (OR)

    b) i) Find the Fourier Series expansion of period $2l$ for the function $f(x) = (l-x)^2$ in the range $(0,2l)$ (8)

    ii) Find the Fourier series for $f(x) = x^2$ *in* $-\pi < x < \pi$ and hence show that $\frac{\pi^4}{90} = 1 + \frac{1}{2^4} + \frac{1}{3^4} + \cdots$ (8)

12. a) A string is stretched and fastened to two points l apart motion is started by displacing the string into the form $k(lx-x^2)$ from which it is released at time t=0.Find the displacement of any point on the string at a distance x from one end at time t. (16)

(OR)

b) A rectangular plate with insulated surface is 10 cm wide and so long compared to its width that it may be considered infinite in length without introducing appreciable error. The temperature at that edge y=0 is given by $u = \begin{cases} 20x & ,0 \le x \le 5 \\ 20(10-x) & ,5 \le x \le 10 \end{cases}$ and all the other three edges are kept at 0^0 C. Find the steady state temperature at any point in the plate. (16)

13. a) i) 1) Find the Laplace Transform of $te^{-2t}cos3t$ (8)

2) Find the inverse Laplace transform of $\frac{1}{(s+1)(s^2+4)}$.

ii) Find the Laplace transform of $f(t) = \begin{cases} k, 0 \le t \le a \\ -k, a \le t < 2a \end{cases}$ such that f(t+2a) = f(t) for all t. (8)

(OR)

b) i) Using convolution theorem find the inverse Laplace transform of $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$. (8)

ii) Using Laplace transform method solve (8)
$y''-4y'+8y=e^{2t}, y(0)=2, y'(0)=-2$

14. a) Find the Fourier transform of $f(x) = \begin{cases} 1-x^2 & , |x| \le 1 \\ 0 & , |x| > 1 \end{cases}$ (16)

Hence evaluate $\int_0^\infty \left\{\frac{\sin s - s\cos s}{s^3}\right\} \cos\frac{s}{2} ds = \frac{3\pi}{16}$

(OR)

b) Find the Fourier Cosine transform of $f(x) = e^{-a^2x^2}$. Hence find $F_s\left[x e^{-a^2x^2}\right]$ (16)

15. a) i) Find Z-transform of (8)

1) $f(n) = \frac{a^n}{n!}$.

2) $f(n) = \frac{1}{(n+1)!}, n \ge 0$

ii) Find $z^{-1}\left[\frac{z^2}{(z-a)(z-b)}\right]$ by using convolution theorem. (8)

(OR)

b) i) Find $z^{-1}\left[\frac{z^3-20z}{(z-4)(z-2)^3}\right]$ by using partial fraction. (8)

ii) Solve: $y(n+2) + 4y(n+1)+3y(n) = 3^k$ where $y(0)=0$, $y(1)=1$ by Z-Transform techniques. (8)

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B.E. Degree Examinations – April/May 2023

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. Determine whether the vectors $v_1 = (1,-1,2), v_2 = (1,-2,1), v_3 = (1,1,4)$ form a linearly dependent or linearly independent in $V_3(R)$.
2. Define kernel of T.
3. State and prove triangular inequality on an inner product space V.
4. Define adjoint of a linear operator.
5. Form the PDE by eliminating the arbitrary constants a and b from $z = ax^2 + by^2$.
6. Classify the PDE : $u_{xx} + 4u_{xy} + u_{yy} + 2xu_x + 2y^2u_y + 4x - 3 = 0$.
7. Find $L[t \sin 3t]$.
8. Find $L^{-1}\left[\frac{s}{(s+3)^2}\right]$.
9. Find 'a' such that $(3x - 2y + 5z)\vec{i} + (4x + ay - 3z)\vec{j} + (2x - 3y + 5z)\vec{k}$ is solenoidal.
10. State Stoke's theorem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Let W_1 and W_2 be subspaces of a vector space V. Prove that $W_1 \cup W_2$ need not be a subspace, also prove that $W_1 \cap W_2$ is a subspace. (8)

ii) Let $T: R^2 \longrightarrow R^3$ defined by $T(x,y) = (x + 3y, 0, 2x - 4y)$. Compute the matrix representation of the transformation with respect to the standard bases for R^2 and R^3. (8)

(OR)

b) i) Whether the set $\{(2,-4,1), (0,3,-1), (6,0,-1)\}$ form the base for R^3. (8)

ii) Let $T: R^3 \longrightarrow R^2$ defined by $T(x,y,z) = (3x - y,\ 2z)$. Verify whether T is linear or not and hence verify dimension theorem. (8)

12. a) i) Apply Gram-Schmidt orthogonalization process to construct an orthonormal basis for V_3 of all $V_3(R)$ with standard inner product for the basis $\{v_1, v_2, v_3\}$ where $v_1 = (1,0,1), v_2 = (1,3,1), v_3 = (3,2,1)$. (10)

ii) State and prove Cauchy-Schwarz inequality of an inner product space. (6)

(OR)

b) i) By using Least square approximation, fit a linear function to the following data $\{(1,2),(2,3),(3,5),(4,7)\}$. (10)

ii) Let V be the of all continuous real valued functions defined on $[0,1]$, then prove that V is a real inner product space with the inner product defined by $< f,g >= \int_0^1 f(t)\, g(t)\, dt$. (6)

13. a) i) Solve $z = px + qy + \sqrt{1+p^2+q^2}$. (8)

ii) Find the general solution of $x(z^2-y^2)p + y(x^2-z^2)q = z(y^2-x^2)$. (8)

(OR)

b) i) Solve $p(1+q) = qz$. (6)

ii) Solve $(D^2 + DD' - 6D'^2)z = x^2y + e^{3x-y}$. (10)

14. a) i) Find the Laplace transform of triangular wave function $f(t) = \begin{cases} t, & 0 < x < a \\ 2a - t, & a < t < 2a \end{cases}$ with $f(t+2a) = f(t)$. (8)

ii) Find $L\left[\frac{1-\cos 2t}{t}\right]$. (8)

(OR)

b) i) Using convolution theorem, find $L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$. (8)

ii) Solve $\frac{d^2x}{dt^2} - 3\frac{dx}{dt} + 2x = 2$, given $x = 0$ and $\frac{dx}{dt} = 5$ for $t = 0$ using Laplace transform method. (8)

15. a) i) Find the directional derivative of $\phi = x^2yz + 4xz^2 + xyz$ at $(1,2,3)$ in the direction of $2\vec{\imath} + \vec{\jmath} - \vec{k}$. (8)

ii) Prove that $\vec{F} = (y^2\cos x + z^3)\vec{\imath} + (2y\sin x - 4)\vec{\jmath} + 3xz^2\vec{k}$ is irrotational and find its scalar potential. (8)

(OR)

b) Verify Gauss divergence theorem for $\vec{F} = 4xz\,\vec{\imath} - y^2\,\vec{\jmath} + yz\,\vec{k}$ over the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$. (16)

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMMON TO ALL BRANCHES

22HS201 – Universal Human Values

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Describe the importance of value education.
2. What are the characteristics of natural acceptance?
3. What is imagination?
4. Define sensations.
5. What does respect mean to you?
6. Explain the feeling of 'gratitude'.
7. What do you mean by co-existence?
8. Define harmony in nature.
9. Human conduct should be ethical. What does this mean?
10. How would you define professional ethics?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	What is the meaning of prosperity? How can you say that you are prosperous?	(8)
		ii)	What is happiness?	(8)
			(OR)	
	b)	i)	Explain the process of value education.	(8)
		ii)	Distinguish between 'human consciousness' and 'animal consciousness'.	(8)
12.	a)	i)	The needs of the body are quantitative. Illustrate.	(8)
		ii)	What is pre-conditioning? What is their source?	(8)
			(OR)	
	b)	i)	"I am the seer, doer and enjoyer. The body is my instrument"- Explain. How does self enjoy the activities of the body?	(8)
		ii)	What are the four steps to ensure harmony?	(8)

13. a) i) How can you say that love is the complete value? (8)

ii) Explain the feeling of 'reverence'. (8)

(OR)

b) i) Explain the problems faced due to differentiation in relationship. (8)

ii) Explain "Family is a natural laboratory for understanding human relationships". (8)

14. a) i) What are the four orders of nature? Briefly explain them. (8)

ii) "Other than human order, the three orders are mutually fulfilling". Describe with examples. (8)

(OR)

b) i) Explain the recyclability in nature with any two examples. (8)

ii) Comment on the statement: "Nature is limited and space is unlimited". (8)

15. a) i) What do you mean by competence in professional ethics? Elaborate with examples. (8)

ii) What do you mean definitiveness of ethical human conduct? (8)

(OR)

b) i) What do you mean by holistic technology? Explain briefly. (8)

ii) Analyze the current models of management in the profession. (8)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDE42 – CAD/CAM Tools

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by integration of CAD/CAM?
2. Define Cellular Manufacturing.
3. List out some input and output devices.
4. List out network topologies.
5. What is tolerance accumulation?
6. Define CAQC.
7. Define Reverse engineering.
8. Differentiate surface and solid models.
9. State the strategies for RE Data management.
10. What is recycling real time embedded software?

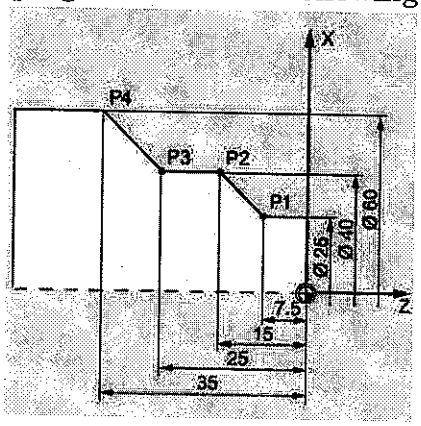
Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Classify CNC machines tools on the basis of : (8)
    1) Types of motion control
    2) According to programming Method
    3) According to types of controllers

    ii) Write the CNC Lathe programme for the following part (8)



All dimensions are in mm

Figure.1.

(OR)

b) i) List out the possible manufacturing processes using CAM. (8)

ii) Discuss the following: (8)
1) Tool path generation and verification
2) Production control

12. a) i) Describe hardware configuration of CIM with the help of a sketch. (8)

ii) Elaborate on the basic requirements that a CAD software has to satisfy. (8)

(OR)

b) i) Give an example of how the centralized integrated database concept can help with the what-if situations that arise during the design process. (8)

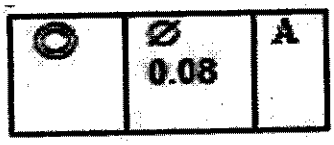
ii) State the applications of PLC in CAD/CAM. (8)

13. a) i) Write briefly about Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterization. (8)

ii) Discuss about tolerance stack analysis methods. (8)

(OR)

b) i) What is the group and characteristic of geometric tolerance? (8)



Explain the tolerance practices in design, drafting and manufacturing.

ii) Discuss the following: (8)
1) Tolerance synthesis
2) FITS and LIMITS.

14. a) i) Describe the design verification and project implementation stage with suitable illustration. (8)

ii) Highlight the importance of reverse engineering process and technical data development. (8)

(OR)

b) i) How will you extend reverse engineering to value engineering and value analysis? (8)

ii) Describe the tools of RE in detail. (8)

15. a) i) Explain design of experiments to evaluate a RE tool. (8)

ii) Briefly explain rule based detection for RE user interfaces. (8)

(OR)

b) i) Write short notes for the following: i) Feature capturing ii) RE of assembly programs. (8)

ii) Differentiate the following : (8)

1) RE Vs concurrent engineering

2) RE Vs Re-engineering

3) Hardware RE Vs software RE

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMMUNICATION SYSTEMS

22COE52 – Electromagnetic Interference and Compatibility

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define EMI and EMC.
2. Compare radiated EMI and conducted EMI.
3. What is meant by ground loop coupling?
4. Specify the important measures to avoid cable to cable coupling.
5. What do you meant by EM shielding?
6. Distinguish between grounding and bonding.
7. What are the EMC requirements imposed on electronic systems?
8. Define zoning.
9. Give the features of TEM cell.
10. What is CISPR22 measurement distance?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain the different sources of EMI in detail. Give examples.	(8)
		ii)	Explain the tests performed for the conducted susceptibility.	(8)
			(OR)	
	b)	i)	Explain in detail about ESD with remedial procedures.	(8)
		ii)	Describe in detail about EMI is caused by radiation hazards.	(8)
12.	a)	i)	Describe cable related emissions and coupling briefly.	(8)
		ii)	Demonstrate the common impedance ground couplings with examples.	(8)
			(OR)	
	b)	i)	Explain how common main supply acts as a frequent source of conducted interference.	(8)
		ii)	Illustrate the electromagnetic impact of cable coupling in a system design.	(8)

13. a) i) What are isolation transformers? Explain in detail. (8)

ii) Explain various methods of grounding with examples. (8)

(OR)

b) i) Explain the factors influencing the EMI performance of the bonding. (8)

ii) How does cable routing control EMI? How is signal control achieved? (8)

14. a) i) Discuss about the various factors to be considered for EMC design of PCB. (8)

ii) Explain the various procedures to minimize cross talk. (8)

(OR)

b) i) Explain the concept of power distribution decoupling. (8)

ii) What are all the procedures used for effective grounding in PCB design? Explain. (8)

15. a) Discuss and describe the construction of an anechoic chamber and the generation of RF field in it. Compare the tests made in it with that of OATS. (16)

(OR)

b) Summarize FCC and CISPR Conducted Emission and Radiated Emission standards. (16)

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE203 – Highway and Railway Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the recommendation by jayakar committee?
2. Define Camber.
3. What are the functions of transition curve?
4. What are the different types of gradient in highway?
5. What are the IRC recommendations of Highway Drainage?
6. What are the different types of failures in rigid pavement?
7. What is the importance of coning of wheel?
8. What is the function of sleepers?
9. What are types of yards?
10. Define interlocking.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Briefly discuss the historical development of road construction.	(8)
		ii)	Explain in detail about the various highway cross sectional elements.	(8)
			(OR)	
	b)	i)	What are the factors controlling the highway alignment? Explain.	(8)
		ii)	Briefly explain the engineering surveys needed for highway location.	(8)
12.	a)	i)	Derive an expression for Overtaking Sight Distance.	(6)
		ii)	Derive an expression for calculating the stopping sight distance on a highway. Find a stopping sight distance of design speed 80 kmph. Assume suitable data.	(10)

(OR)

b) i) Explain the procedure of design of valley curve. (6)

ii) A National Highway of two lane passing through rolling terrain in heavy rainfall area has a horizontal curve of radius 220 m and design speed 65 kmph. Design the length of transition curve and calculate shift of curve. Assuming suitable data. (10)

13. a) Explain any four test of bitumen. (16)

(OR)

b) Explain the construction procedure of the following types of roads (16)
i) Water Bound Macadam
ii) Bituminous Road.

14. a) i) A 3° curve on high speed MG section has maximum sanctioned speed of 100 km/h. Equilibrium speed is 80 km/h and speed of goods train on the section is 50 km/h. Design Super elevation. (8)

ii) Explain various types of gradient in railway track. (8)

(OR)

b) i) What is meant by permanent way? Explain the basic requirements of a permanent way. (8)

ii) Explain the various types of conventional and modern methods of survey used in railway. (8)

15. a) i) Draw a neat diagram of simple right hand turnout and show its various component parts. Explain the working principle of the turnout. (8)

ii) Explain the different methods of plate laying. (8)

(OR)

b) i) Explain the functions of various signals used in Indian railways. (8)

ii) What are the factors to be considered while selection of site for railway station? What are the facilities to be provided in the railway station? (8)

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II Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME204 – Manufacturing Technology - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish Gear forming process from Gear generating process.
2. Brief any one indexing mechanism in gear manufacturing.
3. Define Rheo casting Process.
4. Why CO_2 gas is used in casting process?
5. Write the basic principle of high-speed forming.
6. What is tooling in Explosive Forming?
7. Differentiate wire cut EDM from conventional EDM.
8. List the disadvantages of Electro Chemical Machining.
9. State the data interfacing formats in Rapid Prototyping.
10. Mention any four applications of Rapid Prototyping.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the gear lapping process in detail. (8)

ii) Discuss the shot blasting process in detail. (8)

(OR)

b) i) Brief any two gear testing methods in detail. (8)

ii) Explain the gear hobbing with a neat sketch. (8)

12. a) Explain the process variables and characteristics of squeeze casting process. (16)

(OR)

b) i) Discuss the slush casting with a neat sketch. (8)

ii) Explain the Thixo casting process. (8)

13.	a)	i)	Brief various methods of high-speed forming.	(8)
		ii)	Describe the Electrohydraulic forming process.	(8)
			(OR)	
	b)	i)	Explain Electromagnetic forming process.	(8)
		ii)	Discuss the water hammer forming with a neat diagram.	(8)
14.	a)	i)	Explain the Electro Chemical Spark machining with a neat sketch.	(8)
		ii)	Discuss the water jet machining with a neat diagram.	(8)
			(OR)	
	b)		Explain the Ultrasonic machining with its advantages and disadvantages.	(16)
15.	a)		Discuss any two types of Rapid prototyping with applications.	(16)
			(OR)	
	b)	i)	Write about Fusion deposition modeling in detail.	(8)
		ii)	Describe data preparation for rapid prototyping.	(8)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

STRUCTURAL ENGINEERING

22STC22 – Structural Dynamics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. A harmonic motion has a time period of 0.2 s and amplitude of 0.4 cm. Calculate the maximum velocity and acceleration?
2. State D Alembert's principle.
3. Differentiate free and force vibration.
4. Brief the modal super position method.
5. Differentiate Newmarks method and newmarks - β method.
6. List out the methods of numerical solutions of static space response.
7. Differentiate between flexural and axial vibration of bars.
8. Write down the governing differential equation for flexural vibration of continuous system.
9. Mention the methods of estimating the natural frequency of the soil.
10. State the design criteria for base Isolation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A SDOF system consists of a mass 400kg and a spring stiffness 200 kN/m. by testing it was found that a force of 100 N produces a relative velocity of 120 mm/sec. Find (8)

i) damping ratio

ii) damped frequency

iii) logarithmic decrement

iv) ratio of two consecutive amplitudes.

ii) Describe the role of vibration isolation in reducing vibrations in the foundation. (8)

(OR)

b) i) Determine the equivalent stiffness for the following system as shown in fig 1. Take E = 180 x10^9 N/m^2 and I = 4.5 x 10^{-5} m^4. (8)

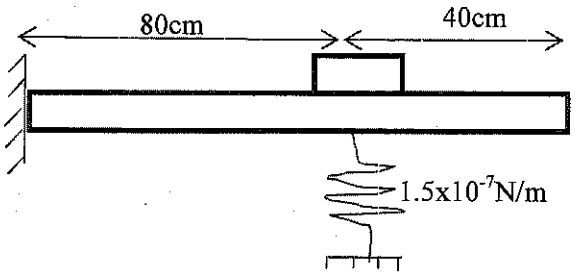

Figure.1

ii) A single degree of freedom system having a mass of 2.5 m is set into motion with a viscous damping and allowed to oscillate freely. The frequency of oscillation is found to be 20 Hz, and measure of the amplitude of vibration shows two successive amplitude to be 6 mm and 5.5 mm. Estimate the viscous damping co-efficient. (8)

12. a) i) Describe the mathematical modeling of multi degree of freedom system. (8)

ii) A two storey building having a floor weight 1200 kN, 600 kN, for the first and second floor respectively. The height of each floor is 3 m and EI = 30 x 10^{12} nmm^2. Analyze the natural frequencies and mode shapes. (8)

(OR)

b) i) State and prove orthogonality property of mode shapes. (8)

ii) The following matrices were obtained for a vibrating system using matrix iteration technique. Evaluate and obtain the natural frequencies and the corresponding modal amplitudes. (8)

$$[k]=\begin{bmatrix}9 & 11 & 7\\ 11 & 16 & 11\\ 7 & 11 & 9\end{bmatrix} \quad [m]=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$$

13. a) i) Explain the Newmark's method for solving numerical solutions of differential equations in structural engineering. (8)

ii) A two-story building has a mass of 2000 kg and is subjected to a triangular pulse loading. Using Wilson's method with a time step of 0.05 seconds, calculate the maximum displacement of the building after 10 seconds, assuming a damping ratio of 0.05. (8)

(OR)

b) i) Explain the finite difference method in structural dynamics, and compare it with other numerical methods. (8)

ii) A one-story building with a mass of 5000 kg is subjected to a harmonic loading with a frequency of 5 Hz. Using direct integration method, calculate the maximum displacement of the building, assuming a damping ratio of 0.02 and a stiffness of 100 kN/m. (8)

14. a) Find the natural frequencies and mode shape of free vibration of the following end conditions of beam (16)

i) The beam has hinged supports at both ends

ii) The beam having both ends free

(OR)

b) i) Calculate a solution to find the natural frequency and mode shape for a simply supported beam. (8)

ii) Evaluate by Rayleigh's method for fundamental frequency of a simply supported beam $\Psi = K (L3x - 2Lx3 + x4)$, where L is the span comment on the value. (8)

15. a) i) Describe the effects of vibration caused by blasting. (8)

ii) Explain dynamic effect of moving loads be accounted for in the design of the structures. (8)

(OR)

b) i) Explain the common challenges in the design of foundations for industrial machinery and how these challenges can be addressed. (8)

ii) Describe the role of vibration base isolation in reducing vibrations in the Structures. (8)

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Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING

22THE42 – Cryogenic Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Cryogenics?
2. Illustrate the concept of Superconductivity.
3. How liquefaction is done in Cryogenics?
4. What are the performance parameters to be considered in gas liquefaction systems?
5. Illustrate with an example of T-C and H-C Diagrams in separation of cryogenic gases.
6. Demonstrate the principle and temperature of cryogenic gas separation?
7. List out the limitations of McCabe-Thiele method.
8. How can distillation be used to separate a mixture of gases? What must the mixture of gas be like?
9. Which of the two components are required for adsorption process?
10. How adsorption is used for purification of cryogenic gases?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Demonstrate the cryo treatment of metal and explain its benefits to the metals? (8)

ii) Discuss the mechanical properties of materials at cryogenic temperatures. (8)

(OR)

b) i) Identify the applications in detail about cryogenics in space Programs. (8)

ii) Outline the need of various properties of the cryogenic fluids like Oxygen, Argon and Helium. (8)

12. a) i) Consider a Linde-Hampson cycle with Nitrogen as working fluid. The system is operated between 1.013 bar (1atm) and 101.3 bar (100 atm) at 300K.Determine (8)

i) Liquid yield

ii) Work per unit mass compressed.

ii) Compare Claude and Simpson cycle Liquefaction systems. (8)

(OR)

b) i) Illustrate with neat sketches related to the important critical components of gas liquefaction systems in elaborate. (8)

ii) What is the significance of ortho to para conversion during the liquefaction of hydrogen? (8)

13. a) i) Interpret the separation procedure of binary mixture related to cryogenic gases? (8)

ii) Design and Thermal Analysis of Rectification Column for Separation of Nitrogen and Oxygen using Rectification Column Method. (8)

(OR)

b) i) Write about the role of MC cabe-thiele method in separation of cryogenic gases. (8)

ii) Elaborate the principles of gas separation and working of gas purification system. (8)

14. a) i) Write notes on G.M.cryocoolers and magnetic refrigerators. (8)

ii) Elucidate the working of a dilution refrigerator with neat schematic diagram. (8)

(OR)

b) i) Distinguish between stirling and pulse tube cryogenic refrigerators (8)

ii) How does cryogenic refrigeration work and discuss along with neat sketch? (8)

15. a) i) With a neat sketch, explain the functions of the various elements of a Dewar vessel. (8)

ii) Interpret the various features of cryogenic fluid transport system. (8)

(OR)

b) i) Describe in detail the different types of insulations used in cryogenic equipments. (8)

ii) List the working principle of different types of cryogenic liquid level indicators and temperature measuring techniques used in cryogenic applications. (8)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

WELDING TECHNOLOGY

22WTC21- Welding Processes - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is hybrid welding process?
2. What are the laser sources for Laser beam welding?
3. What is Electrogas welding?
4. What is Upset welding?
5. List the advantages of solid state welding processes over fusion welding processes.
6. Compare high temperature and low temperature solid state welding processes.
7. What is friction surfacing?
8. List the welding variables in Friction Welding.
9. What is Thermit Welding?
10. Mention the types of adhesive bonded joints.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With neat sketches, explain the principle of operation, advantages, disadvantages and applications of Electron Beam Welding [EBW]. (16)

(OR)

b) With neat sketches, explain the principle of operation, advantages, disadvantages and applications of Laser Beam Welding [LBW]. (16)

12. a) Discuss the principle of operation, wire and consumable guide techniques and variants of Electro Slag Welding [ESW]. (16)

(OR)

b) Describe the following welding processes (16)

1) Spot Resistance Welding
2) Seam Welding
3) Projection Welding
4) High Frequency Welding

13. a) Discuss the principle of operation and applications of Cold Pressure Welding and Explosive Welding Processes. (16)

(OR)

b) With neat sketches, explain the Diffusion Welding and Ultrasonic Welding processes. (16)

14. a) Explain the principle of operation and applications of Friction Welding Process with neat sketches. (16)

(OR)

b) Discuss the principle of operation, tool rotation, transverse speeds and tool design of Friction Stir Welding. (16)

15. a) Explain the various types of Brazing processes. (16)

(OR)

b) Discuss about the Oxy-fuel and Plasma arc cutting methods. (16)

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Ph.D. Degree Examinations – April/May 2023

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18PEE65 – Digital Signal Processors For Power Converters

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is digital signal processing?
2. What is the difference between a serial port and a parallel port?
3. What do you mean by bit reversed addressing?
4. List the control registers common to C6X family of processors.
5. Define a compiler.
6. What is a linker?
7. Mention any four advantages of FPGA.
8. What are the address generation options present in linear addressing?
9. Give the use of a gate driver circuit.
10. Draw the basic circuit diagram of a buck - boost converter.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With a neat diagram, explain the architecture of TMS320C54X. (16)

(OR)

b) Describe the addressing modes and instructions set of TMS320C54X. (16)

12. a) With a neat diagram, explain the architecture of TMS320C67X. (16)

(OR)

b) i) What are the various instruction execution types in 'C6X? Explain. (8)

ii) Explain the different phases of fetch operation of 'C6X pipeline. (8)

13. a) i) Distinguish between distributed RAM and block RAM. (8)

ii) Explain how the special sampling scheme can be used for down conversion of signal with unknown input frequency. (8)

(OR)

b) i) The data stored in data memory is 16 bits long. But the multiplier requires 17 bit data. Explain how the MSB is generated? (8)

ii) Explain the two ways in which the accumulator may be loaded with the most positive value or most negative value when overflow occurs. (8)

14. a) With neat diagram explain the VLIW architecture. How a higher throughput is obtained using the above architecture. (16)

(OR)

b) With an example show how FPGA outperforms P-DSPs for the implementation of high-Speed filters. (16)

15. a) Explain DSP based implementation of Buck-Boost Converter. (16)

(OR)

b) Explain DSP based implementation of BLDC Motor. (16)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDE35 – Supply Chain Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the objective of supply chain management?
2. What are the different strategies followed in supply chain?
3. What is drop-shipping?
4. What are the main factors to be considered in designing distribution network?
5. List the various distribution network designs.
6. What is the difference between logistics and transport?
7. What is Strategic Partnership in Supply Chain Management?
8. Define bullwhip effect.
9. How information is helpful in supply chain?
10. What is e-supply chain?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Explain in detail about integrated logistics and supply chain management.	(16)
		(OR)	
	b)	Identify the major drivers of supply chain performance.	(16)
12.	a)	What are the major issues in distribution-management? How would you handle these issues to make distribution management efficient and effective?	(16)
		(OR)	
	b)	Discuss in details of network design in supply chain. What are the factors which affect the network design decisions?	(16)
13.	a)	Discuss the various modes of transportation and their performance characteristics.	(16)
		(OR)	
	b)	Logistics outsourcing will considerably enhance the competitiveness of the organization- Discuss.	(16)

14. a) Explain in details about sourcing planning and analysis of supply chain management. (16)

(OR)

b) What are the various obstacles to coordination? How such obstacles can be minimized in supply chain? (16)

15. a) i) How do you describe the framework for IT adoption in logistics and supply chain in detail? (8)

ii) Explain the process of Logistics information system for manufacturing company. (8)

(OR)

b) What are the factors that lead to competitive advantage if information technology is used in supply chain? (16)

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Ph.D. Degree Examinations – April/May 2023

(2022 Regulations)

MECHANICAL ENGINEERING

22CDE41 – Experimental Techniques and Data Analysis

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define: Transducer.
2. What is holography and its uses?
3. What are the types of flow measurement?
4. What is an interferometer used for?
5. What does Bragg's law state?
6. What is the cause of residual stress?
7. What is random data?
8. What is meant by regression modelling?
9. What are the principles of design of experiment?
10. What are the 5 key points of experiment design?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)		Discuss in detail of three types of resistance strain gauges.	(16)
			(OR)	
	b)	i)	Explain in detail function of dynamometer.	(8)
		ii)	What is meant by a strain gauge rosette? How is it used?	(8)
12.	a)	i)	Describe the resistance characteristics of thermistors.	(8)
		ii)	Why the reference necessary when using thermocouples?	(8)
			(OR)	
	b)	i)	What particular flow measurement situations are adapted to the hot-wire anemometer?	(8)
		ii)	What basic flow variable is measured using shadowgraph technique?	(8)

13. a) Write the short notes on the following. (16)

i) X ray diffraction

ii) Electron spectroscopy.

(OR)

b) i) Explain in details of micro hardness and roughness. (8)

ii) Discuss in detail of scanning electron microscope. (8)

14. a) How can an uncertainty analysis help to reduce overall experiment uncertainty? (16)

(OR)

b) i) How can statistical analysis be used to determine the number of measurements needed for a required level of confidence? (8)

ii) Discuss in detail of response surface methodology technique. (8)

15. a) Discuss in detail of the concept of design of experiments. Write 12 important steps to complete an effective design of experiment. (16)

(OR)

b) Write the short notes on the following. (16)

i) Taguchi loss function

ii) Robust design.

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Ph.D. Degree Examinations – April/May 2023

(2022 Regulations)

MECHANICAL ENGINEERING

22CDE55 – Maintenance Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define: Maintenance.
2. What is meant by preventive maintenance approach?
3. What is vibration signature analysis?
4. What are the common types of vibrating machinery faults?
5. What is non destructive testing?
6. Write the standards for non destructive testing.
7. Define: Lubrication.
8. What are the types of lubrication?
9. Define: Abrasive wear.
10. What is spalling in wear?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	What do you mean by maintenance job planning? Discuss various steps of maintenance job planning.		(16)
		(OR)		
	b)	Discuss in details of characteristics in need of preventive maintenance and seven elements of preventive maintenance.		(16)
12.	a)	Explain the importance of vibration signature analysis and its technique.		(16)
		(OR)		
	b)	Discuss in details of vibration monitoring system and analysis techniques.		(16)
13.	a)	Discuss in detail of liquid penetrating testing, magnetic particle inspection and eddy current testing.		(16)
		(OR)		
	b)	Illustrate the importance of ultrasonic testing, acoustic emission testing and leak testing.		(16)

14. a) Explain in details of classification of lubricants, property and characteristics of lubrication. (16)

(OR)

b) Discuss in details of bearing lubrication technique and how to minimize the friction and wear using lubrication? (16)

15. a) Discuss in details of different types of wear and technique for minimize the wear. (16)

(OR)

b) Explain the importance of computer aided maintenance management system in the field of data collection and analysis. (16)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMMUNICATION SYSTEMS

22COE44 – 5G Communication Networks

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the key performance indicators of 5G.
2. Differentiate between standalone and non-standalone mode in 5G NR.
3. What are the fundamental requirements of 5G channel modeling?
4. List different propagation scenarios and supported links.
5. Define the different spread spectrum multiple access systems.
6. State the main principle for small cell optimized sub frame structure.
7. What are the use cases of D2D communication in cellular networks?
8. Define the different categorization of Machine Type Communication (MTC).
9. Depending on what factors, millimeter wave path loss is affected?
10. What is phantom cell concept?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Brief the 5G standardization activities in ITU, 3GPP and IEEE.	(8)
		ii)	Discuss on the evolution of cellular standards.	(8)
			(OR)	
	b)	i)	Elaborate on the key challenges in rolling out 5G.	(8)
		ii)	Explain any two use cases and requirements of 5G.	(8)
12.	a)		Describe spectrum access modes and sharing scenarios. Also detail on 5G spectrum technologies on new spectrum access modes as well as in improved usage of new frequency bands.	(16)
			(OR)	
	b)		Elaborate on creation of environment, determine the propagation pathway, determine the propagation channel matrices for map based model.	(16)

13. a) i) Compare FDMA, TDMA and OFDMA systems. (8)

ii) Describe Filter Bank Multicarrier transceiver. (8)

(OR)

b) i) Derive the capacity limits of multiple access channels for uplink and broadcast downlink channel. (8)

ii) Elaborate on Universal filtered Multicarrier system. (8)

14. a) Explain the design principles of reliable low latency design needed in control related communication such as tele-surgery. Detail the technology components among D2D communications. (16)

(OR)

b) Describe the radio resource management techniques and system design for mobile broadband D2D communications. (16)

15. a) Describe the following hardware technologies for mm Wave Systems. (16)

i) Device technology

ii) Antenna

iii) Beam forming architecture.

(OR)

b) Explain the pilot design for massive MIMO. What are the techniques to mitigate the pilot contamination? (16)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES

22PEE45 – Power Electronics for Renewable Energy System

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Identify the challenges associated with solar energy conversion technologies.
2. Why maximum power point tracking is needed for Solar PV system?
3. Write the power coefficient expression for wind turbine and mention its significance.
4. Compare the features of Permanent Magnet Synchronous Generator and Self Excited Induction Generator.
5. List out the types of Fuel Cell.
6. Write the salient features of Bloom's Energy Server.
7. Draw the power circuit for HERIC inverter suitable for solar PV energy conversion.
8. What is the need of Back to Back PWM inverter for renewable energy systems?
9. What are the grid synchronization techniques used for single phase solar PV system?
10. How do you control reactive power injection in grid connected wind energy conversion system?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Elaborate the operation of solar PV Cell with the help of I-V equation and characteristics. (16)

(OR)

b) Discuss the effect of Solar Irradiation and Temperature in solar PV module operation and influence of Perturb and Observe Maximum Power Point Tracking algorithm in solar PV module output. (16)

12. a) Draw the general structure of wind energy conversion system and indicate the key components. Also explain the principle of operation of wind energy conversion system. (16)

(OR)

b) Draw and explain the schematic diagram of a three-phase wind energy conversion system supplied from the permanent magnet generator for an autonomous operation. (16)

13. a) Elaborate the constructional details of Proton Exchange Membrane Fuel Cells and explain its operation with suitable chemical equations. (16)

(OR)

b) Derive the equivalent circuit of fuel cell and discuss the hydrogen as a fuel for fuel cell compared to other types of fuel. (16)

14. a) Draw the power circuit of Neutral Point Clamped (NPC) Half-Bridge Inverter and explain its operation and suitability for solar PV system. (16)

(OR)

b) Explain how three-level back-to-back PWM Inverter used for grid integration of renewable energy systems with the help of power circuit. (16)

15. a) Draw the generic structure for grid connected PV system and explain its operation. Also explain the Phase-Locked Loop control scheme used for single phase PV system. (16)

(OR)

b) Draw the generic control structure for grid connected wind energy conversion system and explain the generator side and grid side control parameters. (16)

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE202 – Strength of Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Recall Castigliona's first theorem.
2. Write down the formula for strain energy in terms of moment.
3. Differentiate statically determinate and statically indeterminate structures.
4. Write down the general form of Claperon's three moment equations for the continuous beam.
5. What are the assumptions made in Euler's theory?
6. Write down the Rankine-Gordon formula.
7. Define unsymmetrical bending.
8. Define shear centre.
9. State Lame's equation.
10. State Maximum shear stress theory.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Using moment area method derive equations for maximum deflection and slope at the support of a simply supported beam carrying U.D.L distributed over entire span. (16)

(OR)

b) A simply supported beam 6 m long carries a concentrated moment of 150 kNm (clockwise) and concentrated load of 300 kN, both at 2 m from the right support. If the flexural rigidity of the beam is 8×10^4 kNm^2, find the maximum deflection and slope at the loaded point using MaCaulay's method. (16)

12. a) A propped cantilever of span of 6m having the prop at the end is subjected to two concentrated loads of 24 kN and 48 kN at one third points respectively from left and right fixed end support. Describe shear force and bending moment diagram with salient points. (16)

(OR)

b) A continuous beam consists of three successive spans of 6 m and 12 m and 4 m which carries the loads of 2kN/m, 1kN/m and 3kN/m respectively on the spans. Draw bending moment diagram and shear force diagram for the beam shown in Fig.1 (16)

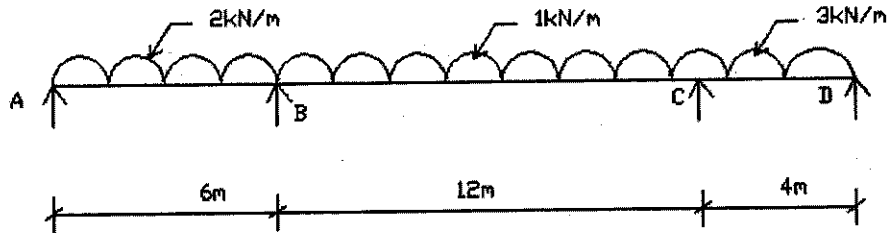

Figure .1

13. a) i) Derive the Euler's equation for column with two ends fixed. (8)

ii) A circular bar of uniform section is loaded with a tensile load of 500 kN. The line of action of the load is off the axis of the bar by 10 mm. Determine the diameter of the rod, if permissible stress of the material of the rod is 140 N/mm^2. (8)

(OR)

b) A 1.5 m long cast iron column has a circular cross section of 50 mm diameter. One end of the column is fixed in direction and position and the other is free. Taking factor of safety as 3, calculate the safe load using Rankine-Gordon formula. Take yield stress as 560 MPa and constant $\alpha = 1/1600$ (16)

14. a) Find the principal moment of inertia of channel section shown in Figure.2 (16)

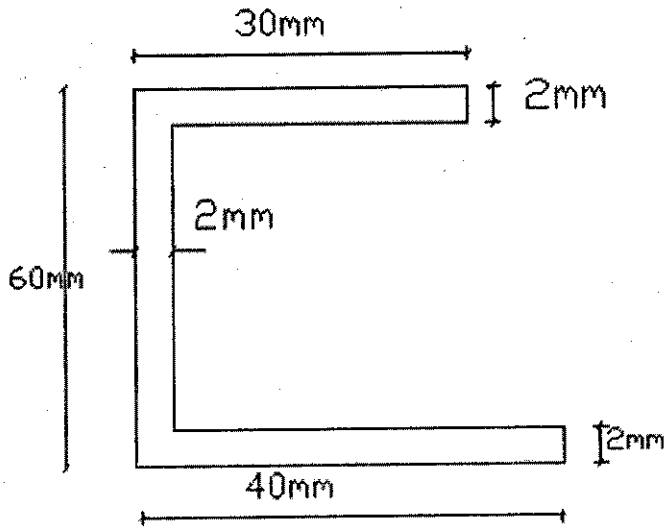

Figure.2

(OR)

b) Derive the equation of shear centre for channel section. (16)

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

(OR)

b) In a material the principal stresses are 60 MN/m^2, 48 MN/m^2 and -36 MN/m^2. Take E = 200 GN/m^2 and 1/m=0.3 and calculate: (16)

i) Total strain energy

ii) Volumetric strain energy

iii) Shear strain energy

iv) Factor of safety on the total strain energy criterion if the material yields at 120 MN/m^2.

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE203 – Measurements and Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the significance of calibration?
2. Distinguish between gravity control and spring control.
3. How are basic low range instruments used in measuring higher range electrical quantities?
4. Which torque is absent in energy meters? Why?
5. Write the condition for an AC bridge to be balanced.
6. State the limitations of Wheatstone's bridge.
7. Define deflection sensitivity.
8. A 3 ¾ digit voltmeter is used for measurement. What is its resolution? How it would display a reading of 34.57 in 400 V scale?
9. What are the advantages of LVDT?
10. What is Hall effect?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Elaborate the construction and working principle of PMMC instrument. (10)

ii) Explain the dynamic characteristics of an instrumentation system. (6)

(OR)

b) i) Elaborate the construction and working principle of MI instrument. (10)

ii) Explain the static characteristics of an instrumentation system. (6)

12. a) i) An energy meter, having meter constant of 1200 revolutions/kWh makes 20 revolutions in 30 seconds for a constant load. Find the connected load in kW? (8)

ii) Explain the errors that affect the characteristics of Current Transformer. (8)

(OR)

b) i) Two wattmeters which are connected to measure the total power on three – phase system supplying a balanced load, read 10.5 kW and – 2.5 kW respectively. Find the total power and the power factor. (8)

ii) How the frequency can be measured through Weston type frequency meter? (8)

13. a) i) Explain the bridge which completely eliminate the effect of lead and contact resistances. (10)

ii) Compare D.C. and A.C. Bridges. (6)

(OR)

b) i) With the help of Schering bridge explain how loss angle of a dielectric can be determined? (10)

ii) An inductive coil was tested by an Anderson bridge. The following values are observed on balance. Arm BC, CD, DA are resistors having 1000 Ω, 1000 Ω and 2000 Ω respectively. A capacitor of 10 μF and resistance 400 Ω are connected between CE and ED respectively, and the source has been connected between A and C, r = 496. Determine L1 and R1 which connected at arm AB. (6)

14. a) i) Draw and explain the co-ordinate type potentiometer. (8)

ii) Explain any two applications of D.C potentiometers. (8)

(OR)

b) i) What are lissajous figure? How the frequency can be measured from it? (8)

ii) What are the advantages of Digital Voltmeter? (8)

15. a) i) List the different criteria for selection of transducer for a particular application. (8)

ii) Describe the different modes of operation of Piezo-electric transducer. (8)

(OR)

b) i) Elaborate the construction and working principle of LVDT. (8)

ii) Explain smart sensors with built-in features. (8)

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME203 – Engineering Materials and Metallurgy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State peritectic and peritectoid reactions.
2. Distinguish between steel and cast iron.
3. Enumerate any two differences between annealing and normalizing.
4. Differentiate carburizing and nitriding.
5. List a few ceramic coating methods.
6. What are the advantages of FRP composites?
7. Classify the different hardness testing methods.
8. List the parameters that can be determined from the tensile test.
9. State the principle of NDT.
10. Define surface engineering.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw an Iron-carbon equilibrium diagram and label all the phases. (8)

ii) Describe with the aid of a diagram the substitutional solid solution. (8)

(OR)

b) i) Discuss the composition, properties, and application of any two types of Cast Iron. (8)

ii) Elucidate the classification and microstructure properties of steel. (8)

12. a) i) Give the process details of full annealing and spheroidising treatments for steels. Explain the microstructure and need for these treatments. (8)

ii) Define hardenability and explain the Jominy End Quench test. How to use this Jominy end quench test data? (8)

(OR)

b) i) Draw Time-Temperature-Transformation (T-T-T) diagram and label all the phases. Also, enumerate any four objectives of heat treatment of steel. (8)

ii) What is case hardening? Discuss the nitriding process and its importance for industrial applications. (8)

13. a) i) Compare and contrast APS and VPS coating. (8)

ii) Examine the properties and applications of Si_3N_4 and SiC. (8)

(OR)

b) i) Examine the process of CVD coating and list the applications. (8)

ii) List the important engineering ceramics and their applications. (8)

14. a) i) Define the term 'hardness of metal' and also give a short note on hardness testing methods. (8)

ii) Illustrate the mechanism of slip and twining. (8)

(OR)

b) i) Draw the S-N curve for ferrous and non-ferrous metals and explain how endurance strength can be determined. (8)

ii) Describe fatigue testing and methods for improving the fatigue strength of the components. (8)

15. a) i) Elucidate ultrasonic testing with a neat sketch. (8)

ii) Enumerate the high and low-energy beam methods for surface improvement. (8)

(OR)

b) i) Examine magnetic particle inspection and give its limitations and applications. (8)

ii) List out the diffusion techniques employed for surface modification and explain any one technique along with its applications. (8)

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Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING

22THE32 – Refrigeration Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Ton of Refrigeration.
2. Write chemical formula for i) R601 ii) R134a.
3. Give short note on steam jet refrigeration.
4. Differentiate VCRS and VARS.
5. Define Energy Efficiency ratio.
6. How do you select refrigerant compressor for data center application?
7. What are the types of evaporators commonly used in refrigeration industry?
8. What is the function of expansion device in refrigerator?
9. What do you understand with thermostats?
10. Why refrigerant control device is used?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain how a refrigerant produces a cooling effect. What are the good qualities of refrigerant? Name of the refrigerant which does not destroy the ozone layer. (16)

(OR)

b) Explain the desirable properties of refrigerants. List all the possible alternative refrigerants to CFCs and HCFCs. (16)

12. a) Explain the effect of the following on the COP of VCRS cycle with suitable P-h diagram: (16)

    1) Subcooling of the liquid in condenser
    2) Decrease of Evaporator temperature
    3) Wet compression

(OR)

b) With the help of a neat sketch, discuss the working principle of a practical VARS. Derive the expression for its coefficient of performance. (16)

13. a) Explain with the help of a neat sketch the working principle of a Thermostatic Expansion Valve (TEV). (16)

(OR)

b) Explain how compressors are used in refrigeration circuits and also give notes on characteristics, performance and types of compressors used in refrigeration systems. (16)

14. a) What do you understand about system balancing in the refrigeration system? (16)

(OR)

b) What condensers are used in the refrigeration systems and explain the performance of condensers. (16)

15. a) Explain different classes of motor duty. (16)

(OR)

b) Explain pressure control and acoustic control in refrigeration systems. (16)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

WELDING TECHNOLOGY

22WTE41 – Materials Characterization

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the terms: Resolution and Depth of Focus.
2. What is In-Situ metallography?
3. State Bragg's Law.
4. How do you characterize the crystal structure of metals in XRD?
5. List the devices commonly used in X-ray diffraction experiments.
6. What are the applications of the X-ray diffraction patterns?
7. List the applications of Transmission Electron Microscope.
8. What is the principle of Atomic Force Microscopy?
9. What is the basic principle of XRF?
10. Mention the applications of Optical Emission Spectrometer (OES).

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With neat sketches, explain the working principle of Metallurgical Microscope with specimen preparation techniques. (16)

(OR)

b) With neat sketches, explain working principle of Polarized light microscopy and Phase contrast microscopy. (16)

12. a) Analyze the Laue, Rotating crystal and Powder methods of diffraction. (16)

(OR)

b) Explain the structure factor calculations in X-ray diffraction. (16)

13. a) Explain the general features of Proportional Scintillating and Geiger counters. (16)

(OR)

b) Explain the various applications of X-ray diffraction. (16)

14. a) Discuss the construction and operation of Transmission Electron Microscope with specimen preparation techniques. (16)

(OR)

b) Discuss the construction and operation of Scanning Electron Microscope with a sketch. (16)

15. a) Explain the principle of Atomic Absorption Spectroscopy and Optical Emission Spectroscopy. (16)

(OR)

b) Explain the Differential Scanning Calorimetric and Thermo Gravimetric Analysis methods. (16)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

I Semester (Part Time)

(2022 Regulations)

CIVIL/ ELECTRICAL AND ELECTRONICS ENGINEERING

22PTMA101 – Mathematics - I

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Solve $(D^2 + 8D + 16)y = 0$
2. Write the general form of Cauchy's homogeneous linear differential equation.
3. Obtain partial differential equation by eliminating arbitrary constants 'a' and 'b' from $z = (x - a)^2 + (y - b)^2$
4. Solve $\left(D^3 - 4D^2D' + 4DD'^2\right)z = 0$
5. Define solenoidal vector.
6. Find the unit vector normal to the surface $x^2y + 2xz^2 = 8$ at (1, 0, 2).
7. Inspect the invariant points of the transformation $W = \frac{Z-1}{Z+1}$.
8. When do you say the function $u(x, y)$ is harmonic?
9. State Cauchy's Integral formula.
10. Calculate the residue of $f(z) = \frac{e^{2z}}{(z+1)^2}$ at its pole.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = sin(logx)$. (8)

ii) Solve $(D^2 + 4)y = cos^2x$. (8)

(OR)

b) i) Solve $(D^2 + 4D + 3)y = e^{-x} \sin x$ (8)

ii) Solve by the method of variation of parameters $\frac{d^2y}{dx^2} + 4y = \sec 2x$. (8)

12. a) i) Form the PDE by eliminating the arbitrary functions f_1, f_2 from the relation $z = xf_1(x + t) + f_2(x + t)$. (8)

ii) Solve $(r + s - 6t) = y \cos x$ (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 angle between the normal to the surface $xy - z^2 = 0$ at the points $(1,4,-2)$ and$(-3,-3,3)$. (8)

ii) Evaluate $\int_C (\sin z\,dx - \cos x\,dy + \sin y\,dz)$ by using Stoke's theorem (8)

where C is the boundary of the rectangle defined by

$0 \le x \le \pi, \quad 0 \le y \le 1, z = 3$

(OR)

b) Verify divergence theorem for (16)

$\vec{F} = (x^2 - yz)\vec{i} + (y^2 - zx)\vec{j} + (z^2 - xy)\vec{k}$ taken over the rectangular parallelopiped $0 \le x \le a, 0 \le y \le b, 0 \le z \le c$.

14. a) i) If $f(z)$ is an analytic function prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ (8)

ii) Determine the analytic function whose real part is (8)
$u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$.

(OR)

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

ii) Determine the bilinear transformation which maps the points (8)
z = 1, i, -1 into the plane w = 0, 1, ∞.

15. a) i) Using Cauchy integral formula evaluate $\int_c \frac{dz}{(z+1)^2(z-2)}$ where C the circle (8)
$|z| = \frac{3}{2}$.

ii) Find the Laurent's Series expansion of the function $\frac{z-1}{(z+2)(z+3)}$, valid in (8)
the region $2 < |z| < 3$.

(OR)

b) Prove that $\int_0^\infty \frac{dx}{(x^2+1)^2} = \frac{\pi}{4}$ (16)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGIENERING

18EEP05 – High Voltage Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Why high voltage is preferred for long distance transmission of voltage?
2. List the causes of power frequency over voltages in power system.
3. Give the criterion for breakdown in non-uniform fields.
4. Write the Paschen's law.
5. Differentiate between spark over, flash over and puncture.
6. State the components of multistage impulse generator.
7. Classify the types of resistive shunts used for impulse current measurements.
8. What are the problems associated with measurement of very high impulse voltages?
9. Outline the demerits of synthetic testing of circuit breaker.
10. List out tests conducted on power transformer as per standard.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw and explain the Bewley Lattice Diagram for a two substation system. (16)

(OR)

b) Explain in detail the origin and characteristics of switching surges and explain the causes of over voltage due to switching surges in EHV and UHV system with a suitable example. (16)

12. a) i) Explain about the breakdown mechanisms in solid dielectrics with neat sketches. (10)

ii) Briefly explain about Corona loss and its effects related to transmission system. (6)

(OR)

b) i) List out the problems caused by corona discharge. (6)

ii) Describe the mechanism of breakdown in composite insulation in detail. (10)

13. a) Give the Marx circuit arrangement for multistage impulse generators. How is the basic arrangement modified to accommodate the wave time control resistances? (16)

(OR)

b) What is the principle behind the electrostatic energy conversion methods? Explain the construction and operation of Van de Graaff generator. (16)

14. a) i) Briefly explain arrangements of Rogowski coil and magneto optic methods for high current measurements. (10)

ii) Explain the Hall generator for measuring high dc current. (6)

(OR)

b) i) Explain the different methods of impulse current measurement techniques. (10)

ii) Discuss elaborately any two digital techniques in HV measurement. (6)

15. a) Discuss the various tests carried out in a circuit breaker at high voltage laboratories. (16)

(OR)

b) List the different test conducted on cables according to standards. Explain any one of them. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D. Degree Examinations – April/May 2023

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18PEE61 – Electric Vehicles

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the electric motor and IC engine speed-torque characteristics.
2. Write the electrical components of a hybrid electric vehicle.
3. Name the key components of EV power train.
4. Under what condition a pure EV can be chosen as a better option compared to HEV considering the impact on the climate change?
5. Enumerate different types of electric motors used for Electric vehicle.
6. Mention the significance of vector control for AC machines used in Electric Vehicle.
7. List out the major types of rechargeable batteries used for electric and hybrid vehicle applications.
8. Draw the circuit for Run-Time Battery Model.
9. Which type of Fuel Cell is preferred for e- mobility applications? Why?
10. What is the use of Reformer in Fuel cell?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain how engine ratings and electric motor ratings are fixed in vehicles. (8)

ii) Compare and analyse electric vehicle with internal combustion engine vehicles on the basis of efficiency, pollution and operating cost. (8)

(OR)

b) i) Analyze in detail the power flow in series-parallel hybrid vehicle for EM and ICE dominated system. (8)

ii) Develop the model for vehicle kinetics and road way with necessary mathematical expressions. (8)

12. a) i) Draw the architecture of electric vehicle and explain the major electrical components used in it. (8)

ii) Discuss the major components in the power train of an electric vehicle and how ratings are selected to meet vehicle performance requirements. (8)

(OR)

b) Discuss the different Power Flow Control techniques used for Series Hybrid and Parallel Hybrid Electric Vehicle indicating modes of operation. (16)

13. a) Draw the power circuit and analyse the four quadrant operation of chopper fed DC drive used in Electric vehicle and also explain its control strategy. (16)

(OR)

b) i) Explain the operation of V/F control of Induction motor drive for motoring as well as braking with power circuits. (8)

ii) Draw the power converter used for SRM drive and explain the control strategy used for SRM drive. (8)

14. a) i) Discuss in detail about significance and procedure to measure the following battery parameters. (8)

1) Battery Capacity
2) State of Charge
3) Battery Energy
4) Battery Power

ii) Develop run time battery model for battery with its equivalent circuit and mathematical expressions. (8)

(OR)

b) Do the case study for comparison of properties of Electric and Hybrid Electric Vehicles Batteries. Identify any two traction batteries suitable for electric car and indicate the reasons. (16)

15. a) i) Draw the basic structure of Fuel cell and analyse its operation with suitable chemical equations and characteristics. (8)

ii) List out the different types of fuel cell. Compare the Fuel cell types with respect to fuel, electrolyte, operating temperature, efficiency and applications. (8)

(OR)

b) i) Describe the need of Hydrogen energy storage system for Fuel cell. (8)

ii) Explain the basic structure and operation of Ultra capacitor. (8)

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Government College of Engineering :: Salem

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDC23 – Solid Freeform Manufacturing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Identify the need of developing Solid free form manufacturing (SFM) systems.
2. List any four applications of SFM.
3. Depict any four advantages of topology optimization.
4. List the dominant design requirements of additive manufacturing.
5. Outline the steps involved in laminated object manufacturing process.
6. Summarize the advantages of sheet lamination process.
7. Identify any two industrial applications of selective laser melting process.
8. Compare the advantages of electron beam melting over fused deposition modelling.
9. Distinguish between two-dimensional and three-dimensional printing process.
10. Classify the types of printing process.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the hierarchical structure of SFM with a neat sketch. (16)

(OR)

b) Discuss in detail about the Economic, strategic, and operative aspects of SFM process. (16)

12. a) Explain the unique capabilities and industrial applications of additive manufacturing process. (16)

(OR)

b) Can additive manufacturing be used for mass production with lower manufacturing cost? Portray the technical difficulties in the existing system and offer suggestions for overcoming such problems. (16)

13. a) A product is being manufactured using digital light processing technique. In the context of production engineer, what are the measures that could be taken for improving the mechanical properties of the manufactured component? (16)

(OR)

b) Enumerate in detail the process parameters used in ultrasonic additive manufacturing process. (16)

14. a) Formulate a set of design rules for fusion deposition modelling with a perspective to improve the surface finish. (16)

(OR)

b) Explain the industrial applications of electron beam melting technique with appropriate case studies. (16)

15. a) Explain the process of multi jet modelling with an example. Also, discuss the materials used in the process. (16)

(OR)

b) With a typical case study, explain the applications of laser engineered net shaping process. (16)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMMUNICATION SYSTEMS

22COE31 – Wireless and Mobile Communication

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by frequency division duplexing?
2. Mention the purpose of MIN.
3. Define dwell time.
4. Outline the necessity of Erlang B formula.
5. Find the far field distance for an antenna with maximum dimension of 1m and operating frequency of 900 MHz.
6. Calculate the Brewster angle for a wave impinging on ground having a permittivity of $\varepsilon_r = 4$.
7. Enumerate the small-scale fading effects of multipath radio propagation.
8. For a Rayleigh fading channel, compute the positive-going level crossing rate for $\rho=1$, when the maximum Doppler frequency (f_m) is 20 Hz. what is the maximum velocity of the mobile for this Doppler frequency if the carrier frequency is 900 MHz.
9. Outline the technique that is used to improve the radio link performance.
10. Enumerate the characteristics of speech signals.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Elaborate the evolution of mobile radio communication. (8)

ii) Describe the concept of paging systems with a neat diagram. (8)

(OR)

b) i) Discuss the trends in cellular radio and personal communications. (8)

ii) Catalogue the advantages and applications of 5G wireless networks. (8)

12. a) Describe the handoff strategies with necessary diagrams. (16)

(OR)

b) With a neat transmitter and receiver block diagram, explain Direct sequence spread spectrum and Frequency hopped spread spectrum technique. (16)

13. a) What is meant by diffraction? Describe the knife-edge diffraction model with necessary illustrations. (16)

(OR)

b) Find the median path loss using okumura's model for d =50 km, h_{te}= 100 m, h_{re}= 10 m in a sub-urban environment. If the base station transmitter radiates an EIRP of 1kW at a carrier frequency of 900 MHz. Find the power at the receiver (assume a unity gain receiving antenna). (16)

14. a) Describe the impulse response model of a multipath channel with necessary illustrations. (16)

(OR)

b) Explain in detail about the clarke's model for flat fading with appropriate illustrations. (16)

15. a) Describe the decision feedback equalization method (DFE) and Maximum likelihood sequence estimation (MLSE) method of nonlinear equalization technique with a neat diagram. (16)

(OR)

b) With a neat block diagram, explain in detail about GSM codec and USDC codec. (16)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES

22PEE34 – Special Electrical Machines and Drives

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare conventional DC motor and PMBLDC motor.
2. What are the relative merits and demerits of BLDCM?
3. Examine the Volt-ampere requirements of PMSM.
4. Why PMSM operating in self – controlled mode is known as commutatorless DC Motor?
5. Differentiate switched reluctance motor and variable reluctance stepper motor.
6. Determine the step angle of a three phase switched reluctance motor having 12 stator poles and 8 rotor poles. What is the commutation frequency in each phase of 6000 rpm?
7. What are the merits of C-Dump Converter?
8. What are the power controllers for PM synchronous machines?
9. What are the advantages of hall effect current sensor when compared to current transformer?
10. Tacho generators are having large number of commutating segments – Justify.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A permanent magnet DC commutator motor has a no-load speed of 6000 rpm when connected to a 120 V supply. The armature resistance is 2 Ω and rotational and iron losses may be neglected. Determine the speed when the supply voltage is 60 V and the torque is 0.5 Nm. (8)

ii) Derive the expression for torque of a PMBLDC motor and prove that torque equation in BLDC motor is similar to that of conventional DC motor. (8)

(OR)

b) i) Identify appropriate power controllers for PMBLDC motor and explain with neat diagram (8)

ii) Select suitable sensors for position sensing in PMBLDC motors and explain the operation with neat sketch. (8)

12. a) A 3 ф, 4 pole, brushless PM rotor has 36 stator slots. Each phase winding is made up of three coils per pole with 10 turns per coil. The coil span = 7 slots. If the fundamental component of magnet flux is 1.8 mWb. Estimate the open circuit phase EMF at 3000 rpm. (16)

(OR)

b) Clarify in detail the field oriented control of permanent magnet synchronous motor. (16)

13. a) A SRM with 6 stator poles and 4 rotor poles has a stator pole arc of 30° and rotor pole arc is 32° . The aligned inductance is 10.7 mH and unaligned inductance is 1.5 mH. Saturation can be neglected. Calculate the instantaneous torque when the rotor is 30° before the aligned position and phase current is 6 A. What is the maximum energy conversion for one stroke, if the current is limited to 7 A? Determine the average torque corresponding to this energy conversion. (16)

(OR)

b) Describe the construction and working of Switched Reluctance motor. (16)

14. a) Describe the various power controller circuits to Switched Reluctance motor and explain the operation of any two scheme with suitable circuit diagram. (16)

(OR)

b) Identify appropriate power controllers for PMBLDC motor and explain with neat diagram. (16)

15. a) Explain about proximity sensor and its interface with DSC. (16)

(OR)

b) Explain about Quadrature encoder interface. (16)

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE201 – Basic Structural Steel Design

(Use of IS 800 – 2007 & Steel Tables are Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the Classification of structures based on function and material.
2. Define Characteristic Strength.
3. Define staggered pitch.
4. What are the types of failures occur in Bolted joint?
5. What is a Lug angle?
6. List out the typical failure modes in tension member.
7. Define slenderness ratio.
8. What are the different types of column base connections?
9. Why does buckling of web occur in beams?
10. What is web crippling?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Write short notes on Limit State design of Steel Structures. (16)

(OR)

b) Explain in detail about various type of structural loads and its combinations consider for design. (16)

12. a) Two plates 200 X 8 mm of grade Fe410 are connected by 20 mm diameter bolts of grade 4.6 using butt joint. Design the bolted connection to transmit a pull equal to strength of the plate. Also sketch the arrangement of bolt in the joint. (16)

(OR)

b) ISA 70 X 75 X 6 acting as a tension member in a roof truss is connected to a gusset plate 8mm thick by welding. The member carries an axial factored load of 110 kN. Design the welded connection using site welds. Use Fe410 grade steel. (16)

13. a) A 220 mm x 8 mm plate is connected to a 10 mm thick gusset plate by 6 bolts of 16 mm diameter as shown in figure.1. Determine the design tensile strength of the plate. The yield strength and ultimate strength of the material is 250 MPa and 410 MPa respectively. (16)

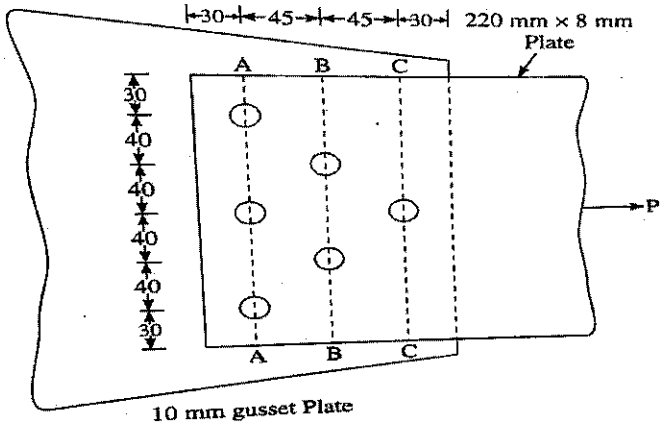

Figure.1.

(OR)

b) The longer leg of a single angle 125 mm X 75 mm X 6 mm is connected to a 10 mm thick gusset plate by 4 bolts of 16 mm diameter arranged as shown in figure.2. Determine the design tensile strength of the angle. Take the yield strength and ultimate strength of the material is 250 MPa and 410 MPa respectively (16)

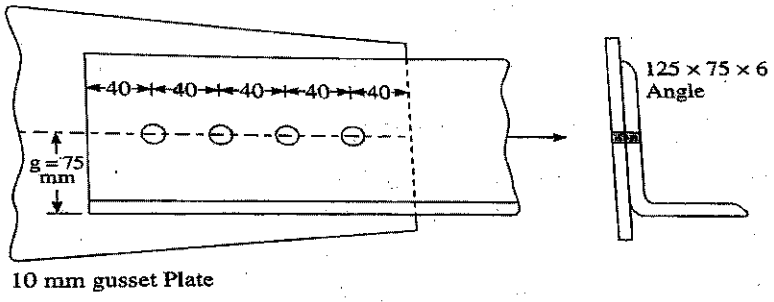

Figure.2.

14. a) A Steel column is subjected to a factored load of 1200 kN. It has as an effective length of 8.75 m with respect to Z axis and 5 m with respect to Y axis. Design the column. (16)

(OR)

b) Write down the design procedure for batten Columns. (16)

15. a) A simply supported beam of span 5m has to support a load of 60 kN/m excluding its weight. The compression flange of the beam is restrained against buckling. Design the beam. Assume that the beam is sufficiently stiff against bearing. (16)

(OR)

b) Determine the design bending strength of a laterally supported beam ISMB 350@ 514 N/m. Assume that the factored shear force is less that the design shear strength. Take grade of steel as Fe410. (16)

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE202 – Synchronous and Induction Machines

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Highlight the principal advantages of rotating field system type of construction of synchronous machines.
2. Justify the use of cylindrical rotor alternators to operate with steam turbines.
3. Point out why synchronous motor is not a self-starting motor?
4. What is an infinite bus bar?
5. Why an induction motor is called a 'rotating transformer'?
6. A 3-phase induction motor is wound for 4 poles and is supplied from 50 Hz system. Calculate the speed at which the magnetic field of the stator is rotating.
7. Define Pullout torque.
8. Give the conditions for maximum torque for 3-phase induction motor.
9. Why single phase induction motor is not a self-starting one?
10. Specify the reason for the capacitor –start induction motors to be more advantageous.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe with neat sketches the constructional details of a salient pole type alternator. (10)

ii) Derive the expression of the emf equation of an alternator. (6)

(OR)

b) i) With required diagrams discuss the synchronous impedance method for determination of voltage regulation. (10)

ii) Explain the concept of armature reaction for different loads. (6)

12. a) i) Explain V-curves and inverted V-curves. (10)

ii) Describe Hunting Phenomenon in synchronous and how can it be minimised? (6)

(OR)

b) i) Explain briefly the principle of operation of three-phase synchronous motor. (10)

ii) Explain a method to start a synchronous motor. (6)

13. a) i) Explain in detail about the induction generator. (10)

ii) Write a note on the practical rating of Induction motors. (6)

(OR)

b) i) Elaborate on the phenomena of Cogging or Magnetic locking and crawling in an induction motor. (10)

ii) Discuss the use of auto transformer on starting of Induction motors. (6)

14. a) Develop the equivalent circuit for 3-phase induction motor. (16)

(OR)

b) A 50 HP, 6–Pole, 50 Hz, slip ring Induction motor runs at 960 rpm on full load with a rotor current of 40 A. Allow 300 W for copper loss in S.C. and 1200 W for mechanical losses, find resistance per phase of the 3- phase rotor. (16)

15. a) i) Draw and explain the concept of two field revolving theory. (10)

ii) Explain the working operation of capacitor start and capacitor run induction motor. (6)

(OR)

b) i) Explain the working of split phase induction motor? List out the advantages, disadvantages and applications. (10)

ii) Briefly discuss about the shaded pole Induction motor with circuit diagram and mention their applications. (6)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME202 – Thermal Engineering

(Refrigeration table and Psychrometric chart to be permitted.)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down the formula to find mean effective pressure for Diesel cycle.
2. The efficiency of an Otto cycle is 60% and $\gamma = 1.5$. What is the compression ratio?
3. Define equivalence ratio.
4. Compare detonation and knocking.
5. What is meant by supersaturated flow of nozzle?
6. Compare velocity and pressure compounding.
7. Distinguish reciprocating air compressor with centrifugal air compressor.
8. Define volumetric efficiency of reciprocating air compressor.
9. What is meant by refrigeration effect?
10. Define the term degree of superheat.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The minimum pressure and temperature in an Otto cycle are 100 kPa and 27°C. The amount of heat added to the air per cycle is 1500 kJ/kg. i) Determine the pressures and temperatures at all points of the air standard Otto cycle. ii) Also calculate the specific work and thermal efficiency of the cycle for a compression ratio of 8: 1. Take for air: Calorific Value of fuel = 0.72 kJ/kg K, and $\gamma = 1.4$. (16)

(OR)

b) Explain actual and theoretical PV diagram of four stroke engines with suitable sketch. (16)

12. a) What are the various types of lubrication systems used in an IC engine? Explain the full pressure lubrication system with appropriate diagram. (16)

(OR)

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

i) Brake specific fuel consumption

ii) Brake thermal efficiency.

iii) Mechanical Efficiency.

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

(OR)

b) In an impulse turbine, the steam enters the wheel through a nozzle with a velocity of 500 m/s and an angle of 20° to the direction of motion of blade. The blade speed is 200 m/s and the exit angle of the moving blade is 25°. Find the inlet angle of moving blade, exit velocity of steam and its direction and work done per kg of steam. (16)

14. a) Derive the expression for volumetric efficiency for a reciprocating air compressor. (16)

(OR)

b) A single stage, single acting reciprocating air compressor has a bore of 200 mm and a stroke of 300 mm. It receives air at 1 bar and 20° C and delivers it at 5.5 bar. If the compression follows the law $pv^{1.3} = C$ and clearance volume is 5 percent of the stroke volume, determine (16)

i) mean effective pressure

ii) the power required to drive the compressor, if it runs at 500 rpm.

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

(OR)

b) Following data refers to an air conditioning system to be designed for an industrial process for hot and wet climate; i) outside conditions = 30°C DBT and 75% RH ii)Required inside conditions = 20°C DBT and 60% RH. The required condition is to be achieved first by cooling and dehumidifying and then by heating. If 20 m^3 of air is absorbed by the plant every minute, find i) Capacity of the cooling coil in tonne of refrigeration ii) Capacity of the coil in kW and iii) amount of water removed per hour. (16)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

STRUCTURAL ENGINEERING

22STE44 – Substructure Design

(Use of IS 2974, 456, 4091, 6043 are permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the requirement of good foundation?
2. Differentiate Shallow and Deep foundation.
3. In which circumstance do you use Raft foundation?
4. What is floating foundation?
5. Define Pile Cap.
6. What type of foundation do you prefer for black cotton soil?
7. Explain machine foundation.
8. List the different types of well foundation.
9. Differential one way shear and two way shear in foundation.
10. Give any two practical examples of ground anchors.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail, the factors affecting bearing capacity of foundation. (10)

ii) Explain the objectives of soil exploration. (6)

(OR)

b) i) Explain in detail, the types of foundations. (10)

ii) Discuss the modes of failure in soils for shallow foundation. (6)

12. a) Design a trapezoidal footing of beam and slab type for two columns 3 m centre to centre. One column is 400 x 400 mm caries 800 kN and another is 350 x 350 mm carrying 600 kN load. The footing can extend by 200 mm beyond both the columns. The allowable bearing pressure for the soil is 160 kN/m^2. (No structural design) (16)

(OR)

b) A rectangular column 450 mm X 600 mm transfers a vertical load of 1000 kN, without any moment. The allowable soil pressure is 120 kN/m^2. Design a rectangular footing to support the column. (16)

13. a) i) Explain the classification of pile foundation. (10)

ii) Write a note on (1) Settlement of piles and (2) Uplift capacity of piles. (6)

(OR)

b) i) Explain steps involved in analysis of laterally loaded pile. (10)

ii) Write a short note on any four of following (6)

1) Negative Skin friction
2) Efficiency of pile group
3) Pile load test

14. a) i) Explain about the design procedure of well foundation and lateral stability in well foundation. (12)

ii) What are the forces acting on tower foundation? (4)

(OR)

b) i) Explain the general criteria for the design of machine foundation. (12)

ii) Write a note on sinking of well. (4)

15. a) i) How is safety of tower foundation is checked against (12)
1) Uplift and
2) Overturning

ii) What are the precautionary steps to be carried out in foundation excavation? (4)

(OR)

b) i) Explain about the design procedure of ground anchors. (12)

ii) What are the forces acting on tower foundation? (4)

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M.E./Ph.D. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING/MECHANICAL ENGINEERING

22THC23 – Instrumentation for Thermal Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define zero drift.
2. What factors influence the time constant in first order systems?
3. How sensor errors reduced?
4. List out the advantages of virtual instruments.
5. State the principle of McLeod gauge.
6. Define Strouhal Number.
7. Upon what does the sensitivity of the schlieren depend?
8. Draw the general block diagram of telemetry system.
9. Give the different types of electrodes used for PH measurement.
10. What is meant by smoke meter?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw the block diagram showing the basic functional elements of an instrument and explain the functions of each. (8)

ii) Briefly explain the five static characteristics of measuring instruments. (8)

(OR)

b) i) Describe in detail the different types of dynamic errors in a measurement system. (8)

ii) Define limiting errors. Derive the expression for relative limiting errors. (8)

12. a) i) Describe the construction and working principle of magnetic sensors. (8)

ii) Discuss the Data acquisition system architecture in detail. (8)

(OR)

b) i) Explain the elements of microcomputer interfacing in detail with a suitable example. (8)

ii) With a suitable example sort the functions performed by intelligent instruments. (8)

13. a) Explain in detail the pressure measurement device Knudsen gage and the ionization gage with a suitable diagram and also discuss the merits and demerits of the above gages. (16)

(OR)

b) i) Describe the resistance characteristics of thermistors. (8)

ii) How are the sensors used in physical variables? Give some suitable examples. (8)

14. a) With a neat sketch explain the shadowgraph and Schlieren techniques in detail. List out its advantages and disadvantages. (16)

(OR)

b) i) Describe the construction and working principle of Hot wire anemometer. (8)

ii) Explain in detail about Pneumatic telemetry system. (8)

15. a) i) Briefly explain the optical gas analyzer with a neat sketch. (8)

ii) Give some measurement techniques to measure the smoke with examples. (8)

(OR)

b) Discuss the types of gas chromatography in detail with a neat sketch. (16)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

WELDING TECHNOLOGY

22WTE31 – Testing and Inspection of Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Name any two specific standards for conducting mechanical testing on metallic materials.
2. What is the effect of strain rate on flow curve of metals?
3. What is the relationship of P/D^2 on hardness of metals?
4. Compare the difference between Izod and Charpy impact tests.
5. Write the principle of magnetic particle inspection test.
6. Give any two applications of acoustic emission test.
7. Compare the properties of X-rays with gamma rays.
8. List the advantages of industrial computed tomography (ICT).
9. State the important characteristics of ultrasonic waves.
10. Expand the terms "WPS, PQR and WPQ".

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the principle and procedures of tensile tests and bend tests. (8)

ii) Give a detailed account on important properties measured by tensile tests with formula and graph. (8)

(OR)

b) i) Explain briefly the relationship between engineering stress-strain and true stress-strain. (8)

ii) Discuss the metallurgical features of plastic instability in metallic material under tension test. (8)

12. a) Discuss the Vicker's hardness test and Brinell hardness tests. (16)

(OR)

b) Explain the procedures and preparation of samples for Charpy impact test and highlight the factors affecting the impact energy of metallic materials. (16)

13. a) Discuss the principle and procedures of fluorescent wet magnetic particles testing with a neat diagram. (16)

(OR)

b) Explain the different types of coil arrangements used in eddy current test. Discuss the significance of different display types of impedance data in eddy current testing. (16)

14. a) Explain the principle and procedures of X-ray radiography test with sketch. (16)

(OR)

b) Draw a typical x-ray radiography exposure chart of steels and explain its usage in getting correct x-ray and process parameters to have good quality radiographs. (16)

15. a) Explain the principle of pulse echo technique in ultrasonic Testing (UT). Enumerate the advantages and limitations of UT. (16)

(OR)

b) Discuss the importance of IIW reference blocks with a schematic diagram. (16)

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B.E. Degree Examinations – April/May 2023

I Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE102 - Mechanics of Fluids

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down the unit and dimensions of Pressure.
2. Define Specific weight.
3. Define Streamline.
4. What are the characteristics of non-uniform flow?
5. Write down Hagen-Poiseuille equation.
6. What are the uses of Moody`s diagram?
7. What is the diameter of equivalent pipe?
8. Define Boundary layer.
9. State Buckingham's π theorem.
10. Define Weber Number.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Define: (8)
    1) Density
    2) Specific Weight
    3) Compressibility
    4) Relative Density

    ii) The space between two square flat parallel plates is filled with oil. Each side of the plate is 600 mm. The thickness of oil film is 12.5 mm. The upper plate which moves at 2.5 m/s requires a force of 100 N to maintain the speed. The specific gravity of oil is 0.96. Determine the dynamic viscosity and kinematic viscosity of oil. (8)

(OR)

b) i) How do you determine the pressure in a pipe using Manometer? Explain. (8)

ii) A 15 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.10 cm. Both cylinders are 25 cm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. If a torque of 12.0 Nm is required to rotate the inner cylinder at 100 rpm determine the viscosity of the fluid. (8)

12. a) i) What are the types of equilibrium of Floating Bodies? Explain. (8)

ii) Derive Continuity equation for three dimensional flow. (8)

(OR)

b) i) What are the types of flow through Pipes? Explain. (8)

ii) The stream function for a two dimensional flow is given by $\psi = 2xy$. Determine the velocity at a point A (2,3). Also determine the velocity potential function Ø. (8)

13. a) i) Derive Euler's equation of motion. (8)

ii) The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 lit/sec. Section 1 is 6m above datum. If the pressure at section 2 is 3 m above the datum and the pressure at section 1 is 39 N/cm^2, determine the intensity of pressure at section 2. (8)

(OR)

b) i) How do you determine rate of flow using Orifice meter? Explain. (8)

ii) Derive Hagen-Poiseuille equation. (8)

14. a) i) How do your prevent separation of boundary layer? Explain. (8)

ii) Two tanks are connected with the help of two pipes in series. The length of the pipes are 700 m and 500 m whereas the diameters are 200 mm and 100 mm respectively. The coefficient of friction for both the pipes is 0.006. The difference of water level in the two tanks is 15 m. Determine the rate of flow of water through the pipes, considering all the losses. (8)

(OR)

b) i) Derive the expressions for displacement thicknes and energy thickness. (8)

ii) The rate of flow through a horizontal pipe is 0.25 m^3/s. The diameter of the Pipe which is 200mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 12 N/cm^2. Determine (8)

i) Loss of head due to sudden enlargement

ii) Pressure intensity in large pipe

iii) Power lost due to enlargement

15. a) i) How do you determine Dimensional homogeneity of equation? Explain. (8)

ii) The resistance 'R' experienced by a partially submerged body depends upon its velocity 'v', length of the body 'l', viscosity of the fluid 'μ', density of the fluid 'ρ' and acceleration due to gravity 'g'. Derive a dimensionless expression for R using Buckingham`s π - Theorem. (8)

(OR)

b) i) What are the various Non-dimensional numbers? Explain. (8)

ii) What are the advantages of Model study? Explain. (8)

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B.E. Degree Examinations – April/May 2023

I Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCE103 – Concrete Technology

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Recall the term grade of cement.
2. Define chemical admixture.
3. Define workability.
4. List out the factors affecting the results of strength test.
5. Interpret the term designed mixes in mix design concept.
6. List the factors affecting the choice of mix proportions.
7. List the general uses of Shotcrete.
8. Write the uses of fibre reinforced concrete.
9. Define frequency of sampling in quality control.
10. Recall the characteristic strength of concrete in concrete structures.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Recognize in detail about test for determination of Aggregate crushing value. (8)

ii) Describe in detail about test for determination of Aggregate impact value. (8)

(OR)

b) Describe in detail about the importance of the quality of water used for concreting. (16)

12. a) Explain the test for workability in brief with relevant sketch. (16)

(OR)

b) Explain in detail about the determination of Compressive and Flexural strength of concrete. (16)

13. a) Explain the concept of mix design and mention the method of proportioning? (16)

(OR)

b) Discuss the design procedure of ACI method of mix design. (16)

14. a) Describe the various methods of corrosion protection. (16)

(OR)

b) Compare the advantages of using ready mixed concrete instead of site mixed concrete. (16)

15. a) Appraise the statistical analysis of test results done to control the quality at site. (16)

(OR)

b) Discuss the acceptance and rejection criteria of concrete in quality control. (16)

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B.E. Degree Examinations – April/May 2023

I Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE102 – DC Machines and Transformers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the relation between energy and co-energy for the linear system?
2. Define field energy.
3. A 4 pole, lap wound DC generator has 960 conductors, a flux of 40 mWb per pole and is driven at 500 rpm. Find the emf developed.
4. What is the influence of armature reaction in DC generator operation?
5. Write the armature torque expression for DC shunt motor.
6. Mention the applications of DC series motors.
7. Sketch the no load equivalent circuit of transformer.
8. List the advantages and application of auto transformer.
9. What is the load current of DC generator corresponding to maximum efficiency?
10. What is the condition for attaining maximum commercial efficiency in transformer?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the expressions for field energy and co-energy in an attracted armature relay. (16)

(OR)

b) Demonstrate the operation of magnetic circuits in AC supply system. (16)

12. a) i) Explain in detail the constructional features of DC machine. (10)

ii) Draw the internal and external characteristics of DC shunt generator. (6)

(OR)

b) i) Explain the parallel operation of DC shunt generators. (8)

ii) With suitable illustration, explain the external characteristics of differentially and cumulatively compounded DC generator. (8)

13. a) i) Derive the following expressions for DC motor: (8)

1) Back emf, and

2) Developed torque.

ii) With suitable equations, explain the speed- torque characteristics of DC shunt motor. (8)

(OR)

b) i) With neat diagram, explain the operation of three-point starter for DC shunt motor. (8)

ii) With suitable equations, explain field current control scheme for speed control of DC shunt motor. (8)

14. a) i) Elaborate the principle of operation of transformer. (8)

ii) Detail the performance of transformer on load condition. (8)

(OR)

b) i) Write in detail about how the energy is transformed from HV side to LV side in an autotransformer? (8)

ii) Elaborate the development of equivalent circuit of transformer referred to primary. (8)

15. a) i) With neat diagrams, explain the experimental procedure of Swinburne's test. (12)

ii) List the advantages and disadvantages of Swinburne's test. (4)

(OR)

b) i) Detail the computational procedure for predetermining efficiency of DC motor by Hopkinson's test. (12)

ii) List the merits and demerits of Hopkinson's test. (4)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME602 – Finite Element Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is a structural and non-structural problem?
2. What is Aspect ratio?
3. State the principle of minimum potential energy.
4. State the properties of stiffness matrix.
5. How do you define two dimensional elements?
6. Write down the expression for the shape functions for a constant strain triangular (CST) element.
7. What are the ways in which a three dimensional problem can be reduced to a two dimensional approach?
8. Write down Gaussian quadrature for numerical integration.
9. Write down the governing equation for two-dimensional heat conduction.
10. Write down the expression for stiffness matrix in two-dimensional heat conduction and convection.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The following differential equation is available for a physical phenomenon: (16)

$d^2y/dx^2 - 10x^2 = 5$, $0 \le x \le 1$

Boundary conditions are, $y(0) = 0$, $y(1) = 0$.

By using Galerkin's method of weighted residuals to find an approximate solution of the above differential equation and also compare with exact solution.

(OR)

b) (16)

$$2x_1 + 4x_2 + 2x_3 = 15;$$
$$2x_1 + x_2 + 2x_3 = -5;$$
$$4x_1 + x_2 - 2x_3 = 0;$$

Solve the above equations using Gauss-Elimination method.

12. a) A fixed beam of length 2L m carries a uniformly distributed load of w (N/m) which run over a length of L m from the fixed end, as shown in figure.1. Calculate the rotation at point B. (16)

Figure.1.

(OR)

b) Consider a three bar truss as shown in figure.2. Take E= 2 x 10^5 N/mm^2. Calculate the stiffness matrix. Take A_1 = 2000 mm^2, A_2 = 2500 mm^2, A_3 = 2500 mm^2. (16)

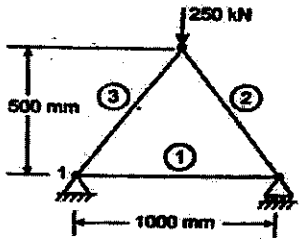

Figure.2.

13. a) Calculate the stiffness matrix for the elements shown in figure.3. The coordinates are given in units of millimeters. Assume plane stress conditions. Take Young's modulus = 2.1 x 10^5 N/mm^2; poison ratio = 0.25; thickness = 10 mm. (16)

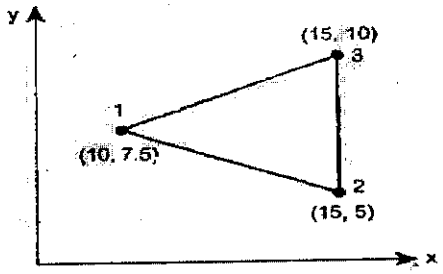

Figure.3.

(OR)

b) Derive the shape function equation of axisymmetric triangular element. (16)

14. a) Evaluate [J] at ε = η = 1/2 for the linear quadrilateral element shown in figure.4 (16)

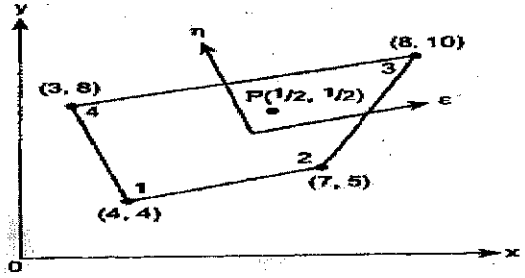

Figure.4.

(OR)

b) Evaluate the integral $I = \int_{-1}^{1}(x^2 + \cos(\frac{x}{2}))dx$ by using three point Gaussian quadrature and compare with exact solution. (16)

15. a) A metallic fin, with thermal conductivity k = 360 W/m°C, 0.1 cm thick and 10 cm long, extends from a plane wall whose temperature is 235°C. Determine the temperature distribution and amount of heat transferred from the fin to the air at 20 °C with h = 9 W/m²°C. Take width of the fin to be 1 m. (16)

(OR)

b) For the element shown in figure.5, determine the K and F matrices. The conductivities are $K_x = K_y = 15$ W/m°C and the convection coefficient is h = 20 W/m²°C. Convection occurs across the i-j surface. The free-stream temperature is $T_\infty = 70$°C. The coordinates are expressed in units of m. Let the line source be $Q^* = 150$ W/m as located in the figure. Assume the thickness of the element is 1 m. (16)

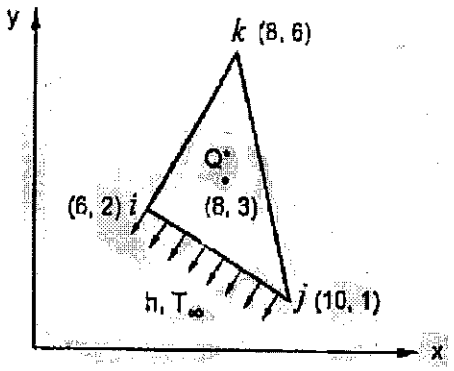

Figure.5.

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M.E./Ph.D. Degree Examinations – April/May 2023

II Semester (Full Time)

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STRUCTURAL ENGINEERING/ CIVIL ENGINEERING

22STE36 – Design of Steel Concrete Composite Structures

(Use of relevant Codes are permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the essential difference between RCC and steel concrete composite structures.
2. Write the applications of steel concrete steel sandwich construction.
3. Write the effective breadth of the composite beam is considered.
4. State the suitability of composite trusses.
5. List the functions of connectors.
6. State the purpose of shear connectors.
7. Write the design concepts in box girder bridges.
8. State the behaviour of composite bridge.
9. Write two economic benefits of steel composite structures.
10. List the types of load combination to be considered while design a composite structure under seismic consideration.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Investigate the behaviour of composite sections. (8)

    ii) Describe the various construction issues of composite sections. (8)

    (OR)

    b) i) Explain with neat sketches the various types of steel concrete composite members. (8)

    ii) Discuss the proportioning of composite members. (8)

12. a) Estimate a composite section without shores, for use as an interior floor beam. Span of the beam =8.5 m, Spacing of beam = 2.5 m, Thickness of slab = 100 mm, Dead load = 2.5kN/m^2, Live load = 7.5 kN/m^2, Concrete strength = 20 MPa, Modular ratio = 9. (16)

(OR)

b) i) The composite column of size 400 X 400 X 400 mm under the design axial load of 1500 KN and bending moment about XX axis is of 200 kNm with steel section ISMB 250 is at the center. Steel reinforcement is 4 No's of 12 mm diameter bars. Check the adequacy of the Section for uniaxial bending. Adopt M30 and Fe 415 steel. (16)

13. a) i) Discuss the load carrying mechanisms of shear connectors. (8)

ii) Explain about the various types of shear connections along with the neat sketch. (8)

(OR)

b) i) Outline the step by step design procedure of connection in composite trusses. (8)

ii) An ISMB 250 is supporting a slab of thickness 120 mm. the steel beam of 5.5 m span are spaced at 4 m interval. The slab is subjected to a super imposed load of $2kN/m^2$. Design the suitable connectors between steel beam and RC Slab to ensure full interaction. (8)

14. a) i) Discuss the advantages of box Girder Bridge. (8)

ii) Elaborate the bending, torsion, and distortion behavior of box girder bridges. (8)

(OR)

b) i) Detail the specification with regard to the design of composite bridges. (8)

ii) Compare the various forms of composite box girder bridges with neat sketches. (8)

15. a) i) Discuss a case study on steel concrete composite construction in buildings. (8)

ii) Discuss the common construction methods in composite design in respect of buildings. (8)

(OR)

b) i) Write notes on seismic behavior of Composite connections. (8)

ii) Explain the factors to be considered while the designing the composite structure under seismic load. (8)

Register No :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

WELDING TECHNOLOGY

22WTC21- WELDING PROCESSES - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is hybrid welding process?
2. What are the laser sources for Laser beam welding?
3. What is Electrogas welding?
4. What is Upset welding?
5. List the advantages of solid state welding processes over fusion welding processes.
6. Compare high temperature and low temperature solid state welding processes.
7. What is friction surfacing?
8. List the welding variables in Friction Welding.
9. What is Thermit Welding?
10. Mention the types of adhesive bonded joints.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With neat sketches, explain the principle of operation, advantages, disadvantages and applications of Electron Beam Welding [EBW]. (16)

(OR)

b) With neat sketches, explain the principle of operation, advantages, disadvantages and applications of Laser Beam Welding [LBW]. (16)

12. a) Discuss the principle of operation, wire and consumable guide techniques and variants of Electro Slag Welding [ESW]. (16)

(OR)

b) Describe the following welding processes (16)

1) Spot Resistance Welding
2) Seam Welding
3) Projection Welding
4) High Frequency Welding

13. a) Discuss the principle of operation and applications of Cold Pressure Welding and Explosive Welding Processes. (16)

(OR)

b) With neat sketches, explain the Diffusion Welding and Ultrasonic Welding processes. (16)

14. a) Explain the principle of operation and applications of Friction Welding Process with neat sketches. (16)

(OR)

b) Discuss the principle of operation, tool rotation, transverse speeds and tool design of Friction Stir Welding. (16)

15. a) Explain the various types of Brazing processes. (16)

(OR)

b) Discuss about the Oxy-fuel and Plasma arc cutting methods. (16)

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Ph.D. Degree Examinations – April/May 2023

(2022 Regulations)

MECHANICAL ENGINEERING

22CDE54 – Failure Analysis

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the classifications of failure?
2. Write the characteristic of brittle fracture?
3. Define: elevated temperature fatigue.
4. What is metallurgical instability?
5. Write the types of wear.
6. What are the various types of stress corrosion cracking?
7. What are the effects of improper heat treatment?
8. What is stress concentration?
9. Define: reliability.
10. What is mean time between failure analysis?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in detail of classification of fracture and identification of fracture. (16)

(OR)

b) Describe in detail of mechanism of fracture and characteristics of fracture. (16)

12. a) i) Explain the fracture characteristics revealed using microscope. (8)

ii) Analyze the factors affecting fatigue life. (8)

(OR)

b) Write the short notes on the following. (16)
1) Stress ruptures 2) Environmental induced failure.

13. a) Describe in detail of corrosion failure and influencing factors of corrosion failure. (16)

(OR)

b) Explain in details of source, characteristics and procedure for analyzing stress corrosion cracking. (16)

14. a) Analyze the causes of failure of iron and steel castings. (16)

(OR)

b) Describe in detail procedure to find out the failure of weldments. (16)

15. a) i) Explain the concepts of reliability. (8)

ii) Write the importance of condition monitoring of reliability. (8)

(OR)

b) Write the short notes on the following. (16)

1) Weibull distribution

2) Bathtub curve

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDC22 – Mechanical Vibrations and Acoustics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is forced vibration?
2. How do you connect several springs to increase the overall stiffness?
3. How are arbitrary constants for a second-order differential equation determined?
4. What is the basic principle used in Holzer's method?
5. Differentiate transient and steady-state responses.
6. What is the difference between deterministic and random vibration?
7. Why does the amplitude of free vibration gradually diminish in practical systems?
8. Give two examples each of the bad and good effects of vibration.
9. How is acoustic impedance calculated?
10. What is the relationship between acoustic impedance and speed of sound?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the dynamic and static coupling with suitable example. (16)

(OR)

b) An unknown mass m kg attached to the end of an unkown spring k has a natural frequency of 94 cpm (cycle per minute). When a 0.453 kg mass is added to m, the natural frequency is lowered to 76.7 cpm? Determine the unknown mass m and the spring constant k in N/m. (16)

12. a) Discuss the Rayleigh's method, to obtain fundamental natural frequency of vibration of a multi-degree of freedom system, with suitable example. (16)

(OR)

b) Using matrix method, determine the natural frequencies of the system shown in Figure.1 (16)

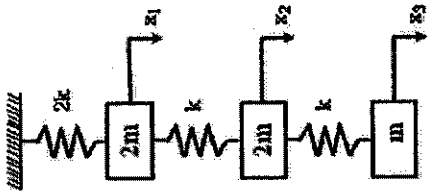

Figure.1.

13. a) A random signal has a spectral density that is constant S(t) = 0.004 cm^2 /cps between 20 and 1200 cps and that is zero outside this frequency range. Its mean value is 2.00 cm. Determine its i) mean square value ii) rms value iii) standard deviation. (16)

(OR)

b) A mass of 50 kg suspended from spring produces a static deflection of 0.017m and when in motion, it experience a viscous damping force with a value of 250 N at a velocity of 0.3 m/s. calculate the periodic time of damped vibration if the mass is then subjected to periodic disturbing force having a maximum value of 200 N and making 2 Cps. Find the amplitude of the ultimate force. (16)

14. a) Estimate fundamental frequency of the lateral vibration of shaft carrying three motors as shown in Figure with m_1=20 kg, m_2=50 kg, m_3=40 kg, l_1=1m, l_2=3 m, l_3=4m and l_4=2 m. The shaft is made of steel with solid circular cross section of 10 cm. (16)

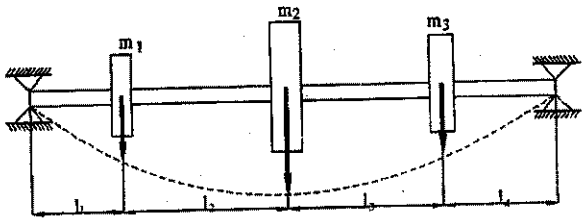

Figure.2.

(OR)

b) A 200 kg machine is attached to a spring of stiffness $4x10^5$ N/m. during operation the machine is subjected to a harmonic excitation of mass 500 kg and frequency 50 rad/s. Design an undamped vibration absorber such that the steady state amplitude of primary mass is zero and the steady state amplitude of the absorber mass is less than 2 mm. What are the natural frequencies of the system with absorber in place? (16)

15. a) Discuss design principles for noise reduction. (16)

(OR)

b) Explain the variation in the properties before and after the expansion wave. (16)

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Ph.D. Degree Examinations – April/May 2023

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18PESE1 – Pattern Recognition

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are discriminant functions?
2. State Bayes' Theorem.
3. Differentiate between supervised and unsupervised learning.
4. What do you mean by cluster validation?
5. Define parsing.
6. What are the elements of formal grammars?
7. Compare feature selections through functions approximation and binary feature selection.
8. Define Entropy.
9. Draw the structure of a biological neuron.
10. Mention the various defuzzification techniques.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Detail on parametric and maximum Liklihood estimations.	(16)
		(OR)	
	b)	Elaborate on LMSE algorithm.	(16)
12.	a)	Describe the Hierarchical clustering procedure in pattern recognition.	(16)
		(OR)	
	b)	Explain the graph theory approach to pattern clustering concept.	(16)
13.	a)	Illustrate on string generation as pattern description.	(16)
		(OR)	
	b)	Describe Stochastic grammar with its types.	(16)
14.	a)	Explain Kohenen self-organising feature maps.	(16)
		(OR)	
	b)	Describe in detail the Karhunen-Loeve transformation technique.	(16)

15. a) i) Write short notes on NN based pattern associators technique. (8)

ii) Self-organising networks technique. (8)

(OR)

b) i) Write short notes on Fuzzy based pattern classification. (8)

ii) Genetic algorithm-based pattern classification. (8)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE602 – Electrical Drives and Control

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the speed torque characteristics of dc series motor when field control applied.
2. Which type of choppers is suitable for two – quadrant operation of dc drives?
3. A 220V DC shunt motor runs at 1500 rpm, when the armature current is 10A.Calculate the speed if the torque is doubled. Ra=0.2Ω.
4. What are the effects of ripples in the performance of the dc motor when it is fed by chopper and how it can be reduced?
5. What are the various methods available for the speed control of induction motor in the rotor side?
6. Why current source inverter fed induction motor drive is not useful for multi motor drives?
7. List some advantages of stator voltage control method.
8. What is V/F ratio control? Give the advantages of it over frequency control with the necessary equations.
9. List the special features of rotor resistance speed control.
10. Differentiate Kramer and Scherbius drive.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the characteristics of various DC motor with neat plots. (8)

    ii) Draw the circuit diagram of a chopper feeding a series motor used in a hoisting and lowering application. (8)

(OR)

    b) i) Explain why tacho meter feedback is necessary when the speed control range required is above base speed. (8)

ii) A 220 V , 960 RPM , 90 A separately excited DC motor has an armature resistance of 0.06 Ω . Under rated condition the motor is driving a load whose torque is constant and independent of speed. Neglecting the losses, obtain the value of flux as percent of rated flux for the speed of 1200 RPM. What is the expected armature current? (8)

12. a) i) Draw and explain the full power circuit of a four quadrant chopper feeding a series motor, including the front end circuit with regeneration capability. (8)

ii) Derive the transfer function equation of a self excited DC motor. (8)

(OR)

b) i) Draw and explain with appropriate block diagram the typical inner loop DC motor torque control system. Explain why this is normally implemented by generating a current reference. (8)

ii) A 230 V, 1000 RPM, 30A separately excited DC motor has an armature resistance and inductance of 0.7 Ω and 50 mH respectively. The motor is controlled in regenerative braking by a chopper operating at 800 Hz with TRC control strategy. Assume continuous conduction. What will be the allowable maximum speed at which regeneration takes place, if the chopper has a maximum duty ratio of 0.9 and if the regenerating current is controlled in close loop at 150%? (8)

13. a) i) Stator voltage control is an inefficient method of induction motor speed control. Validate the reasons. (8)

ii) Compare the induction motor characteristics with that of the DC motor. (8)

(OR)

b) i) Derive the relation between slip and torque of induction motor and draw its characteristics (8)

ii) Starting from the approximate equivalent circuit, derive an expression for the torque developed in an induction motor. (8)

14. a) i) Sketch the block diagram representation of regenerative braking capacity of VSI IM drive. (8)

ii) Explain the procedure to develop switching table for direct torque control (8)

(OR)

b) i) With neat circuit diagram, explain the working of $\left(\frac{v}{f}\right)$ drive fed three phase induction motor. (8)

ii) A 25 kW, 2 pole, 3 phase induction motor is fed from a three phase voltage controller for speed control. The motor has a stator to rotor resistance ratio of 0.7. The speed control is required from 3000 to 1400 rpm. Determine derating of this motor when it drives (8)

1) Constant torque loads
2) Loads having $T \propto N$
3) Loads having $T \propto N^2$

Assuming the efficiency of the motor to be 84%.

15. a) i) Sketch the torque speed characteristics of induction motor. How does this characteristics change, when the rotor resistance is varied? (8)

ii) Describe the working of static Scherbius drive in sub and super synchronous mode of operation. Also validate the same with mathematical expressions. (8)

(OR)

b) i) Explain how the speed of slip ring induction motor is controlled by slip power recovery scheme. What are its advantages and disadvantages? Derive an expression between the slip and delay angle. (8)

ii) Explain how a chopper can be used to vary the resistance of the rotor of the induction motor? Describe the rotor resistance control with neat diagrams. (8)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING

22THC22 – Computational Fluid Dynamics for Thermal Systems

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Classify the types of heat transfer problems.
2. Distinguish between uniform and non-uniform grids.
3. Write the steady state one dimensional diffusion equation.
4. How stability of schemes can be estimated?
5. Distinguish between finite difference method and finite volume method.
6. Portray the advantages of using QUICK scheme.
7. List any two techniques used for discretizing incompressible flow equations.
8. List any four applications of PISO algorithm.
9. Differentiate laminar and turbulent flow based on Reynold's number.
10. Identify any two situations having high Reynolds number.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in detail about the discretization techniques used in finite difference methods. (16)

(OR)

b) Explain the application of grid independence test with a case study. (16)

12. a) Enumerate the steps involved in Nicholson's scheme for solving steady state diffusion problems. (16)

(OR)

b) What are explicit and implicit schemes? Depict its applications for heat transfer problems. (16)

13. a) Suggest an appropriate methodology to solve one dimensional diffusion problems. Explain with an example. (16)

(OR)

b) Explain in detail about power-law discretization technique with an example. (16)

14. a) With a neat flow chart, explain the steps involved in SIMPLE algorithm. (16)

(OR)

b) With a case study, explain the applications of SIMPLER algorithm for modelling a flow process. (16)

15. a) Explain K-ε models for modelling turbulence problems with examples. (16)

(OR)

b) Propose a model for analyzing turbulence in a pipe flow. (16)

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PTEE201 – Electromagnetic Theory

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Specify the unit vector extending from the origin toward the point P (2, -2, -1).
2. Determine the electric flux density at a distance of 20 cm due to an infinite sheet of uniform charge 20 $\mu C/m^2$ lying on the $z = 0$ plane.
3. Distinguish between Dielectric constant and Dielectric strength.
4. Give the mathematical expersion for Poisson's and Laplace's equations.
5. State Ampere's circuital law.
6. A coil has a self-inductance of 1 H and a resistance of 4 Ω. If it is connected to a 40 V DC supply, estimate the energy stored in the magnetic field when the current has attained the final steady value.
7. The flux through each turn of a 100-turn coil is $(t^3 - 2t)$ mWb where t is in seconds. Find the induced EMF at $t = 2$ seconds.
8. How does displacement current differ from conventional current?
9. What is 'Loss tangent'?
10. If a plane wave is incident normally from medium 1 to medium 2, write the expressions for reflection and transmission coefficients.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With neat sketches, explain how the differential elements in length, area, and volume are defined in cylindrical and spherical coordinate systems? (10)

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

(OR)

b) i) Determine the divergence and curl of the following vector fields: (10)

i) $\vec{P} = x^2 yz\,\vec{a}_x + xz\,\vec{a}_z$

ii) $\vec{Q} = \rho \sin\phi\,\vec{a}_\rho + \rho^2 z\,\vec{a}_\phi + z\cos\phi\,\vec{a}_z$

ii) State and explain coulomb's law and deduce the vector form of force equation between two point charges. (6)

12. a) i) Distinguish between electric potential and electric potential difference. (8)
Two point charges -4 μC and 5 μC are located at (2, -1, 3) and (0, 4, -2) respectively. Find the potential at (1, 0, 1) assuming zero potential at infinity.

ii) Determine the capacitance of a capacitor consisting of two parallel metal plates 30 cm × 30 cm surface area, separated by 5 mm in air. What is the total energy stored by the capacitor if the capacitor is charged to a potential difference of 500 V? What is the energy density? (8)

(OR)

b) i) Explain briefly the polarization in dielectrics. (8)

ii) At an interface separating dielectric 1 (ε_{r1}) and dielectric 2 (ε_{r2}), show that the tangential component of $\vec{E}$ is continuous across the boundary, whereas the normal component of $\vec{E}$ is discontinuous at the boundary. (8)

13. a) i) By means of Biot-Savart's law, derive an expression for the flux density produced by an infinitely long straight wire carrying a current 'I', at any point P distant 'a' normal to the wire. (10)

ii) If the vector potential is given by $\vec{A} = \vec{i}\,5(x^2 + y^2 + z^2)^{-1}$ Wb/m, find the magnetic flux density $\vec{B}$. (6)

(OR)

b) i) Derive the expressions for torque and magnetic moment in a rectangular loop which is carrying a current of 'I' A and is situated in a uniform magnetic field 'B' Wb/m^2. (10)

ii) For an infinite current sheet of uniform current density 'K' A/m, derive the expression for the magnetic field intensity. (6)

14. a) i) An iron ring with a cross sectional area of 3 cm^2 and a mean circumference of 15 cm is wound with 250 turns of wire carrying a current of 0.3 A. The relative permeability of the ring is 1500. Calculate the flux established in the ring. (4)

ii) State and derive the time-harmonic Maxwell's equations in integral form. (12)

(OR)

b) i) A straight conductor of length 40 cm moves perpendicularly to its axis at a velocity of 50 m/s in a uniform magnetic field of flux density 1.3 Tesla. Find the EMF induced in the conductor if the direction of motion of conductor is i) normal to the field, and ii) at an angle 45° to the orientation of the field. (4)

ii) By means of a simple RLC series circuit, explain the relationship between the field theory and circuit theory. (12)

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

(OR)

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

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Ph.D. Degree Examinations – April/May 2023

(2022 Regulations)

MECHANICAL ENGINEERING

22CDE45 – Design of Material Handling Equipment

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the different types of hoisting systems?
2. Why use chain instead of rope?
3. How are lifting hooks sized?
4. What is brake pad and brake shoe?
5. What is surface and overhead equipment?
6. Define: cogwheel drive.
7. What is an industrial lift?
8. What are the dimensions of an elevator?
9. What is conveying system in material handling?
10. What are the types of conveying systems?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the factors affecting the selection of material handling equipment. (16)

(OR)

b) i) Discuss in details of hoisting elements and their applications. (8)

ii) Explain in details of the mechanism of the pulley system. (8)

12. a) i) Illustrate the design importance of different hooks. (8)

ii) Discuss in detail of crane grabs. (8)

(OR)

b) Design a simple band brake with a ratchet wheel for a hand operated winch. Actual braking torque, with account taken of the braking coefficient = 1500 Kg-cm. Diameter of the Brake drum = 30 cm. Width of the band = 50 mm. Unlined steel band $\mu = 0.15$, $\alpha=225°$. (16)

13. a) i) Explain in detail of hand operated and powered trucks. (8)

ii) Discuss in details of construction of winches. (8)

(OR)

b) i) Explain in detail of mono rail conveys. (8)

ii) Discuss the advantages of overhead cranes compared to cantilever cranes. (8)

14. a) i) Discuss in detail reciprocating motion conveyers. (8)

ii) Explain basic procedural requirements for design of a passenger lift. (8)

(OR)

b) Sketch and explain various methods of feeding and discharging bulk materials in different types of bucket elevators. (16)

15. a) Discuss in detail the main components and the function of a belt conveyer. (16)

(OR)

b) Where to use a screw conveyer and oscillating conveyers? Discuss in detail. (16)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES

22PEC22 – Modern Electrical Drives

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the mechanical characteristics of various types of DC motor
2. What are the quadrants of operation for a three phase converter controlled DC drive?
3. Give the principle of phase control in converter circuit.
4. What is the importance of freewheeling diodes in converter circuits?
5. State the stator torque production in Induction motor.
6. Draw the equivalent circuit of an Induction Motor.
7. What do you mean by vector control?
8. Distinguish between direct and indirect methods of field oriented control of induction machines.
9. Illustrate when a synchronous motor said to be self-controlled?
10. State the difference in performance between brush and brushless excitation in synchronous motor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain Ward Leonard speed control of DC motor.	(8)
		ii)	Describe the characteristics of mechanical systems.	(8)
			(OR)	
	b)	i)	Explain the multi-quadrant operation of DC drives.	(8)
		ii)	Explain the factors involved in the selection of motor rating for load.	(8)
12.	a)		Describe the operation of Single phase fully controlled rectifier control of DC separately excited motor and obtain the expression of motor speed for continuous and discontinuous modes of operations.	(16)
			(OR)	
	b)		Explain the operation of three phase dual converter fed DC drives.	(16)

13. a) Explain with graph variable voltage, constant frequency, and variable frequency operation of induction motor. (16)

(OR)

b) Explain the different methods of braking in Induction motor. (16)

14. a) Explain the direct control strategy of field oriented control in induction motor detail. (16)

(OR)

b) i) Drive the torque expression for Induction motor with stator and rotor fluxes. (8)

ii) Write short notes on flux vector estimation in induction machines. (8)

15. a) Derive the performance equations of operation of Synchronous motor from a voltage source. (16)

(OR)

b) With neat diagrams, explain the self control load commutated synchronous motor drives. (16)

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMMUNICATION SYSTEMS

22COC22 – Advanced Digital Signal Processing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the necessary and sufficient conditions for a random process to be ergodic in mean?
2. The autocorrelation of a zero mean white noise process is $r_v(k)=\sigma_v^2\ \delta(k)$. Find its power spectrum.
3. What is the basic principle of periodogram method of power spectrum estimation?
4. State the properties of modified periodogram.
5. How causal IIR wiener filter can be used as noise cancellation?
6. Distinguish between forward and backward prediction error.
7. State the need of adaptive filters.
8. Why LMS algorithm is normally preferred over RLS?
9. When can a digital system be called as multirate system?
10. What is the effect on power spectrum due to up sampling and down sampling?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) State the conditions for a random process to be a Wide Sense Stationary (WSS). State and explain the properties of autocorrelation of a WSS process. (8)

ii) Derive the Yule-Walker equation for AR, MA and ARMA process. (8)

(OR)

b) i) Explain the concept of spectral factorization in detail. (8)

ii) A LTI filter having system function $H(Z) = \frac{1}{1-0.25z^{-1}}$. Find the power spectrum and autocorrelation of x(n). Where x(n) is output of a LTI filter, which is obtained by passing unity variance white noise w(n) through the LTI filter. (8)

12. a) With necessary expression, briefly explain the Bartlett and Welch method of power spectrum estimation. Compare the performance measures of various nonparametric method of power spectrum estimation. (16)

(OR)

b) Describe model-based approach of power spectrum estimation. Define AR, MA and ARMA models. Illustrate AR model of spectrum estimation. Also discuss various methods to estimate all pole parameters in AR model with necessary equations. (16)

13. a) Explain the Kalman filter estimation approach in detail. Derive the expression for Kalman gain that minimizes mean square error. (16)

(OR)

b) Derive Wiener Hopf equations and the minimum mean square error for the FIR wiener filter. How causal IIR wiener filter can be used as noise cancellation? (16)

14. a) i) What do you understand by an adaptive filter? Discuss the minimum MSE criterion to develop an adaptive FIR filter. (10)

ii) Derive the first order adaptive filter equation and explain about the LMS adaptation algorithm. (6)

(OR)

b) i) Write brief note on Newton steepest Descent algorithm. (10)

ii) Draw and explain adaptive echo canceller in detail. (6)

15. a) i) Illustrate sampling rate conversion process from bandpass to low pass for decimation. (8)

ii) Explain the process of interpolation by an integer factor. (8)

(OR)

b) i) Describe about subband coding of speech signal. (8)

ii) Explain the concept of multirate signal processing with spectral interpretation of decimation of a signal from 6 KHz to 2 KHz and spectral interpretation of interpolation of a signal from 2 KHz to 6 KHz. (8)

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Ph.D. Degree Examinations – April/May 2023

(2022 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

22PEE36 – Modeling of Switched Mode Power Converters

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. At what duty cycle does the load ripple current become maximum?
2. What is the effect of load inductance on the load ripple current?
3. Compare forward and fly back converter.
4. Write the advantages and disadvantages of Push-pull converters.
5. Compare Half-bridge and Full-bridge converters.
6. Illustrate the half-bridge converter viewed as two back-to-back converter.
7. What is meant by area-product method?
8. What are the thermal considerations required in the design of inductor?
9. Compare P and PI controller.
10. How the selection of controller parameters is done?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Frame the Dc and small-signal ac circuit averaged model of the boost converters and explain how it is developed. (10)

ii) Write short notes on averaged switch model. (6)

(OR)

b) i) The buck regulator has an input voltage V_s = 15 V. The average output voltage V_o=6.5 V at I_a = 0.5 A. and the peak to peak output ripple voltage is 10 mV. The switching frequency is 20 kHz. The peak to peak ripple current of the inductor is limited to 0.25 A. Determine, (10)

i) The duty cycle

ii) The filter inductance

iii) The filter capacitance

iv) The critical values of L and C.

ii) Compare the regulator gains of Buck, Boost and Buck-Boost converter. And also list the limitations of Single stage Conversion. (6)

12. a) i) Discuss the two modes of operation of Fly back converter with a neat circuit diagram. Also picturize the steady state waveforms under a discontinuous mode operation. (12)

ii) Write short notes on the requirement for isolation in the switch-mode converters. (4)

(OR)

b) i) The average (or dc) output voltage of the push-pull circuit is V_o=24 V.at are resistive load of R = 0.8 Ohms. The On-state voltage drops of transistors and diodes are V_t =1.2 V and V_d = 0.7 V respectively. The turns ratio of the transformer is a= N_s/N_p = 0.25. Determine, (12)

i) Average input current Is

ii) The efficiency

iii) The average transistor current

iv) The peak transistor current

v) Rms transistor current

vi) Open-circuit transistor voltage. Neglect the losses in transformer and the ripple current of the load and input supply is negligible. Assume duty cycle k = 0.5.

ii) List out the causes for Magnetic saturation. (4)

13. a) Frame the power circuit of Half-bridge Converter and discuss the steady state waveforms under continuous mode operation. (16)

(OR)

b) Frame the power circuit of Full-bridge Converter and discuss the steady state waveforms under continuous mode operation. (16)

14. a) An ac-dc converter steps down the voltage through a transformer and supplies the load through a bridge rectifier. Design a 60 Hz power transformer of the specifications: primary voltage V_1 =120 V, 60 Hz (square wave), secondary voltage output V_o = 40 V and secondary output current I_o = 6.5 A. Assume transformer efficiency = 95% and window factor K = 0.4.Use E core. (16)

(OR)

b) Design a dc inductor of L = 450 μH. The dc current is I_l = 7.2 A with a ripple of Δf =1 A. Assume window factor K = 0.4.Use Power core with graded air gap. (16)

15. a) Design a PI controller for DC –DC buck converter and discuss how it maintains the output voltage feedback at a constant level according to the control signal both without load and with load conditions. (16)

(OR)

b) Design a PI controller for DC –DC boost converter and discuss how it maintains the output voltage feedback at a constant level according to the control signal both without load and with load conditions. (16)

Register No :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2022 Regulations)

MECHANICAL ENGINEERING

22PTME201 – Kinematics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State the Grashoff's law for 4-bar mechanism.
2. List the inversion of slider crank chain.
3. Define rubbing velocity.
4. How to find the number of instantaneous centre in a mechanism?
5. Write down the Freudenstein's Equation.
6. What is meant by number synthesis?
7. Why a roller follower is preferred to a knife edge follower?
8. How will you reduce the wear and side thrust in a cam and follower?
9. What is the significance of contact ratio in gears?
10. List out the applications of epicyclic gear train.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A crank rocker mechanism ABCD has the dimension AB= 30 mm, BC=90 mm, 75 mm and AD (Fixed link)=100 mm. Draw the mechanism and determine the maximum and minimum values of the transmission angle. Locate the two toggle positions. (8)

ii) Briefly explain various types of constrained motions. (8)

(OR)

b) i) The layout of a quick return mechanism of the oscillating link type for a special purpose machine is shown in figure.1below. The driving crank BC is 30 mm long and time ratio of the working stroke to the return stroke is to be 1.7. If the length of the working stroke of R is 120 mm, determine the dimensions of AC and AP. (8)

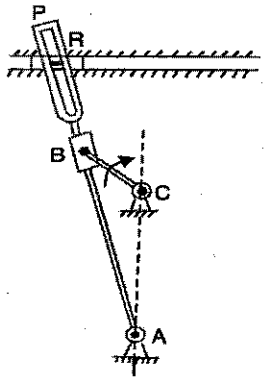


Figure.1.

ii) With the help of a neat sketch explain the working of oldham's coupling. (8)

12. a) In a mechanism as shown in Figure.2, the link AB rotates with a uniform angular velocity of 30 rad/s. The lengths of various links are : AB = 100 mm ; BC = 300 mm ; BD = 150 mm ; DE = 250 mm ; EF = 200 mm ; DG = 165 mm. Determine the velocity and acceleration of G for the given configuration. (16)

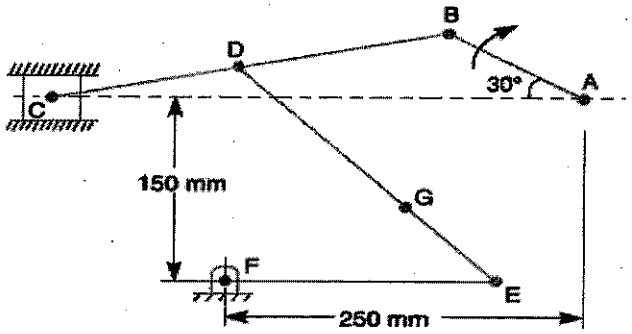


Figure.2.

(OR)

b) PQRS is a four-bar chain with a fixed link PS. The lengths of the links are : PQ = 62.5 mm, QR = 175 mm, RS = 112.5 mm and PS = 200 mm. The crank PQ rotates at 10 rad/s clockwise. Draw the velocity and acceleration diagram when angle QPS = 60° and find the angular velocity and angular acceleration of the links QR and RS. (16)

13. a) Synthesize a four bar mechanism to move the rod AB as shown in figure.3, through the positions 1, 2 and 3. The end points A and B are used as moving pivot points. (16)

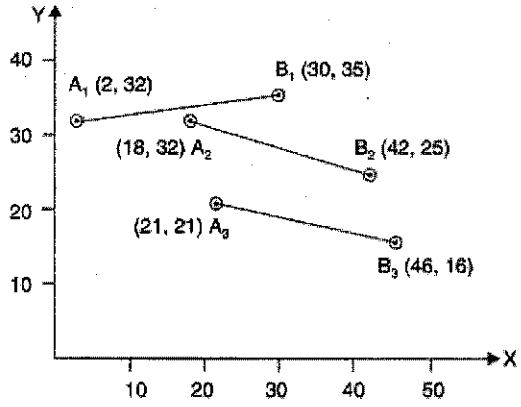


Figure.3.

(OR)

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

14. a) Draw the profile of the cam when the roller follower moves with cycloidal motion during out stroke and return stroke, as given below: (16)

1) Out stroke with maximum displacement of 31.4 mm during 180° of cam rotation,
2) Return stroke for the next 150° of cam rotation,
3) Dwell for the remaining 30° of cam rotation.

The minimum radius of the cam is 15 mm and the roller diameter of the follower is 10 mm. The axis of the roller follower is offset by 10 mm towards right from the axis of cam shaft.

(OR)

b) From the following data, draw the profile of a cam in which the follower moves with simple harmonic motion during ascent while it moves with uniformly accelerated motion during descent: Least radius of cam = 50 mm; Angle of ascent = 48°; Angle of dwell between ascent and descent = 42°; Angle of descent = 60°; Lift of follower = 40 mm; Diameter of roller = 30 mm; Distance between the line of action of follower and the axis of cam = 20 mm. If the cam rotates at 360 r.p.m. anticlockwise, find the maximum velocity and acceleration of the follower during descent. (16)

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

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

(OR)

b) An epicyclic gear train consists of a sun wheel S, a stationary internal gear E and three identical planet wheels P carried on a star- shaped planet carrier C. The size of different toothed wheels is such that the planet carrier C rotates at $1/5^{th}$ of the speed of the sun wheel S. The minimum number of teeth on any wheel is 16. The driving torque on the sun wheel is 100 N-m. Determine: (16)

1) Number of teeth on different wheels of the train, and
2) torque necessary to keep the internal gear stationary.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

I Semester (Full Time)

(2018 Regulations)

COMMON TO ALL BRANCHES

18MA101 – Matrices and Calculus

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. If 2, 3 are the eigen values of $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ a & 0 & 2 \end{bmatrix}$. Find the value of a.
2. State Cayley-Hamilton theorem.
3. Find the radius of curvature at (3,10) on the curve $xy = 30$.
4. What is the curvature of the circle $(x-1)^2 + (y+2)^2 = 16$ at any point on it?
5. Find $\frac{du}{dt}$ if $u = xy + yz + zx$, where $x = e^t, y = e^{-t}$ and $z = \frac{1}{t}$.
6. Compute the Jacobian of x, y with respect to r, θ if $x = r\cos\theta, y = r\sin\theta$.
7. Evaluate $\int_0^1 \int_1^2 x(x+y)dydx$.
8. Evaluate $\int_0^{\frac{\pi}{2}} \int_0^{\sin\theta} r\, drd\theta$.
9. If $\vec{F} = (x+3y)\vec{i} + (y-2z)\vec{j} + (x+cz)\vec{k}$ is solenoidal, then find the value of 'c'.
10. State Green's theorem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Obtain Eigen values and Eigen vectors of the matrix (8)

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}.$$

ii) Verify that A = $\begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$ satisfies its own characteristic equation and hence find A^4. (8)

(OR)

b) Reduce the Quadratic form $2x_1^2 + 5x_2^2 + 3x_3^2 + 4x_1x_2$ to Canonical form by an Orthogonal transformation. Also find the rank, index and signature of the Quadratic form. (16)

12. a) Find the equation of the Evolute of the parabola $y^2 = 4ax$. (16)

(OR)

b) Show that $\beta(m,n) = \frac{\Gamma m \Gamma n}{\Gamma(m+n)}$ and hence find the value of $\Gamma\frac{1}{2}$. (16)

13. a) i) If $u = f(x,y)$ where $x = r\cos\theta, y = r\sin\theta$. Prove that (8)
$$\left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial u}{\partial y}\right)^2 = \left(\frac{\partial u}{\partial r}\right)^2 + \frac{1}{r^2}\left(\frac{\partial u}{\partial \theta}\right)^2.$$

ii) If $y_1 = \frac{x_2x_3}{x_1}, y_2 = \frac{x_3x_1}{x_2}$ *and* $y_3 = \frac{x_1x_2}{x_3}$, then show that Jacobian of y_1, y_2, y_3 with respect to x_1, x_2, x_3 is 4. (8)

(OR)

b) i) Expand $e^x \log(1+y)$ in powers of x and y upto terms of third degree. (8)

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

14. a) Evaluate $\int_0^{4a}\int_{x^2/4a}^{2\sqrt{ax}} xy\,dydx$ by changing the order of integration. (16)

(OR)

b) i) Find the area enclosed between the curves $y^2 = 4ax$ *and* $x^2 = 4ay$. (8)

ii) Find the Volume of the sphere $x^2 + y^2 + z^2 = a^2$. (8)

15. a) Verify Stoke's theorem for $\vec{F} = (x^2+y^2)\vec{\imath} - 2xy\vec{\jmath}$, taken around the rectangle bounded by the lines $x = \pm a$, $y = 0$, $y = b$. (16)

(OR)

b) Verify the Gauss divergence theorem for $\vec{F} = (4xz)\vec{\imath} - y^2\vec{\jmath} + yz\vec{k}$ over the cube bounded by $x = 0$, $x = 1$, $y = 0$, $y = 1, z = 0, z = 1$. (16)

Register No :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2022 Regulations)

CIVIL ENGINEERING

22PTCY201 – Environmental Science and Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Outline the importance of forest resources for a country's economic growth.
2. List the equipment(s)/instrument(s) used in modern agriculture.
3. Define the term "Ecosytem".
4. Write short notes on endangered and endemic species.
5. How are the air pollutants classified?
6. Distinguish between BOD and COD.
7. Illustrate the formation of photo chemical smog.
8. Examine the 3R's adopted in solid waste management.
9. What do you mean by water conservation? Justify its significance.
10. Briefly discuss the role of individuals to eradicate HIV/AIDS from our society.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the causes, effects, and control measures of deforestation. (12)

    ii) Evaluate the use of fertilizers and pesticides in modern agriculture and their impact on environment. (4)

(OR)

    b) i) Demonstrate the environmental effects of extracting and using mineral resources. (12)

    ii) List the factors responsible for land degradation. (4)

12. a) i) Deduce the role of producers, consumers, and decomposers in an ecosystem. (8)

    ii) Explain the flow of energy through the various components of the ecosystem. (8)

(OR)

b) i) Identify the threats to biodiversity. (8)

ii) Explain the In-situ and Ex-situ conservation methods of biodiversity. (8)

13. a) i) Identify the major air pollutants and explain their effects on human beings. (8)

ii) Analyze the working of various equipment's used in air pollution control. (8)

(OR)

b) i) Demonstrate the wastewater treatment process. (8)

ii) Examine the effects and control measures of noise pollution. (8)

14. a) i) Illustrate the causes and effects of acid rain. Write about the control measures of acid rain. (8)

ii) Elucidate the correlation between greenhouse effect and global warming. Describe the preventive measures to reduce the global warming. (8)

(OR)

b) i) Explain the origin of earthquake. Discuss the effects and management of earthquake. (8)

ii) Describe the disposal methods employed in solid waste management. (8)

15. a) i) Inference the term "sustainable development". Construct the measures to attain sustainability. (12)

ii) Show the rainwater harvesting method(s) adopted in your college. (4)

(OR)

b) i) Inspect the mode of transmission of HIV/AIDS and evaluate the effectiveness of current control and preventive measures. (12)

ii) Discuss the various steps taken in our country to control the population growth. (4)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D. Degree Examinations – April/May 2023

(2022 Regulations)

MECHANICAL ENGINEERING

22THE61 – Environmental and Pollution Control

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by green house gases? Give examples.
2. Write down the chemical reaction of ozone depletion.
3. How can indoor air quality be controlled?
4. Define air pollution meteorology.
5. What are the major water pollutants?
6. Define waste water treatment.
7. What is hazardous solid waste? Give examples.
8. Write short notes on waste minimization.
9. How is noise pollution measured?
10. Write down the ways to control radiation pollution.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What is meant by ozone depletion potential? Explain the causes, effects and remedies of ozone depletion in detail. (16)

(OR)

b) What are the environmental legislations implemented in India to control global atmospheric changes? Explain in detail. (16)

12. a) What are the sources and effects of air pollution explain in detail? (16)

(OR)

b) Explain the control methods and equipment used for controlling air pollution. (16)

13. a) Elaborate the water treatment techniques which are used to reduce water pollution. (16)

(OR)

b) Explain in detail about utilization and disposal of sludge in detail. (16)

14. a) Classify the solid waste and explain the methods of collection, transportation and disposal of solid wastes in detail. (16)

(OR)

b) Explain the processing methods of solid waste, energy recovery and waste minimization in detail. (16)

15. a) What is radiation pollution? Explain its types, sources, effects and controlling methods in detail. (16)

(OR)

b) Explain the water pollution from tanneries and industries and their control in detail. (16)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2023

I Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES

22PEC12 – Analysis of Power Converters

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Highlight the function of free-wheeling diodes.
2. Write the effect of Source and load inductances in AC to DC Converters.
3. Distinguish between Isolated and Non-Isolated DC-DC converters.
4. How is core flux reset done in Forward converters?
5. Recall the performance parameters of a single phase inverter.
6. Differentiate between offline and online UPS.
7. Highlight the features of Space Vector Modulation technique.
8. State the applications of Multilevel inverters.
9. What are commutated inverters?
10. Compare CSI and VSI.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain with neat diagram and output waveforms, the operating modes of a single phase fully controlled converter with RL load. (10)

ii) Describe briefly Power factor improvement techniques. (6)

(OR)

b) i) Illustrate with neat diagram and output waveforms, the operation of a dual converter. (10)

ii) Write short notes on Reactive power and power balance in Converter circuits. (6)

12. a) i) Explain with neat diagram and necessary expressions, the operating modes of Boost converter. (8)

ii) Illustrate with neat diagram, the working of a Flyback converter. (8)

(OR)

b) i) Demonstrate with neat diagram, the operation of a Cuk converter. (8)

ii) Discuss with neat diagram and output waveforms, the working of a Push-pull converter. (8)

13. a) Explain with neat diagram and output waveforms, the principle of operation of a single phase full bridge inverter. (16)

(OR)

b) i) Discuss the different PWM techniques used in the Voltage control of single phase inverter. (10)

ii) Demonstrate with neat block diagram, the working of an online UPS. (6)

14. a) Explain with neat diagram, and input and output waveforms, the principle of working of a 180 degree conduction mode three-phase inverter. (16)

(OR)

b) Demonstrate with neat diagram, the working of a Cascaded H-Bridge multilevel inverter. (16)

15. a) i) Explain with neat diagram and waveforms, the operating modes of six- step thyristor inverter. (10)

ii) Write short notes on 'load commutated inverter'. (6)

(OR)

b) Demonstrate with neat diagram, the working of Auto-sequential current source inverter. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2023

I Semester (Full Time)

(2022 Regulations)

STRUCTURAL ENGINEERING

22STE21 – Analytical and Numerical Methods for Structural Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Derive Newton's algorithm for finding the p^{th} root of a number N.
2. Distinguish between direct method and indirect method of solving a system of equations AX = B.
3. Find the parabola of the form $y = ax^2 + bx + c$ passing through the points (0, 0), (1, 1) and (2, 20).
4. When will we use Newton's forward interpolation formula and when to use Newton's backward interpolation?
5. Write trapezoidal and Simpson's formula.
6. Evaluate $\int_0^1 e^{-x^2} dx$ by dividing the range of integration into four equal parts using Simpson's 1/3 rule.
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 finite difference for the following second order ordinary differential equation with $h = \frac{1}{4}, y'' = y + x, y(0) = y(1) = 0$.
10. Solve the difference equation $y_{x+2} - 4y_x = 0$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Using Newton-Raphon method, solve $x \log_x x = 12.34$ taking the initial value $x_0 = 10$. (8)

ii) Using Gauss-Elimination method, solve the system (8)

$3.15x - 1.96y + 3.85z = 12.95$

$2.13x + 5.12y - 2.89z = -8.61$

$5.92x + 3.05y + 2.15z = 6.88$

(OR)

b) i) Solve the system of equation by Gauss – Sedial method correct to 4 decimal places $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$. (8)

ii) Find the numerically largest eigenvalue of $A = \begin{pmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{pmatrix}$ by power method. (8)

12. a) i) Use Lagrange's formula to find a polynomial which takes the value f(0)=-12, f(1)=0,f(3)=6 and f(4)=12, hence find f(2). (8)

ii) Given the following table, find the number of students whose weight is between 60 and 70 lbs. (8)

Weight(in lbs) :	0-40	40-60	60-80	80-100	100-120
No. of students :	250	120	100	7	50

(OR)

b) i) Find $f(8)$ by Newton's divided difference formula for the data: (8)

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

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

13. a) i) Find $f'(3)$ *and* $f''(3)$ for the following data: (8)

x	3	3.2	3.4	3.6	3.8	4
$f(x)$	-14	-10.032	-5.296	-0.256	6.672	14

ii) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by i) Trapezoidal rule ii) Simpson's rule. And compare the result with its actual integration value. (8)

(OR)

b) Evaluate $I = \int_1^2 \int_1^2 \left(\frac{1}{x+y}\right) dxdy$ using Trapezoidal rule with $h = k = 0.25$. (16)

14. a) i) Using Taylor series method, find y at x = 0.1 given $\frac{dy}{dx} = 2y + 3e^x, y(0) = 0$. (8)

ii) Solve $\frac{dy}{dx} = \log_{10}(x + y)$, $y(0) = 2$ by Euler's modified method and find the values of y(0.2) and y(0.4) taking h = 0.2. (8)

(OR)

b) Given $y' = x^2 + y, y(0) = 1$, find y (0.1) by Taylor series method, y (0.2) by Modified Euler's method, y (0.3) Runge – Kutta method and y (0.4) by Milne's method. (16)

15. a) Solve: $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 8x^2y^2$ in the square mesh given $u = 0$ on the four boundaries dividing the square into 16 subsqures of length 1 unit. (16)

(OR)

b) i) Solve $4u_{xx} = u_{tt}$ subject to the conditions $u(0,t) = 0 = u(4,t)$, $u_t(x,0) = 0$ and $u(x,0) = x(4-x)$. Take $h = 1$ and obtain solution up to 5 time steps. (8)

ii) Using Crank-Nicolson method solve $u_{xx} = u_t$ subject to $u(x,0) = 0, u(0,t) = 0$ and $u(1,t) = t$, taking $h = \frac{1}{4}$ and $k = \frac{1}{8}$. Compute u for one time step only. (8)

Register No :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMPUTER AIDED DESIGN

22CDC21 – Finite Element Methods in Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by 'discretization'?
2. List out any four advantages of using FEA.
3. List out the properties of stiffness matrix.
4. What types of problems are treated as one-dimensional problems?
5. Define 'Plane stress' and 'Plane strain' with suitable example.
6. What are the differences between use of linear triangular element and bilinear rectangular element?
7. Where can we use mass matrix in damping problems?
8. Illustrate the phenomenon of damping.
9. Writedown the Finite Element equation for 2D heat Conduction in fins.
10. How will you find rate of heat transfer using temperature gradient?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A simply supported beam is subjected to uniformly distributed load over entire span. Interpret the bending moment and deflection at the mid span using Rayleigh-Ritz method and compare with exact solution. Use a two term trial function $y = a \sin(\pi x / l)$. (16)

(OR)

b) The following differential equation is available for a physical phenomenon. $d^2Y/dx^2 + 50 = 0$, $0<x<10$, The trial function is, $y = ax(10-x)$, The boundary conditions are $y(0)=0$ and $y(10)=0$. Compare the value of the parameter 'a' by (16)

i) Point collocation method

ii) Sub-domain collocation method

iii) Least squares method iv) Galerkin's method

12. a) Consider the bar shown in figure an axial load P=200x10³ N applied as shown in figure.1. Using the penalty approach for handling boundary condition do the following (16)

(i) Show the nodal displacement.

(ii) Define the stress in each element.

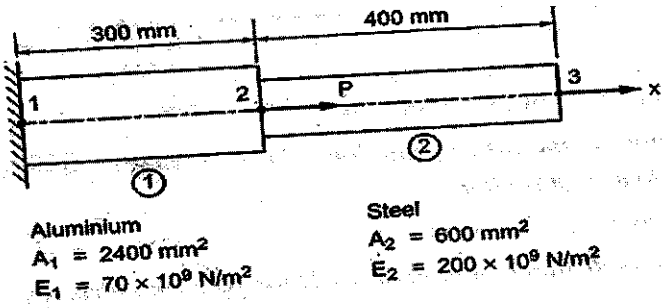


Figure.1.

(OR)

b) Consider a 4-bar truss as shown in figure.2. It is given that E = 200 GPa and A= 500 mm² for all the elements. Relate (16)

i) Nodal displacements

ii) Support reactions.

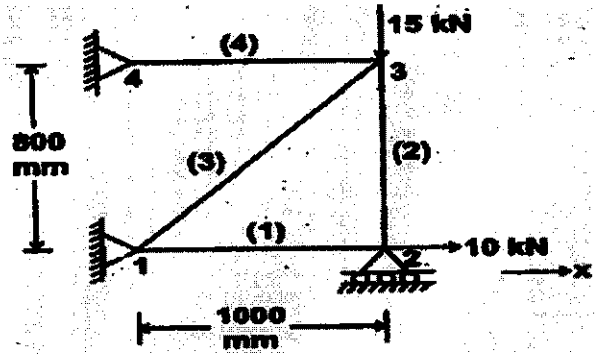


Figure.2.

13. a) Construct the element stiffness matrix and thermal force vector for the plane stress element shown in figure.3 The element experiences a rise of 10°C. (16)

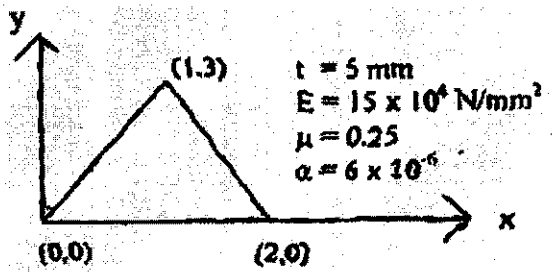


Figure.3.

(OR)

b) For a 4-noded rectangular element shown in figure.4. Identify the temperature at the point (7,4). The nodal values of the temperatures are T1= 42°C, T2= 54°C and T3= 56°C and T4= 46°C. Also determine the three points on the 50°C contour line. (16)

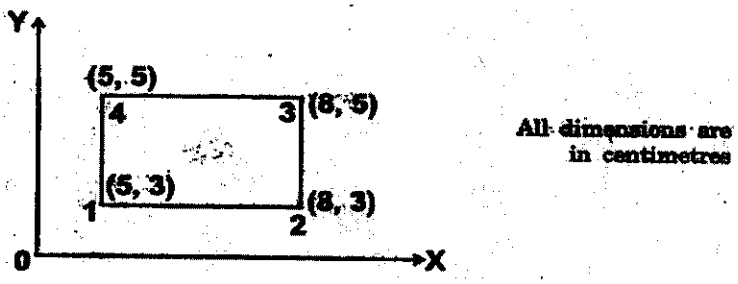


Figure.4.

14. a) Examine the natural frequencies of longitudinal vibration of the constrained stepped bar shown in figure.5. Also find the mode shapes. (16)

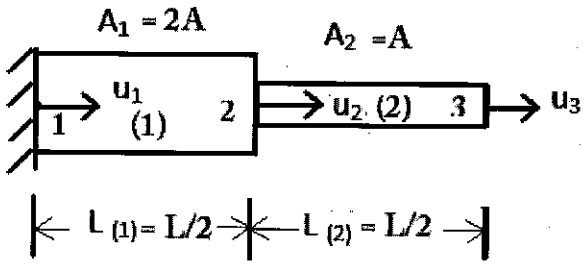


Figure.5.

(OR)

b) Categorize the eigen values and frequencies for the stepped bar shown in figure.6. (16)

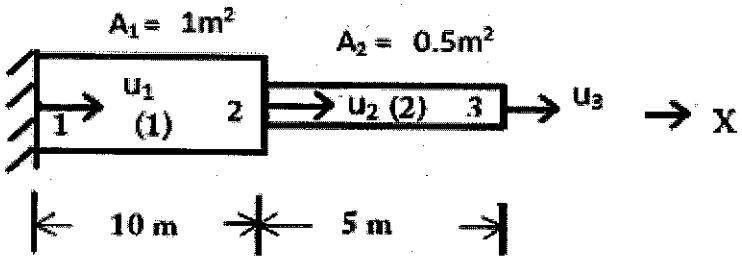


Figure.6.

15. a) A wall of 0.5 mm thickness having thermal conductivity of 6 W/mk. The wall is to be insulated with a material thickness 0.1m having an average thermal conductivity of 0.3 W/mk. The inner surface temperature is 1200° C and the outside of the insulation is exposed to atmospheric air at 30°C with heat transfer coefficient of 40 W/m²K as shown in figure.7. Inference the nodal temperatures. (16)

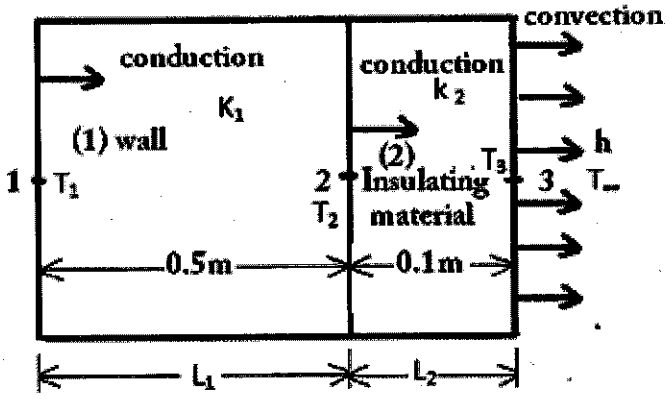
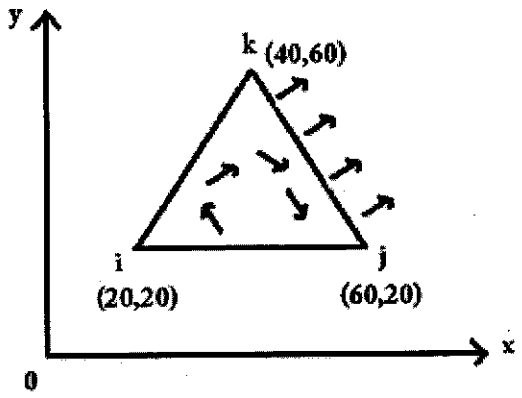


Figure.7.

(OR)

b) Analyze the element equations for the element shown in figure.8. Which experiences convection on the side j k and its upper face: Take k = 7.5W/mm°C, h = 0.15W/mm²°C, T∞= 20°C and t = 1 mm. (16)



(All dimensions are in mm)

Figure.8.

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Government College of Engineering :: Salem

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

COMMUNICATION SYSTEMS

22COC21 – RF and Microwave Circuit Design

(Smith chart to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Estimate the wavelength and phase velocity of a wave with 100 MHz frequency in free space?
2. Show the electrical equivalent circuit of high frequency capacitor.
3. Outline the condition for oscillation of a two port network.
4. Identify the parameters that govern the gain of Low noise amplifier?
5. Predict the disadvantages of self biased networks.
6. Define the term power gain related to RF amplifier.
7. Distinguish between class A and class C amplifier.
8. What is gain margin and phase margin of a feedback system?
9. Compare Butter worth and Chebyshev filters.
10. Explain the need for RF resonators.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A lossless transmission line (Z_0 =50 Ω) is 10 cm long (f =800 MHz), v_p =0.77C). If the input impedance is Z_{in} =j60 Ω, solve for Z_L using smith chart. Also solve for the length of short circuit termination needed to replace Z_L. (8)

ii) Show the characteristics of high frequency resistor and high frequency inductors. (8)

(OR)

b) i) Explain the equivalent circuit representation of transmission line and features of coaxial line and microstrip line. (8)

ii) The current flowing in a microstrip line (infinite and lossless) is $i(t) = 0.6\cos(9x10^9t-500z)$. Infer the values of phase velocity, frequency wavelength and phasor expression of the current. (8)

12. a) i) Examine the Low noise amplifier characteristics in heterodyne systems. (8)

ii) Explain the conversion loss and nonlinearities associated with a single ended mixer. (8)

(OR)

b) i) Show the operation of negative resistance oscillator. (8)

ii) A colpitt's oscillator is to be designed for 250 MHz. At the bias point V_{CE} =2.2 V and I_C = 1.8 mA, the following circuit parameters are given at room temperature of 25°C: C_{BC}=0.1fF, r_{BE} = 2.8 kΩ, r_{CE} =10 kΩ and C_{BE} = 76 fF. If the inductance is fixed at 45 nH, find the values for the capacitance in the feedback loop. Examine whether it is appropriate to use the h parameters obtained under DC conditions. (8)

13. a) i) Using analytical approach, develop a two component matching network that matches the Z_L =(100+j20)Ω load impedance to a given network Z_S =(10+j25)Ω source at a frequency of f_0 =960 MHz. (8)

ii) How active binary network for common emitter RF BJT is working? (8)

(OR)

b) i) An amplifier is characterized by the following S parameters. S_{11}= 0.78∠-65°,S_{21}=2.2∠78°, S_{12}=0.11∠-21° and S_{22}=0.9∠-29°. The input side of the amplifier is connected to a voltage source with V_S=4V∠0° and impedance of Z_S=65 Ω. The output is utilized to drive an antenna that has an impedance of Z_L =85 Ω. The S parameters are measures with reference to Z_0=75 Ω, characteristic impedance. Solve for the transducer gain, unilateral gain, operating power gain and power delivered to load. (8)

ii) With suitable show how single stub matching is done using smith chart. (8)

14. a) i) The open loop transfer function of a system is (4)

$$G(s) = \frac{10^5}{(0.1s+1)\quad(1+10^{-6}s)^2}$$

Evaluate the gain margin and phase margin of this system with unity feedback?

ii) Explain any three efficient boosting techniques used in power amplifier? (12)

(OR)

b) i) Design a class E power amplifier to provide 1W to 50 Ω load with 3.3 V DC supply? (4)

ii) Explain about ACPR metrics, Lag and lead compensating networks? (12)

15. a) i) Recall the working of transmission line resonators. (8)

ii) Analyse the filter circuit shown in figure.1 below in terms of loaded, unloaded and external quality factors? Also determine the power generated by the source. (8)

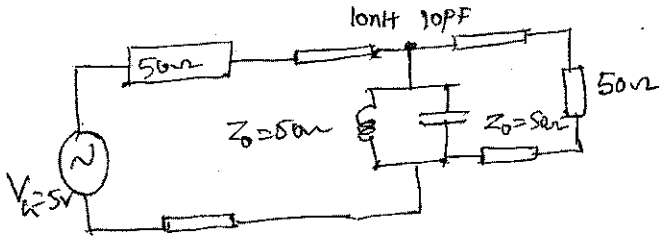

Figure. 1

(OR)

b) i) Design a chebysehev band pass filter for N=2 with 3dB pass band ripple. The centre frequency is at 2.4GHz and the filter has to meet a bandwidth requiremanr of 20%. The filter has to be inserted into the 50Ω characteristic line impedance. Solve for the values of inductive and capacitive element. For N=2 the coefficients are g_1=3.1013, g_2=0.5339 and g_3=5.8095. (8)

ii) Show the operation of resonant waveguide cavities. (8)

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Government College of Engineering :: Salem

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Ph.D. Degree Examinations – April/May 2023

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18PEE21 – Advanced Power Electronic. Circuits

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Low-order dominant harmonics in the line current are of high magnitude. Justify the statement and mention how to remove these dominant harmonics?
2. Compare series- and separate-type multi pulse rectifiers.
3. Mention the advantage of flyback converter over other topologies.
4. Explain no-polarity inversion in SEPIC converter operation.
5. Diode clamped multilevel inverter is rarely used in industrial applications. Justify the reason for the statement.
6. List the advantages of modified series inverter over series inverter.
7. Explain the constant switching frequency control method of bidirectional converter.
8. List the applications of bidirectional converters.
9. Mention the source of EMI and indicate how to manage the EMI in power converters.
10. Name some of the EMI standards that specify the maximum limit on the conducted EMI.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With neat block diagram and waveforms, explain the working of 18-pulse rectifier. Also explain the effect of line inductance and leakage inductance. (16)

(OR)

b) Describe the phase shifting transformer configurations for multi-pulse converters. (16)

12. a) Explain in detail the operation of forward converter with voltage mode control and current mode control. (16)

(OR)

b) Describe the working of flyback converter in discontinuous conduction with peak current mode control. (16)

13. a) i) Describe the working of five-level cascaded H bridge inverter. (8)

ii) Compare unipolar and bipolar pulse width modulation. (8)

(OR)

b) Draw the 5-level flying capacitor multi-level inverter and explain the working with a phase-shifted modulation scheme. (16)

14. a) Discuss the working of three phase bidirectional converter in rectifier mode. (16)

(OR)

b) Describe the hysteresis control in single phase inverter mode. (16)

15. a) Explain the sources of EMI generation and the filtering techniques in power converters in detail. (16)

(OR)

b) i) Describe the effect of EMI filter on converter control dynamics. (8)

ii) Discuss the power circuit layout for minimum EMI generation and write the effects of shielding and grounding. (8)

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Government College of Engineering :: Salem

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

POWER ELECTRONICS AND DRIVES

22PEC21 – Modelling and Analysis of Electrical Machines

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the influence of field resistance upon terminal voltage of self-excited DC generator.
2. Recall the effect of armature mmf.
3. What are the points to be considered when performing three phase to two phase transformation?
4. Name the commonly used reference frames. Write main differences among them.
5. What is slip power? Write the merits of Slip Power Recovery scheme.
6. Compare phase control and frequency control of induction motor.
7. Distinguish between direct vector control and indirect vector control.
8. State the significance of Space Vector modulation.
9. Write the features of PMSM.
10. What is an electronic commutation?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss with neat equivalent circuits, the different field excitations of DC machines. (12)

ii) Write short notes on Interpoles in DC machine. (4)

(OR)

b) i) The magnetic circuit shown in the Figure.1 has dimensions $A_c=A_s$ = 9 cm^2, g = 0.050 cm, l_c =30cm, and N=500 turns. Assume the value μ_r = 70,000 for core material. Find the reluctance R_c and R_g. For the condition that the magnetic circuit is operating with B_c =1.0 Tesla. Determine the flux (φ) and the current (i). (12)

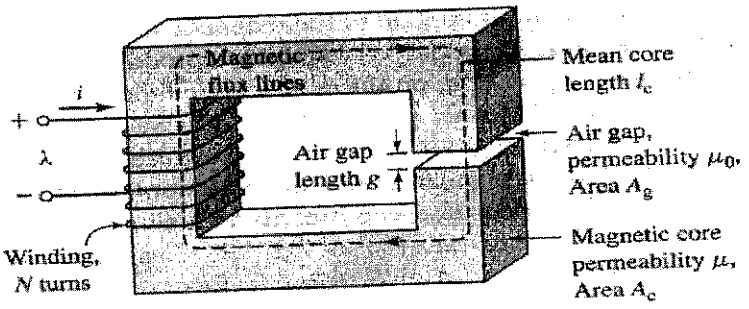

Figure.1.

ii) Write short notes on Commutation in DC machine. (4)

12. a) i) Discuss briefly on Park's transformation. (6)

ii) Demonstrate with necessary equations, the dynamic modelling of two phase induction machine. (10)

(OR)

b) i) Develop the torque equation of a three phase induction motor. (6)

ii) Discuss the generalized model in arbitrary reference frames. (10)

13. a) i) Illustrate with neat diagram, the principle of operation of slip power recovery scheme. (8)

ii) Explain with neat diagram, the working of constant Volts/Hz control. (8)

(OR)

b) i) Discuss with neat diagram, the principle of operation of static Scherbius drive. (8)

ii) With the help of an equivalent circuit, describe the steady state operation of a 3 phase symmetrical induction machine. (8)

14. a) Demonstrate with neat diagram, the operation of direct vector control in stator reference frames with space vector modulation. (16)

(OR)

b) Explain with neat diagram, the implementation of indirect vector control scheme with derivation of necessary equations. (16)

15. a) Explain with constructional features, the operating principle and dynamic modeling of a Permanent magnet synchronous machine. (16)

(OR)

b) Elaborate with constructional features, the operating principle and dynamic modeling of a BLDC motor. (16)

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Government College of Engineering :: Salem

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M.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

THERMAL ENGINEERING

22THC21 – Hydrogen and Fuel Cell Technologies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the salient characteristics of hydrogen?
2. Define steam reforming.
3. Why hydrogen storage is challenging?
4. Write down any two thermo physical properties of liquid hydrogen.
5. Compare battery and fuel cell.
6. Write down the main parts of a fuel cell.
7. Classify the fuel cell.
8. Define SOFC.
9. Whether fuel cells can be used in large scale systems? If so, what will be the constraints?
10. What are the merits of fuel cells while used in automobiles?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the biological hydrogen production process with suitable sketch. (16)

(OR)

b) Explain in detail about chemical and physical properties of hydrogen. (16)

12. a) Elaborate the conventional hydrogen storage options and its future scope. (16)

(OR)

b) Explain about safety and management of hydrogen and applications of hydrogen. (16)

13. a) Explain the thermodynamic and kinetic properties of fuel cells in detail. (16)

(OR)

b) How performance evaluation of fuel cell is obtained? Explain in detail. (16)

14. a) Explain PAFC with suitable sketch. (16)

(OR)

b) What is meant by proton exchange membrane fuel cell? Explain its functions in detail. (16)

15. a) Explain in detail about the applications of fuel cells in space. (16)

(OR)

b) Explain the environmental analysis on usage of hydrogen and fuel cells in detail. (16)

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(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D. Degree Examinations – April/May 2023

(2022 Regulations)

MECHANICAL ENGINEERING

22THE31 – Advanced Energy Storage Technologies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the types energy storage systems.
2. Identify any two importances of storage systems.
3. Select various types of thermal energy storage materials.
4. Differentiate between water bed and rock bed thermal storage system.
5. List the various safety issues for electrical storage system.
6. Why lithium batteries are used in modern electrical vehicles? Justify.
7. List the merits of hydrogen as a fuel in automotive vehicles.
8. Identify any four applications of biogas storage system.
9. List the types of alternative mechanical energy storage systems.
10. What do you understand by hybrid storage system?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Elaborate the necessity of an energy storage system.	(8)
		ii)	Compare the mechanical and electrical storage systems.	(8)
			(OR)	
	b)	i)	Explain any two types of energy storage methods with suitable diagram.	(12)
		ii)	Summarize the applications of energy storage systems.	(4)
12.	a)	i)	Explain the working principle of pressurized water storage system with neat diagram.	(12)
		ii)	Explain the packed bed thermal storage system.	(4)
			(OR)	
	b)	i)	Sketch the plot of temperature versus thermal energy storage material undergoing phase change.	(8)
		ii)	Discuss how porous medium used for thermal storage system?	(8)

13. a) i) Describe the various types of battery performance measuring techniques used for electrical storage system. (12)

ii) Compare storage density and energy density. (4)

(OR)

b) i) Discuss the uses of Nickel – Cadmium batteries in electrical vehicles and list the merits and demerits. (12)

ii) List the various types of modern batteries with their properties. (4)

14. a) i) Discuss the compressed gaseous hydrogen storage system with ambient temperature condition. (8)

ii) Discuss how the hydrogen gas explosion can be prevented while using it in two wheelers? (8)

(OR)

b) i) Compare hydrogen and biogas storage system. (8)

ii) Illustrate the biogas storage systems based on the gas pressure. (8)

15. a) i) Elaborate the working principle of super capacitor energy storage system. (8)

ii) Explain the compressed gas energy storage system used for industrial applications. (8)

(OR)

b) i) Discuss how hybrid storage system used for industrial application with suitable examples? (12)

ii) Compare flywheel and battery energy storage system. (4)

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Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

Ph.D. Degree Examinations – April/May 2023

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18PEE14 – Artificial Intelligence and Machine Learning

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. As per the turning test, what are the capabilities required for an artificial intelligence system.
2. Mention the need for a heuristic function.
3. Define predicate calculus.
4. What is meant by representational adequacy?
5. State Baye's rule and mention its application.
6. Distinguish between backward chaining and forward chaining.
7. List out the main elements of a planning system.
8. Mention the significance of adaptive learning?
9. Define the knowledge acquisition process.
10. List out few or typical expert systems.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Write A* algorithm and discuss briefly the various observations about algorithm. (16)

(OR)

b) Explain the various problem solving and problem reduction methods with algorithm and example. (16)

12. a) Explore the use of predicate logic as a way of representing knowledge for the following set of sentences. (16)

1) Marcus was a man.
2) Marcus was a Pompeian.
3) All Pompeiians were Romans.
4) Caesar was a ruler.
5) All Romans were either loyal to Caesar or hated him.
6) Everyone is loyal to someone.
7) People only try to assassinate rulers they are not loyal to.
8) Marcus tried to assassinate Caesar.

(OR)

b) Elaborate the structured representation of knowledge. (16)

13. a) With suitable example, elaborate the implementation of backward chaining. (16)

(OR)

b) Detail how Dempster Shafer theory can be used in AI systems? (16)

14. a) Explain various machine learning methods. (16)

(OR)

b) Elaborate in detail about STRIPS. (16)

15. a) Explain the architecture of expert system. (16)

(OR)

b) Detail the knowledge acquisition process in expert systems. (16)

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M.E. & Ph.D. Degree Examinations – April/May 2023

II Semester (Full Time)

(2022 Regulations)

STRUCTURAL ENGINEERING

22STC21 – Finite Element Method in Structural Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by Discretization?
2. What is Rayleigh-Ritz Method?
3. Define Shape Function.
4. What is Global co-ordinate and local co-ordinate?
5. What is CST element?
6. Write a strain-displacement matrix for CST element.
7. Write down the stress strain relationship matrix for an axisymmetric triangular element.
8. What is axisymmetric element.
9. Define super parametric element.
10. Calculate the value of $\oint_A L_1 L_2 L_3 \, dA$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The following differential equation is available for a physical phenomenon. (16)

Differential Equation, $\frac{d^2y}{dx^2} + 50 = 0;\ 0 \le x \le 10$

Trail function, $y = a_1 x\,(10 - x)$

Boundary condition are $y(0) = 0$ & $y\,(10) = 0$

Find the value of the parameter a_1 by the following methods:

i) Point collocation method;

ii) Subdomain collocation method ;

iii) Least square method.

(OR)

b) A beam AB of span 'l' simply supported at ends and carrying a concentrated point load W at the center 'C' as shown in figure.1. Determine the deflection at midspan by using Rayleigh-Ritz and compare the exact solutions. (16)

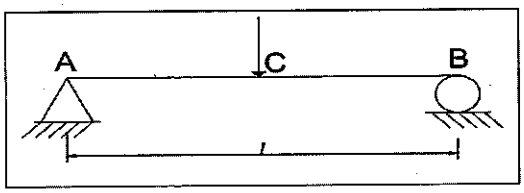

Figure.1.

12. a) Consider a bar as shown in Figure.2. Cross-sectional area of the bar is 750 mm2 and Youngs modulus is E =2 x 10^5 N/mm^2 If u_1 = 0.5 mm and u_2 = 0.625 mm, Calculate the following : (16)

i) Displacement at point, P
ii) Strain ,e
iii) Stress, σ
iv) Element stiffness matrix [K],
v) Stain energy, U

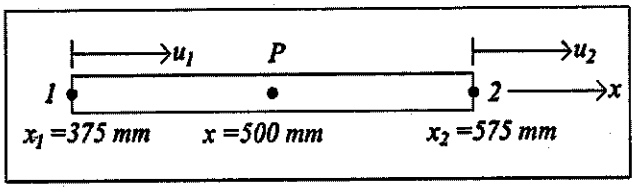

Figure.2.

(OR)

b) Derivation of the displacement function **u** and shape function **N** for one dimensional linear bar element. (16)

13. a) For the constant strain triangular element shown in figure.3 as strain -displacement matrix. Take t=20 mm and E =2 x 10^5 N/mm^2 (16)

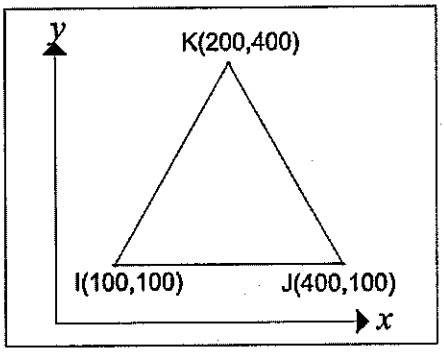

Figure.3.

(OR)

b) For the plane stress element shown in figure.4, the nodal displacement are: $u_1 = 2.0$ mm; $u_2 = 0.5$ mm; $u_3 = 3.0$ mm; $v_1 = 1.0$ mm; $v_2 = 0.0$ mm; $v_3 = 1.0$ mm; Determine the element stress let σ_x , σ_y , τ_{xy} E =210 GPa, υ= 0.25 and t =10 mm. All co-ordinates are in millimetres. (16)

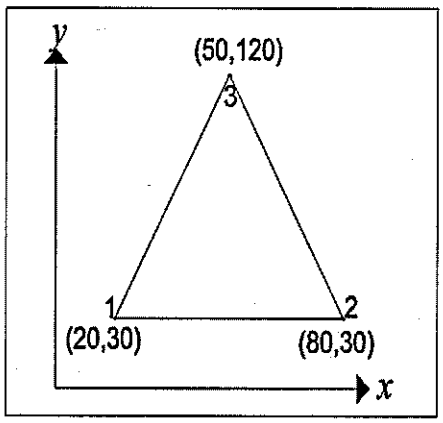

Figure.4.

14. a) The nodal co-ordinates for an axisymmetric triangular element are given below : (16)

$r_1 = 20$ mm; $z_1 = 40$ mm;

$r_2 = 40$ mm; $z_2 = 40$ mm;

$r_3 = 30$ mm; $z_3 = 60$ mm; Evaluate [B] matrix for the element.

(OR)

b) For an axisymmetric element show in figure.5, determine the element stresses. Take E = 2 x 10^5 N/mm^2. υ= 0.25. The co-ordinates shown in figure in millimeters. The nodal displacements are : (16)

$u_1 = 0.05$ mm; $u_2 = 0.01$ mm; $u_3 = 0$ mm;

$w_1 = 0.03$ mm; $w_2 = 0.02$ mm; $w_3 = 0$ mm;

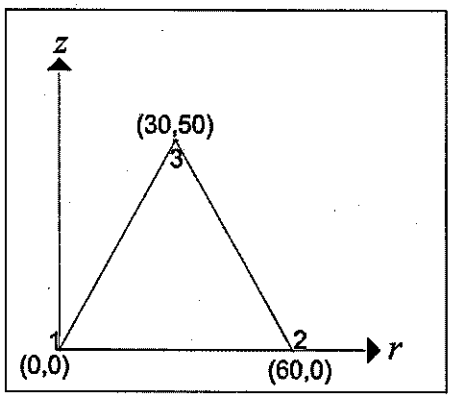

Figure.5.

15. a) For the iso parametric four noded quadrilateral element shown in figure.6. Determine the cartesian co-ordinates of point P which has local co-ordinates $\varepsilon = 0.5$ and $\eta = 0.5$. (16)

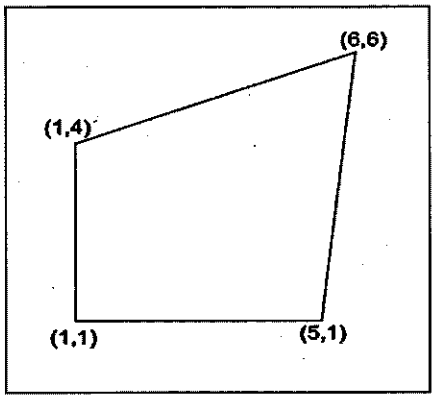

Figure.6.

(OR)

b) Evaluate the integral $I = \int_{-1}^{1}(2 + x + x^2)dx$ by Gauss quadrature and compare with exact solution. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME601 – Computer Integrated Manufacturing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Name the three classifications of production machines in terms of worker participation.
2. How will you differentiate closed and open system?
3. Can you name the major industry to first use UPC Universal product code.
4. Define part family.
5. List the different stages of shop floor control.
6. State the functions of computer control systems of FMS.
7. Name the different types of topology in communication.
8. List out the different networks available. Specify the features of your mobile.
9. Mention the importance of Engineering Change Control.
10. List the features of RDBMS.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Illustrate with neat example islands of automation.	(10)
		ii)	Elaborate on the physical distribution of a company.	(6)
			(OR)	
	b)	i)	Describe in detail about the origin of CIM.	(10)
		ii)	Express your views on business and financial system of company.	(6)
12.	a)	i)	Elaborate about the advantages of group technology.	(8)
		ii)	Highlight about the advantages of optical character recognition technology over bar code technology.	(8)
			(OR)	
	b)	i)	Distinguish OPTIZ coding system and MICLASS coding system.	(8)
		ii)	Mention about the advantages of generative process.	(8)

13. a) i) Discuss in detail about FMS workstation. (8)

ii) List the applications of FMS. (8)

(OR)

b) i) Explain about factory data collection system. (8)

ii) Highlight your views on any five material handling systems. (8)

14. a) i) Describe about seven layer OSI model (CIM). (8)

ii) Write short notes on product data management. (8)

(OR)

b) i) Write in detail about advantages of EIM open system architecture. (8)

ii) Illustrate in detail about disadvantages of LAN. (8)

15. a) i) List out the salient features of MAP. (8)

ii) Write short notes on TOP. (8)

(OR)

b) i) Draw the RDBMS architecture. (8)

ii) Highlight about the database requirements of CIM. (8)

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VI 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. What are the advantages of per-unit computations?
2. Draw the equivalent circuit of a three winding transformer.
3. Why is one of the bus considered as a slack bus in power flow study?
4. What is a Jacobian matrix?
5. Define short circuit capacity of a power system.
6. Enumerate the steps involved in short circuit current computation by Thevenin's theorem.
7. What is the purpose of symmetrical components in power system?
8. What are sequence impedance and sequence networks?
9. State Equal area criterion.
10. On what factor does the critical clearing time depend?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A 300 MVA, 20 kV, 3ϕ generator has a sub-transient reactance of 20%. The generator supplies 2 synchronous motors through a 64 km transmission line having transformers at both ends as shown in Figure.1. In this T_1 is a 3ϕ transformer of rating 350 MVA, 20/230 kV 10% reactance and T_2 is made of 3 single –phase transformer of rating 100 MVA, 127/13.2 kV, 10% reactance. Series reactance of the transmission line is 0.5 Ω/ km. The rating of synchronous motor M_1 is 200 MVA, 13.2 kV, X = 20% and M_2 is 100 MVA, 13.2 kV, X = 20%. Draw the reactance diagram with all the reactance marked in p.u. Select the generator rating as base values. (16)

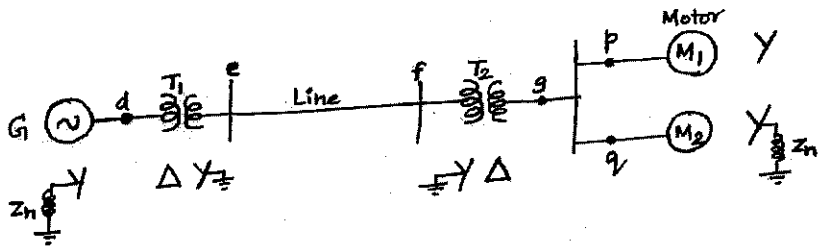

Figure.1.

(OR)

b) Describe the modelling of generator, transformer, transmission line and load for power flow, short circuit and stability studies. (16)

12. a) The system data for a load flow problem are given in Table Q.12 (a) (i) and Q.12 (a) (ii). (16)

Table Q.12 (a) (i) - Bus Data:

Bus code	P (pu)	Q (pu)	V (pu)	Remarks
1	-	-	1.06	Slack Bus
2	0.2	-	1.05	PV bus
3	0.6	0.25	-	PQ bus

Table Q.12 (a) (ii) - Line Data:

Bus code	Bus code	Impedance (pu)
1	1 – 2	$0.07 + j0.2$
2	1 – 3	$0.01 + j0.05$
3	2 – 3	$0.02 + j0.15$

i) Compute Y bus

ii) Determine bus voltages at the end of first-iteration by Gauss-Seidal method by taking acceleration factor as 1.6. Take Q limits of the generator-2 as $0.01 \leq Q2 \leq 0.25$.

(OR)

b) In the two bus system shown in Figure.2. bus 1 is a slack bus with $V_1 = 1.0 \angle 0°$. A load of 100 MW and 50 MVAR is taken from bus-2. The line impedance is $Z_{12} = (0.12 + j0.16)\, pu$ on a base of 100 MVA. Using Fast-decoupled algorithm, obtain the voltage magnitude and phase angle of bus-2. Start with an initial estimate of $|V_2|^{(0)} = 1.0\, pu$ and $\delta_2{}^{(0)} = 0°$. Perform two iterations. (16)

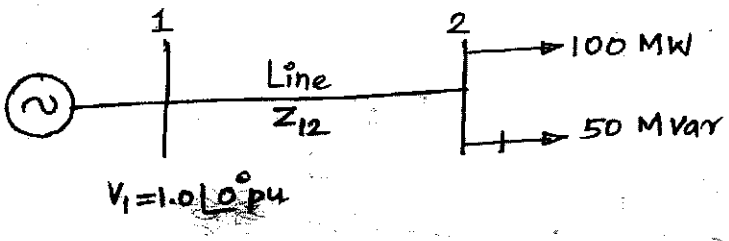

Figure.2.

13. a) The reactance diagram for the 3-bus network shown in Figure.3. Construct bus impedance matrix (Z_{Bus}) using Z-Bus building algorithm. The impedance values is given in p.u. Preserve all the nodes. (16)

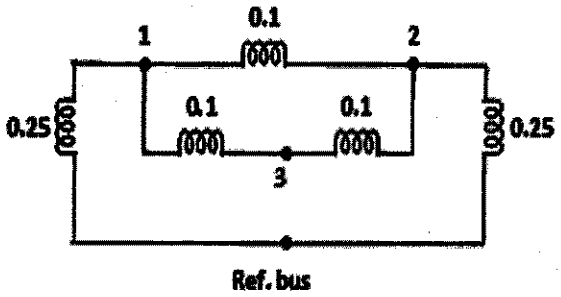

Figure.3.

(OR)

b) For the radial network in Figure.4. a three-phase fault occurs at point-F. Determine the fault current and the short circuit MVA. Also calculate the line voltage at 11 kV bus under fault conditions (16)

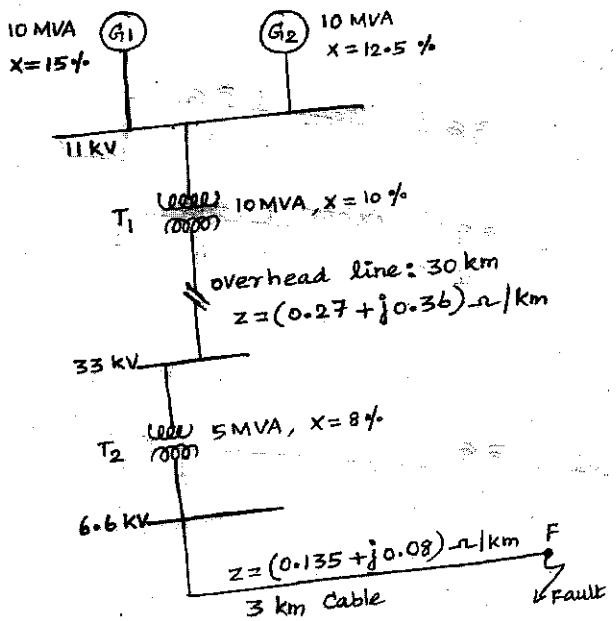

Figure.4.

14. a) A double line to ground fault occurs on phases b and c at the midpoint of the transmission line of the network shown in Figure.5. Using Z_{bus} method, find the fault currents. Assume that the motor operating at its rated voltage. Neglect prefault current. The reactances in p.u. are on the same base. (16)

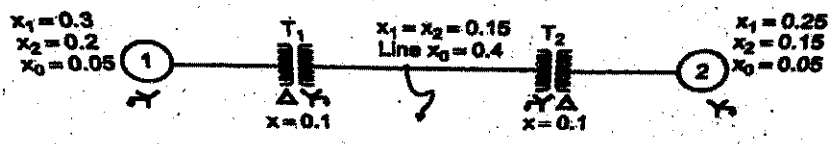

Figure.5.

(OR)

b) A single line to ground fault occurs on phase-a at bus-2 of the system shown in Figure.6. Neglect prefault current. Assume that the synchronous motor operating at its rated voltage. (16)

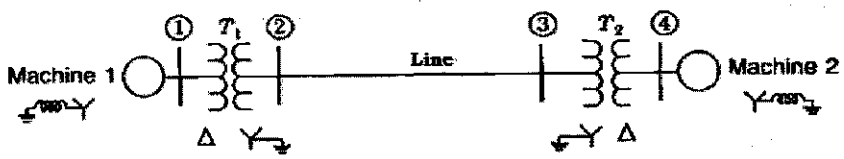

Figure.6.

The system data is given below.

Equipment	MVA rating	Voltage rating	reactance (p.u.)
Synchronous machines 1 and 2	100	20 kV	$X'_d = X_1 = X_2 = 20\%$; $X_0 = 4\%$; $X_n = 5\%$
Transformers 1 and 2	100	20/345 kV	$X = 8\%$
Transmission line	100	345 kV	$X_1 = X_2 = 15\%$; $X_0 = 50\%$

(i) Draw the positive, negative, and zero sequence networks
(ii) Determine the fault current.

15. a) Derive the swing equation for single machine connected to an infinite bus system and explain the step by step procedure for determining the solution of swing equation using Runge-Kutta method. (16)

(OR)

b) Discuss briefly the various factors affecting the transient stability of the power system. Also discuss the methods to improve transient stability limit. (16)

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B.E. Degree Examinations – April/May 2023

I Semester (Part Time)

(2022 Regulations)

CIVIL/ELECTRICAL AND ELECTRONICS ENGINEERING

22PTCS101 – Fundamental of Problem Solving and C Programming

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the characteristics of computer.
2. Convert the number $(245)_{10}$ into Octal number.
3. Write an algorithm to calculate addition of two numbers.
4. Define symbolic constant.
5. What is meant by shorthand operator? Give example.
6. Define storage classes. List the different classes.
7. How will you declare two dimensional array? Give example.
8. Define string. List its operation.
9. What is meant by recursive function?
10. List the difference between Structure and Union.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw the block of a basic computer. Explain the functions of each block. (16)

(OR)

b) i) Explain the different computer generations. (8)

ii) How will you classify the computer? Explain. (8)

12. a) i) Draw the flowchart to check the given number is prime number or not. (8)

ii) Write the pseudo code to generate the Fibonacci series of N terms. (8)

(OR)

b) i) Explain different data types available in C. (10)

ii) How will you declare the variables? Give example. (6)

13. a) Illustrate different types of operator available in C with example. (16)

(OR)

b) i) Explain input and output statements scanf() and printf() with example. (8)

ii) Describe the pre-processor directives with example. (8)

14. a) Explain different conditional statements (Branching and looping) with example. (16)

(OR)

b) i) Write a program to sort the given N numbers in ascending order using array. (8)

ii) Depict the different string functions in C with example. (8)

15. a) i) Explain function prototype and definition with example program. (8)

ii) Illustrate call by value and call by reference with suitable example program. (8)

(OR)

b) i) Write a program to define structure for student (register number, name, CGPA) and declare array of structure for student and access the student information. (10)

ii) Describe the Pointer with example. (6)

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2022 Regulations)

CIVIL/MECHANICAL/ELECTRICAL AND ELECTRONICS ENGINEERING

22PTMA201 – Mathematics - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the Fourier coefficient b_n for $x \sin x$ in $(-\pi, \pi)$.
2. Find the root mean square value of f(x) = x in $0 < x < 1$.
3. Find the nature of the partial differential equation $u_{xx} + u_{yy} = 0$.
4. Write down the various solutions of one dimensional wave equation.
5. Find the Laplace transform of $f(t) = sin2t + cost$.
6. Define Laplace transform.
7. State Fourier integral theorem.
8. State Parseval's identity of Fourier transforms.
9. Prove that $Z\left[\frac{1}{n!}\right] = e^{1/z}$.
10. If $z[f(t)] = F(z)$ then, prove that $z[f(t+T)] = zF(z) - zf(0)$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the Fourier series to represent the function $f(x)$ given by $f(x) = \begin{cases} x & for \ 0 < x \leq \pi \\ 2\pi - x & for \ \pi \leq x < 2\pi \end{cases}$, hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$. (8)

ii) Obtain the half-range cosine series for $f(x) = (x-1)^2$ in the interval $0 < x < 1$. (8)

(OR)

b) i) Determine the Fourier series for the function $f(x) = \begin{cases} x - 1, & -\pi < x < 0 \\ x + 1, & 0 < x < \pi \end{cases}$. (8)

ii) Find the Fourier series of $f(x) = x^2$ in $-\pi < x < \pi$. Hence show that $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \cdots = \frac{\pi^4}{90}$. (8)

12. a) A tightly stretched string of length 10 cm has its end fastened at $x = 0, x = 10$. At $t = 0$, the string is in the form $f(x) = 2x(10 - x)$ and then released. Find the displacement at any point on the string at a distance $x$from one end and at any time $t > 0$. (16)

(OR)

b) A bar 10 cm long, with insulated sides, has its ends A and B kept at $20°C$ and $40°C$ respectively until steady state conditions prevail. The temperature at A is then suddenly raised to $50°C$ and at the same instant at B is lowered to $10°C$. Find the subsequent temperature at any point of the bar at any time. (16)

13. a) i) Verify the initial and final value theorem for the function $f(t) = 1 + e^{-t}(sint + cost)$, using by Laplace transformation. (8)

ii) Find the inverse Laplace transform of the function $\frac{1}{(s^2+\omega^2)^2}$, using convolution. (8)

(OR)

b) Solve the initial value problem: $y'' + 2y' - 3y = 3,\ y(0) = 4,\ y'(0) = -7,$ using by Laplace transform. (16)

14. a) Find the Fourier transform of the function $f(x) = \begin{cases} a^2 - x^2, & |x| < a \\ 0, & |x| > a > 0 \end{cases}$. (16)

Hence deduce that $(i) \int_0^\infty \frac{sint - tcost}{t^3} dt = \frac{\pi}{4}$, $(ii) = \int_0^\infty \left(\frac{sint - tcost}{t^3}\right)^2 dt = \frac{\pi}{15}$.

(OR)

b) i) Find Fourier cosine transform of $f(x) = e^{-2x} + 5e^{-x}$ (8)

ii) Using Fourier transform, evaluate $\int_0^\infty \frac{x^2}{(x^2+4)} dx$. (8)

15. a) i) Find $z\left[\frac{1}{(n+1)(n+2)}\right]$. (8)

ii) Using convolution theorem evaluate inverse Z –transform of $\left[\frac{3z^2}{(z-1)(3z-9)}\right]$. (8)

(OR)

b) Solve the following uisng Z – transform method (16)

$y_{n+2} + 4y_{n+1} + 3y_n = 3^n$ *given that* $y_0 = 0$ *and* $y_1 = 1$.

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V Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCEE24 – Air Pollution Monitoring and Control

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Classify the air pollutants.
2. Enlist the pollutants responsible for global warming.
3. Give the effects of air pollution on meteorological conditions.
4. What do you mean by plume rise?
5. Mention the advantages of scrubbers.
6. Name the types of condensation system.
7. Define zoning.
8. Write about environmental impact assessment.
9. What are the most common sources of Noise pollution?
10. How will you prevent your ears from noise pollution?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Identify the sources of air pollutants. (8)

ii) Evaluate the effects of air pollution on human beings and animals. (8)

(OR)

b) Categorize the various sampling techniques involved in air pollution study. (16)

12. a) i) Illustrate the significance of wind rose diagram. (8)

ii) Discuss the types of adiabatic lapse rate. (8)

(OR)

b) i) Make a note on atmospheric stability. (8)

ii) What are the assumptions made in the Gaussian Model? (8)

13. a) Summarize about electrostatic precipitator with its merits and demerits. (16)

(OR)

b) i) Describe adsorption method of control for gaseous contaminants. (8)

ii) Explain how the combustion process is applied in gaseous emission control. (8)

14. a) Demonstrate the purpose of air quality monitoring. (16)

(OR)

b) i) Discuss the salient features of Air (Prevention and Control of Pollution) act? (8)

ii) Enumerate the environmental guidelines for locating an industry. (8)

15. a) i) State the ill effects of noise pollution. (8)

ii) Elaborate the noise standards. (8)

(OR)

b) Examine the control strategies and preventive measures of noise pollution. (16)

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B.E. Degree Examinations – April/May 2023

VII Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEEE20 – Smart Grid Technologies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define smart grid.
2. What is the function of self-healing grid?
3. What are points to be consider for substation automation in smart grid?
4. How will you charge the plug in hybrid electric vehicles?
5. What are the benefits of smart metering?
6. List the applications of intelligent electronics devices.
7. What is meant by EML? Why it is important in smart grid?
8. Mention any four issues of power quality monitoring.
9. What are the features of HAN?
10. List out any four IP based protocols in smart grid.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw the architecture of smart grid and explain. (10)

ii) Discuss in detail about the need of smart grid. (6)

(OR)

b) i) Discuss the difference between conventional grid and smart grid. (6)

ii) Why the global smart grid initiatives is needed with diverse perceptive from the experts. (10)

12. a) i) Draw a diagram of smart substation and explain in detail. (8)

ii) Write notes on FACTS and HVDC systems. (8)

(OR)

b) i) How the faults are detected in smart grid and explain the same. (8)

ii) Explain the principle and operation of a phase shifting transformer. (8)

13. a) i) Describe the advanced metering infrastructure in detail. (8)

ii) What are the needs of AMI in smart grid? (8)

(OR)

b) i) Explain the phasor measurement unit with neat diagram? (8)

ii) Write short notes on AMI protocols. (8)

14. a) i) Explain the power quality issues of grid connected renewable energy sources in detail. (8)

ii) Explain the standards of EMC in smart grid. (8)

(OR)

b) i) Explain in detail about any one active power filters for power quality conditioning in smart grid? (8)

ii) Write steps involved for power quality audit in smart grid. (8)

15. a) i) Write notes on LAN networks in smart grid. (8)

ii) How to cloud computing to make the smart grid smarter? (8)

(OR)

b) i) Describe the performance of broad band over the power line in smart grid. (8)

ii) Write a short note on cyber security in smart grid. (8)

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III Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING/MECHANICAL ENGINEERING

16PTMA301 – Numerical Methods

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down the Newton Raphson iterative formula to solve f(x) = 0 .
2. State two difference between direct and iterative methods for solving system of equations.
3. Find $\Delta(logx)$.
4. Find the second degree polynomial fitting the following data:

x	1	2	4
f(x)	4	5	13

5. Using Simpson's 1/3 rule, evaluate $\int_0^4 e^x\,dx$.
6. What is the Geometrical interpretation of trapezoidal rule?
7. Apply Taylor's series method to find $y(1.1)$ given that $\frac{dy}{dx} = y + x, y(1) = 0$.
8. How many prior values are required to predict the next value in Milne's method?
9. Write down the Bender – Schmidt recurrence relation for one dimensional heat equation.
10. Write the standard five point formula to solve Laplace equation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find a positive root of $x^3 - 2x + 0.5 = 0$ by Newtons method. (8)

ii) Solve the following system by Gauss Elimination method: (8)
$x - y + z = 1; -3x + 2y - 3z = -6; 2x - 5y + 4z = 5$

(OR)

b) i) Solve the following system by Gauss Seidel method: (8)
$4x + 2y + z = 14; x + 5y - z = 10; x + y + 8z = 20$

ii) Find the real root of the equation $Cosx = 3x - 1$, using Iteration method. (8)

12. a) i) From the following data, find y at $x = 43$ using newton's interpolation formula: (8)

x	40	50	60	70	80	90
y	184	204	226	250	276	304

ii) Use Lagrange's interpolation formula to fit a polynomial $f(x)$ given $f(0) = -12, f(1) = 0, f(3) = 6$ and $f(4) = 12$. (8)

(OR)

b) Find the equation $y = f(x)$ of least degree and passes through the points (-1, -21), (1, 15), (2, 12), (3, 3), find also y at x=0 using Newton's divided difference formula. (16)

13. a) i) The table given below reveals the velocity v of a body during the time t specified. Find its acceleration at t = 1.1 (8)

x	1.0	1.1	1.2	1.3	1.4
v	43.1	47.7	52.1	56.4	60.8

ii) Evaluate $\int_0^1 \frac{x^2}{1+x^3}\,dx$, using Simpson's $\frac{1}{3}$ rule. (8)

(OR)

b) i) From the table given below , find $y'(1.1)$ (8)

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

ii) Evaluate: $\int_1^2 \frac{dx}{1+x^3}$, using three-point Gaussian quadrature. (8)

14. a) i) Using Modified Euler Method to find $y(0.1)$ and $y(0.2)$ given that $\frac{dy}{dx} = 1 - y;\ y(0) = 0$ (8)

ii) By applying the fourth order R.K Method find y(0.1) , given that $\frac{dy}{dx} = y - x, y(0) = 2$ taking $h = 0.1$. (8)

(OR)

b) Given $\frac{dy}{dx} = xy + y^2, y(0) = 1$, use Taylor's series method to find the values of $y(0.1), y(0.2), y(0.3)$ and $y(0.4)$ by Milne's method. (16)

15. a) Evaluate u in the given range, taking h=1 and time up to 3 seconds, use Bender Schmidt scheme given that $u_{xx} - u_t = 0$ with $u(0,t) = 0$, $u(5,t) = 0$ and $u(x,0) = x^2(25 - x^2)$ (16)

(OR)

b) Solve the Poisson's equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides x=0,y=0 ,x=3, y=3 with u = 0 on the boundary and mess length 1 unit. (16)

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B.E. Degree Examinations – April/May 2023

III Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC301 – Signals and Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Determine, the x(n) = u(n) signal is energy or power signal.
2. Define Quarter wave symmetry.
3. Define Inverse Fourier transform.
4. Determine the Laplace transform of the signal x(t) = $-e^{-at}\,u(t)$.
5. Define Sampling Theorem.
6. State the final value theorem of Z transform.
7. Determine the impulse response for the cascade of two LTI systems having impulse responses, $h_1(n) = \left(\frac{1}{2}\right)^n u(n)$ *and* $h_2(n) = \left(\frac{1}{4}\right)^n u(n)$
8. Determine the transfer function for the given system, $y(n) - 2y(n-1) - 3y(n-2) = x(n-1)$.
9. What are the difficulties in cascade realization?
10. Draw the direct form structure of FIR system.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Determine the power and energy signals for the signal x(n)=cos $(\frac{\pi}{8}n^2)$. (6)

ii) Determine whether the $x(n) = \cos\left(\frac{n\pi}{2}\right) - \sin\left(\frac{n\pi}{8}\right) + 3\cos(\frac{n\pi}{4} + \frac{\pi}{3})$ signal is periodic or not. If periodic find the fundamental period. (10)

(OR)

b) i) State the Trigonometric form of Fourier series. Write the conditions for existence of Fourier series. (6)

ii) Determine the trigonometric form of Fourier series for the signal given in figure.1. (10)

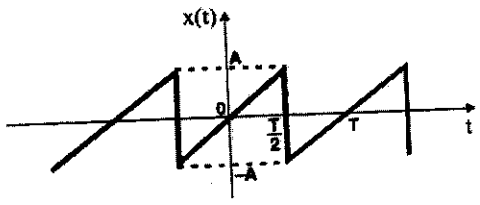

Figure.1.

12. a) i) Determine the convolution of $x_1(t) = e^{-2t}\,u(t)$ *and* $x_2(t) = e^{-6t}\,u(t)$, using Fourier transform. (6)

ii) Find Inverse Laplace Transform of $X(s) = \frac{4s^2 + 15s + 62}{(s+1)(s^2 + 4s + 20)}$. (10)

(OR)

b) i) Determine the impulse response of the system $T_0 \frac{d^2y(t)}{dt^2} + y(t) = x(t)$. Assume zero initial conditions. (6)

ii) Determine the complete response y(t) of the system represented by the differential equation, (10)

$$\frac{d^2y(t)}{dt^2} + 6\,\frac{dy(t)}{dt} + 5\,y(t) = \frac{dx(t)}{dt} + 4\,x(t)\,;\; y(0) = 1;\; \frac{dy(t)}{dt}\Big|_{t=0} = -2;$$

for input $x(t) = 2e^{-3t}\,u(t)$ using Laplace Transform.

13. a) i) Determine the Z-transform of $x(n) = \left(\frac{1}{2}\right)^n u(n) + \left(\frac{1}{3}\right)^n u(n-1)$. (8)

ii) Find Inverse Z-Transform of $X(z) = \frac{3Z^2 + 2Z + 1}{Z^2 + 4Z + 1}$. (8)

(OR)

b) i) Consider the analog signal $x(t) = 5\,Sin50\pi t$. If the sampling frequency is 60Hz, find the sampled version of discrete time signal x(n). Also find an alias frequency corresponding to F_S = 60Hz. (8)

ii) Determine the inverse Z-Transform of the function, $X(Z) = \frac{3+2Z^{-1}+Z^{-2}}{1-3Z^{-1}+2Z^{-2}}$ by using power series expansion method. (8)

14. a) Determine the response of discrete time LTI system governed by the difference equation $y(n) = -0.5\,y(n-1) + x(n)$, when the input is unit step and initial condition, $y(-1) = 0$ & $y(-1) = 1/3$. (16)

(OR)

b) Determine the response of the LTI system using graphical method whose input x(n) and impulse response h(n) are given by, (16)

x(n) = {1, 2, 0.5, 1} and h(n) = {1, 2, 1, −1}.

15. a) Obtain the direct form realization and realization with minimum number of multipliers of the FIR system described by the transfer function $H(z) = \left(1 + \frac{1}{2}\,z^{-1} + z^{-2}\right)\left(1 + \frac{1}{4}\,z^{-1} + z^{-2}\right)$. (16)

(OR)

b) Obtain the parallel realization of IIR system (16)

$$H(Z) = \frac{\left(1 + \frac{1}{2}Z^{-1}\right)}{\left(1 - Z^{-1} + \frac{1}{4}Z^{-2}\right)\left(1 - Z^{-1} + \frac{1}{2}Z^{-2}\right)}.$$

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

IV & VII Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCEE25 – Municipal Solid Waste Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define solid Waste Management.
2. Draw hierarchy pyramid of municipal solid waste management.
3. List the any two factors considered for onsite Storage of MSW.
4. Write the Modes of operation in solid waste collection.
5. List out the types of Compaction equipment used for waste management.
6. When will you recommend Hauled container system for transferring the solid waste?
7. Define Composting.
8. List the any two advantages of incineration process.
9. List any two advantages of sanitary landfill.
10. What is the use of landfill liners?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in brief about the sources and types of solid wastes. (8)

ii) Write short note on the various physio-chemical and biological characteristics of MSW. (8)

(OR)

b) Describe the effects on improper disposal of solid waste on human health. (16)

12. a) i) Explain in detail Onsite handling and Onsite storage methods. (8)

ii) Discuss about the materials used for on-site storage of MSW. (8)

(OR)

b) Explain in brief about the Onsite processing and Segregation. (16)

13. a) i) Write short notes on the factors considered while planning collection routes for MSW. (8)

ii) With the aid of flow diagram brief about the various MSW collection methods. (8)

(OR)

b) List the factors considered for locating a transfer stations and explain each. (16)

14. a) i) Brief about the various MSW Off-site processing techniques. (8)

ii) With proper sketch explain processes involved in solid waste composting. (8)

(OR)

b) Explain how resource recovery is achieved by Pyrolysis process. (16)

15. a) i) Write short note on Landfill location and site selection. (8)

ii) Explain the process of degradation in a municipal landfill. (8)

(OR)

b) Explain the importance of Landfill liners and also brief about the types of it. (16)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18PH101 - Physics - Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define average velocity and instantaneous velocity of a particle in rectilinear motion.
2. The motion of a particle is defined by the relation $x = t^3-6t^2-36t-40$ where x and t are expressed in mm and seconds respectively. Calculate the time at which the velocity is zero.
3. Give the principle of conservation of linear momentum of a particle.
4. Write down the equation of motion in terms of radial and transverse components.
5. A body of 50 kg is sliding down from rest on inclined plane of 30°. If the coefficient of friction is 0.2, calculate the resultant force acting on the body.
6. Give the major advantages of the method of work and energy.
7. Define radius of gyration.
8. A fly wheel has initial angular velocity of 10 $rads^{-1}$ and a constant angular acceleration of 3 $rads^{-2}$. Determine the number revolutions it must undergo to attain an angular velocity of 18 $rads^{-1}$. Also find the time required.
9. Define simple harmonic motion and write down its equation.
10. Differentiate between forced vibrations and resonance.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Derive the equations of motion (i) for a particle in a uniform rectilinear motion (ii) for a particle in a uniformly accelerated rectilinear motion. (12)

ii) The vertical motion of mass A is defined by the relation $x = 10\sin 2t + 15\cos 2t + 100$, where x and t are expressed in mm and seconds respectively. Determine the position, velocity and acceleration of A when t=1s. (4)

(OR)

b) Discuss the transformation of position and displacement vectors (16)
i) by translation of the coordinate system.
ii) by rotation of coordinate system.

12. a) Consider the pulley itself is accelerating upward with an acceleration (16)
a_p. Find the tension in the string and the acceleration of the masses as seen by an outside observer.

(OR)

b) Consider a mass 'm' released from the top of a smooth wedge of (16)
mass 'M' which rests on a smooth tables, Calculate the velocity of wedge.

13. a) Derive the expression for trajectory of a particle under a central force (16)
and apply to space mechanism.

(OR)

b) Discuss the principle of work and energy. Hence mention the (16)
importance of work energy theorem.

14. a) Define Coriolis acceleration. Discuss the plane motion of a particle (16)
relative to a rotating frame.

(OR)

b) State and prove parallel and perpendicular axis theorem on moment (16)
of inertia.

15. a) Obtain an expression for the period of a simple pendulum by (16)
considering it as an approximated simple harmonic motion.

(OR)

b) Derive the equation for Damping oscillator with discussing of three (16)
different cases. Hence obtain an equation for critical damping coefficient.

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT504 – Introduction to Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is resolution?
2. The amplifier system of a CRO is stated to have a sensitivity of 2.2 cm/V. What would be the deflection on the screen for an input of 0.38 V?
3. If the measured peaks from a datum were 35, 25, 32, 20, 18, 26, 24, 21 determine CLA values of surface roughness.
4. Give the applications of Optical bevel protractor.
5. What is the purpose of torque measurements?
6. State the technique for the measurement of the coating thickness 1 mm painting.
7. What is anemometer?
8. Give major advantage of Accelerometer measurements.
9. Can you suggest one instrument for measuring 1 atmospheric pressure?
10. Give some bimetallic strip metals.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Compare and contrast accuracy and precision.	(10)
		ii)	Compare and contrast digital and analogue instruments.	(6)
			(OR)	
	b)		Elaborate sources of Errors. And how will it be reduced..	(16)
12.	a)	i)	List the gauges used in assembly section.	(4)
		ii)	Explain any two gauges with construction, working and advantages.	(12)
			(OR)	
	b)	i)	List angle measuring instruments.	(4)
		ii)	Explain construction, advantages and limitations of sine bar.	(12)

13. a) i) List torque measuring devices and explain anyone with an application. (12)

ii) Differentiate between force and torque. (4)

(OR)

b) i) Classify the types of strain gauges; explain its construction and working. (12)

ii) Suggest the strain gauge for the tensile specimen elongation. (4)

14. a) Explain the construction working and limitations of variable head and variable area flow meters. (16)

(OR)

b) i) What is seismograph? Explain velocity seismic accelerometer. (8)

ii) Explain the vibrometer for 2 Richter scale earthquake vibrations. (8)

15. a) Explain the construction and uses of various pyrometers and thermisters. (16)

(OR)

b) With neat sketch explain the construction and working principles of the U tube Manometer. (16)

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B.E. Degree Examinations – April/May 2023

VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING/MECHANICAL ENGINEERING

18CEOE02 – Disaster Mitigation and Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the types of disaster.
2. What are roles taken up by volunteers during disaster?
3. Mention the roles and responsibilities of communities during disaster.
4. A structure gets damaged after the disastrous event. Can the structure be claimed for insurance? If so, justify.
5. Mention the components to be considered to achieve structural safety in structures.
6. List the common maintenance items of dams.
7. How are the risk assessed quickly?
8. List any four uses of internet in disaster management.
9. What is vulnerability analysis?
10. How is the utility of software's helpful in disaster management?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the types of disasters with examples. (8)

ii) Explain the effects of a natural disaster. (8)

(OR)

b) i) With an example, explain the role of non-Government organizations during a cyclone. (8)

ii) Give an account on the international assistance required in managing a disaster. (8)

12. a) Education plays a key role in disaster risk reduction- Justify. (16)

(OR)

b) Public awareness plays a key role in disaster risk reduction- Justify. (16)

13. a) Discuss the various methods to achieve low cost construction for disaster prone areas. (16)

(OR)

b) Enumerate the significance of structural safety of bridges. (16)

14. a) How far the saying of "Prevention is better than cure" suits to pre disaster planning? (16)

(OR)

b) Explain the applications of GIS in emergency planning. (16)

15. a) Sketch and explain the disaster management plan with an example. (16)

(OR)

b) Is the statement "Without space science input, disaster management is tedious" is true? Justify. (16)

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE506 – Transportation Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the functions of Indian Road Congress (IRC).
2. Tell which type of camber is suitable for fast moving vehicle? Why?
3. Illustrate "off tracking".
4. Define the different types of vertical curves in a highway.
5. Mention the factors that affect stability of the pavement.
6. Write a note on rapid curing cutback bitumen.
7. Quote the various types of gauges used in Indian Railways.
8. Summarise the objective for providing gradient in railway.
9. Give the uses of the station yards.
10. What is meant by the platforms?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain how did the Jayakar committee help road development in India. (12)

ii) Brief about the cross sectional element camber on highway. (4)

(OR)

b) i) Give a detailed note on the various factors that contribute to select an alignment of roads in hilly terrain. (10)

ii) Write short notes on shoulder, pavement width, kerb and foot path. (6)

12. a) i) Calculate the length of transition curve for a design speed of 80 km/h at a horizontal curve radius 250 m in a road area. Assume suitable data. (8)

ii) Gradient of a highway is 1 in 20. A horizontal curve of 150 m radius is to be constructed on this road (8)

1) What will be the grade compensation?

2) What will be the compensated gradient?

(OR)

b) i) Derive the formula for overtaking sight distance. (8)

ii) Derive the formula for stopping sight distance. (8)

13. a) Explain any four tests on bitumen. (16)

(OR)

b) State the stepwise recommended construction procedure for rigid pavements for highways. (16)

14. a) Explain the permanent way components with suitable sketch. (16)

(OR)

b) Drive an expression for the relationship between super elevation, gauge and curve in a railway track. (16)

15. a) How are stations classified? Explain the features of each. (16)

(OR)

b) Enumerate the various types and classification of signals with suitable sketch. (16)

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE504 – Design of Reinforced Concrete Elements

(IS 456 - 2000 & Design charts and tables from SP - 16 are permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare the advantages of limit state method with other methods.
2. Write any two assumptions of Working Stress method.
3. Define flanged beam.
4. Distinguish between one way and two way slabs.
5. List the different types of shear reinforcement in beams.
6. What is meant by anchorage bond?
7. Write any two salient assumptions that are made for the limit state design of columns.
8. List out the various end conditions of braced column and their effective length.
9. Draw neat sketches of different type of Isolated footings.
10. Define Tread.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the concepts of Working Stress Method. (8)

ii) Explain the stress strain behaviour of concrete and steel. (8)

(OR)

b) Eexplain briefly about characteristic strength, characteristic loads and importance of partial Safety factor. (16)

12. a) A flanged beam has dimensions as given below – Breadth of flange = 1500 mm, Depth of Flange = 100 mm, Breadth of web = 250 mm. It is reinforced with 7 Nos. of 25 mm dia bars at an effective depth of 500 mm. Determine the moment of resistance of M20 Grade concrete and Fe415 steel used. (16)

(OR)

b) Design a slab for a hall of inner dimension 4 m x 6 m. The slab is simply resting on 230 mm thick brick wall along the four sides. The live load on the slab is 4 kN/m^2. The load due to floor finish and partitions may be taken as 1.2kN/m^2. Use M20 grade concrete and Fe415 steel. (16)

13. a) A simply supported beam of span 6m is subjected to an ultimate load of 50 kN/m over the entire length. Design the shear reinforcement for the beam. Assume that the section of the beam as rectangle of width 300 mm and effective depth 500 mm. The beam is reinforced with 4 Nos. of 20 mm diameter bars. Assume grade of concrete as M20 and grade of steel as Fe415. (16)

(OR)

b) A rectangular beam of width 300 mm and overall depth 600 mm is subjected to a ultimate bending moment of 120 kNm, ultimate twisting moment of 50 kNm and an ultimate shear force of 100 kN. Design the steel reinforcement required for the given section. Assume grade of concrete as M20 and grade of steel as Fe415. (16)

14. a) Design the reinforcements in a circular column of diameter 300 mm to support a service axial load of 800 kN. The column has an unsupported length of 3 m and is braced against side sway. The column is reinforced with helical ties. Adopt M20 grade concrete and Fe 415 HYSD bars. (16)

(OR)

b) A reinforced concrete short column of rectangular dimension in plan is 350 mm X 500 mm in size. Determine the reinforcement required for the column to support an ultimate axial load of 1500 kN with an ultimate moment of 100 kNm about x axis and 80 kNm about Y axis. Assume that the unsupported length of the column about both axies as 5 m. Assume grade of concrete as M20 and grade of steel as Fe415. (16)

15. a) A square footing has to transfer a dead load of 900kN and an imposed load of 500 kN for a square column of size 400 mm. Assume the Safe Bearing Capacity of the soil as 200 kN/m^2. Design the square footing to support the above column. Adopt M20 grade concrete and Fe415 HYSD bars. (16)

(OR)

b) Design a dog legged staricase for an office building in a room measuring 3 m x 6 m. Floor to Floor height is 3.5 m. Stairs are supported on brickwalls 230 mm thick at the end of landing. Use M30 and Fe415. (16)

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC504 – Computer Networks

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Protocol.
2. Identify the five components of Data communication system.
3. What are the types of Errors?
4. Write about SONET.
5. State the duties of Network layer.
6. Classify the Routing protocol.
7. Draw the Frame format used in UDP.
8. What is meant by Quality of Service?
9. What are the limitations of POP3?
10. Write about DNS.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With necessary diagrams briefly explain the responsibilities of different layers of OSI reference model. (16)

(OR)

b) Explain & compare the Guided and Unguided media. (16)

12. a) Briefly explain the mechanism of Error detection and explain any two Error detection mechanisms in detail. (16)

(OR)

b) Define and explain the data link layer in IEEE 802 project. Why is this layer divided onto sub-layer? Describe the function of each Sub-layer. (16)

13. a) i) With the diagram explain all the fields in the IPv4 datagram header. (8)

ii) Explain in detail about the concept of Subnetting and Masking. (8)

(OR)

	b)	i)	Briefly explain Distance Vector Routing with example.	(8)
		ii)	Briefly explain Link State Routing with example.	(8)
14.	a)	i)	Distinguish between UDP and TCP.	(8)
		ii)	With the diagram, Explain the purpose of all the fields in TCP header.	(8)
			(OR)	
	b)	i)	Discuss briefly about Congestion prevention techniques with necessary diagrams.	(8)
		ii)	What is Silly Window Syndrome? How do you avoid it?	(8)
15.	a)		Briefly discuss about the steps involved in e-mail transfer.	(16)
			(OR)	
	b)		Explain in brief about Symmetric and Asymmetric Cryptography methods.	(16)

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE504- Microprocessor And Microcontroller

Time : 3 Hours

Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is a Microprocessor? Give the power supply & clock frequency of 8085.
2. Identify the difference between the following instructions in 8085:
   SUB and CMP
3. Find the content of register A after the execution of the following code in 8051 Microcontroller.
   CLR A
   ORA A,#99H
   CPL A
4. How does the status of EA pin affect the access to internal and external program memory in 8051 Microcontroller?
5. What is interfacing?
6. Sketch the interfacing of 8051 microcontroller with tactile switches.
7. How the RS-232 serial bus is interfaced to TTL logic device?
8. Draw the frame format of asynchronous serial communication.
9. List the various modes of control in a DC motor.
10. Apply the function of solid state relay interfacing with microcontroller.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With a neat diagram, elucidate the architecture of 8085 microprocessor. (12)

    ii) List out the different addressing modes used in 8085. (4)

(OR)

    b) i) Summarize how the interrupts are handled in 8085 microprocessor. (12)

    ii) Draw the timing diagram of MVI A, 50 H instruction. (4)

12. a) i) With a neat diagram, explain the mode 0 and mode 3 of Timer1 of 8051. (8)

ii) Comment on the function of the different special function registers available in the 8051 microcontroller. (8)

(OR)

b) i) Explain the unconditional branching instructions of 8051. (8)

ii) Write an 8051 assembly language program to add three 8 bit numbers. (8)

13. a) i) Write about voltage sensor interfacing using 8051. (8)

ii) Illustrate the procedure of matrix keyboard interfacing with 8051 microcontroller. (8)

(OR)

b) i) Interface an ADC chip with 8051. Explain the algorithm to read the data from ADC. (8)

ii) Sequence the commands used to interface LCD device with 8051 microcontroller. (8)

14. a) i) Write short notes on interfacing microcontroller to protocols with Bluetooth. (12)

ii) How does I2C work in microcontroller? (4)

(OR)

b) i) Explain the functions of the pins of RS232 connector (9 pin). (12)

ii) Explain how 8051 transmit the character and receives a character serially using UART. (4)

15. a) i) Explain the interfacing of stepper motor with 8051 Microcontroller with a neat diagram. (10)

ii) Discuss about the electric power and power factor measurement using microcontroller. (6)

(OR)

b) i) Explain the data acquisition system using microcontroller with neat block diagram. (10)

ii) Write the interfacing of DC motor with 8051 microcontroller. (6)

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME504 – Dynamics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Specify the difference between static force and dynamic force.
2. Draw the turning moment diagram of a single cylinder double acting steam engine.
3. How the different masses rotating in different planes are balanced?
4. Write the expression for the swaying couple and state at which it is maximum and minimum.
5. What are the causes and effects of vibration?
6. Determine the natural frequency of a mass of 10 kg suspended at the bottom of two springs in parallel of stiffness 5 N/mm and 8 N/mm.
7. What is meant by torsionally equivalent length of a shaft as referred to a stepped shaft?
8. List a few instruments for frequency measurement in vibration.
9. Differentiate between governor and fly wheel.
10. What is meant by sensitiveness of a governor?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A vertical petrol engine 90 mm in diameter and 120 mm stroke has a connection rod of 240 mm length. The piston has a mass of 1 kg and the speed is 1800 rpm. On the explosion stroke with the crank at 30° from top dead centre, the gas pressure is 0.5 N/mm^2. Find (16)
    i) The resultant load on the gudgeon pin
    ii) The thrust on the cylinder walls and
    iii) The speed above which other things remaining same, the gudgeon pin load would be reversed in direction.

    Also calculate the crank effort at the given position of the crank.

(OR)

b) The turning moment diagram for a multi cylinder engine has been drawn to a scale of 1 mm = 325 N-m vertically and 1 mm = 3° horizontally. The areas above and below the mean torque lines are -26, +378, -256, +306, -302, +244, -380, +261 and -225 mm^2. The engine is running at a mean speed of 600 rpm. The total fluctuation of speed is not to exceed $\pm$1.8% of the mean speed. If the radius of flywheel is 0.7 m, find the mass of the flywheel. Also determine the diameter and cross section of the rim, If the density of rim material is 7000 kg/m^3 and width of the rim is 4.5 times its thickness, centrifugal stress in the rim material is limited to 5 N/mm^2, neglecting the effect of the boss and arms. (16)

12. a) A shaft has three eccentrics, each 75 mm diameter and 25 mm thick, machined in one piece with the shaft. The control planes of the eccentric are 60 mm apart. The distance of the centres from the axis of rotation are 12 mm, 18 mm and 12 mm and their angular positions are 120° apart. The density of the metal is 7000 kg/m^3. Find the amount of out of balance force and couple at 600 rpm. If the shaft is balanced by adding two masses at a radius of 75 mm and at distances of 100 mm from the centre plane of the middle eccentric, find the amount of the masses and their angular positions. (16)

(OR)

b) The cranks of a 2 cylinder uncoupled inside cylinder locomotive are at right angles and are 325 mm long. The cylinders are 675 mm apart. The rotating mass per cylinder is 200 kg at crank pin and the mass of the reciprocating parts per cylinder is 240 kg. The wheel centre lines are 1.5 m apart. The whole of the rotating and two thirds of the reciprocating masses are to be balanced and the balance masses are to be placed in the planes of the rotation of the driving wheels at a radius of 800 mm. (16)

Find

i) The magnitude and direction of the balancing masses

ii) The magnitude of hammer blow

iii) The variation in tractive force, and

iv) The maximum swaying couple at a crank speed of 240 rpm.

13. a) The mass of a single degree damped vibrating system is 7.5 kg and makes 24 free oscillations in 14 seconds when disturbed from its equilibrium position. The amplitude of vibration reduces to 0.25 of its initial value after five oscillations. Determine: (16)

i) Stiffness of the spring,

ii) Logarithmic decrement

iii) Damping factor.

(OR)

b) A single-cylinder engine of total mass 200 kg is to be mounted on an elastic support which permits vibratory movement in vertical direction only. The mass of the piston is 3.5 kg and has a vertical reciprocating motion which may be assumed simple harmonic with a stroke of 150 mm. It is desired that the maximum vibratory force transmitted through the elastic support to the foundation shall be 600 N when the engine speed is 800 r.p.m. and less than this at all higher speeds. (16)

i) Find the necessary stiffness of the elastic support, and the amplitude of vibration at 800 r.p.m.,

ii) If the engine speed is reduced below 800 r.p.m. at what speed will the transmitted force again becomes 600 N?

14. a) A single cylinder oil engine drives directly a centrifugal pump. The rotating mass of the engine, flywheel and the pump with the shaft is equivalent to a three rotor system as shown in figure.1. The mass moment of inertia of the rotors A, B and C are 0.15, 0.3 and 0.09 kg-m^2. Find the natural frequency of the torsional vibration. The modulus of rigidity for the shaft material is 84 kN/mm^2. (16)

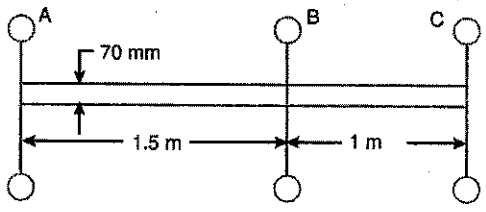

Figure.1.

(OR)

b) Discuss about vibration measuring instruments and its necessity with neat sketches. (16)

15. a) A loaded Porter governor has four links each 250 mm long, two revolving masses each of 3 kg and a central dead weight of mass 20 kg. All the links are attached to respective sleeves at radial distances of 40 mm from the axis of rotation. The masses revolve at a radius of 150 mm at minimum speed and at a radius of 200 mm at maximum speed. Determine the range of speed. (16)

(OR)

b) A Proell governor has all four arms of length 305 mm. The upper arms are pivoted on the axis of rotation and the lower arms are attached to a sleeve at a distance of 38 mm from the axis. The mass of each ball is 4.8 kg and are attached to the extension of the lower arms which are 102 mm long. The mass on the sleeve is 45 kg. The minimum and maximum radii of governor are 165 mm and 216 mm. Assuming that the extensions of the lower arms are parallel to the governor axis at the minimum radius, find the corresponding equilibrium speeds. (16)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE503 – Power Electronics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is reverse recovery time of diodes?
2. State the basic requirements for MOSFET gate drive circuit.
3. Calculate the value of Harmonic factor (HF) for a single-phase full converter.
4. What is the need for PWM rectifiers?
5. Define the term: 'Duty ratio' of a power switch.
6. For a buck converter, the input voltage is 110 V, the average load voltage is 60 V, peak-to-peak ripple current is 2 A, and the chopping frequency is 20 kHz. Design the value of the inductor.
7. Define 'Modulation index' of PWM. What is its use?
8. What is the objective of Space Vector Modulation?
9. State the applications of AC voltage controllers.
10. What is a Matrix converter?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw and explain the steady state and switching characteristics of SCR. (8)

ii) Explain the structural features and V-I characteristics of power diodes. (8)

(OR)

b) i) Explain (di/dt) and (dv/dt) protection of thyristors. (8)

ii) Describe the turn-on and turn-off characteristics of an IGBT. (8)

12. a) A 3-phase full converter, fed from 3-phase, 400 V, 50 Hz source, is connected to load R = 10 Ω, E = 350 V and large inductance so that output current is ripple free. Calculate the power delivered to the load and input power factor for (16)

i) Firing angle of 30 degree and

ii) Firing advance angle of 60 degree.

(OR)

b) Describe the working of single-phase dual converter with appropriate waveforms. Derive expressions for the average output voltage and the circulating current. (16)

13. a) Explain the modes of operation of a DC-DC boost converter with neat power circuit and waveforms. Derive the expression for the voltage gain of the converter. (16)

(OR)

b) Explain the working of SEPIC topology of DC-DC converter with power circuit and waveforms. Also derive the expression for its voltage gain. (16)

14. a) With neat power circuit and waveforms, explain the basic principles of operation of the two types of single-phase bridge inverters. (16)

(OR)

b) Explain in detail about the functioning of three-phase voltage source inverter in 120 degrees mode. (16)

15. a) With neat power circuit and relevant waveforms, explain the operation of a single-phase AC voltage controller with resistive load. (16)

(OR)

b) Discuss the working of two stage sequence control of AC voltage controller. (16)

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME503 – Metrology and Quality Control

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define measurement uncertainty.
2. Differentiate between Standard deviation (σ) of a single measurement in a series of measurements and σ of the arithmetic mean of a series of measurements.
3. What do you mean by wringing of gauge blocks?
4. Mention the least count of dial gauge.
5. Mention the significance of floating carriage micrometer.
6. Which gears connect two non-parallel, non-intersecting shafts which are usually at right angles?
7. Name the Control charts for variables? Mention the control charts for attributes.
8. Suggest the best method to measure surface finish.
9. Write about the importance of hypothesis testing.
10. Highlight the necessity of multivariate analysis.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Highlight the various systematic and random errors in measurement. (6)

ii) Explain the Generalised measurement system with neat sketch. (10)

(OR)

b) i) One manufacturer of CMM has indicated its accuracy as (6)

3σ(three sigma accuracy ± 0.003mm)

2σ(accuracy ± 0.002mm)

1σ (accuracy ± 0.001mm).

What do you understand by this statement?

ii) Distinguish between (10)

1) Sensitivity and range

2) Calibration and correction

3) Repeatability and reproducibility.

12. a) i) Discuss in detail on ISO 9000 quality standards. (12)

ii) Briefly explain the precautions to be taken to handle Micrometer. (4)

(OR)

b) i) Explain why it is not preferred a Sine bar for generating angles large than 45° if high accuracy is demanded. (4)

ii) Discuss the advantages, limitations of optical comparator. (12)

13. a) i) State the Taylor principle for the design of limit gauges. (4)

ii) Write short notes on the various aspects for deciding the limits on the limit gauges. Why unilateral tolerances preferred over bilateral tolerances? (12)

(OR)

b) i) Discuss different methods to measure the roundness. (4)

ii) Explain different probes used in CMM? Discuss the working principle, merits and applications of each type of probes. (12)

14. a) i) Write short notes on different types of control charts. (4)

ii) Control charts for X bar and σ are maintained on a process. The subgroup size is 10. The values σ are computed for each subgroup. After 18 subgroups $\Sigma\sigma = 8.24$ and Σ X bar = 5958. Compute the value of 3 sigma limits for the X bar and σ charts on the assumption that the process is in statistical control. For n = 10take C2 = 0.9227. (12)

(OR)

b) i) Discuss the different, methods used to mention the surface finish. Explain with example. (4)

ii) Explain the working of optical measuring instruments with suitable sketch. (12)

15. a) i) Write in detail about Histogram and cause and effect diagram. (10)

ii) Highlight the need of box plots. (6)

(OR)

b) i) Explain the role of ANOVA for research application. (10)

ii) State the different aspects of Regression analysis. (6)

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B.E. Degree Examinations – April/May 2023

V & VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18CSOE03 – Computer Networks

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Identify the use of logical addressing in Computer network. Give an example.
2. Describe the advantage of using Local Area Network.
3. Define flow control.
4. What is the advantage of FDDI over a basic token ring?
5. How does router differ from bridges?
6. What are the salient features of IPv6?
7. Draw the TCP header format.
8. What are the advantages of using UDP over TCP?
9. List out the various parts of URL with example.
10. Mention the types of HTTP messages.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw the ISO-OSI architecture and outline the functions performed by each layer. (16)

(OR)

b) i) Compare and contrast guided media and unguided media for transmission. (10)

ii) Describe any three types of networks topologies in computer network. (6)

12. a) i) Compare Stop and Wait ARQ scheme with sliding window ARQ scheme. (8)

ii) Discuss the fundamentals of Token bus architecture with frame format. (8)

(OR)

b) Explain in detail about the various error detection and correction Mechanisms used in computer network with example. (16)

13.	a)	i)	Discuss the various IP addressing methods.	(10)
		ii)	Explain about Address Resolution Protocol (ARP).	(6)
			(OR)	
	b)	i)	Explain the process of Routing algorithms.	(4)
		ii)	State the major difference between Distance vector routing and Link state routing.	(12)
14.	a)	i)	Enumerate the mechanism of three way handshake protocol for TCP.	(8)
		ii)	Briefly explain about approaches used for TCP congestion control.	(8)
			(OR)	
	b)	i)	Discuss about TCP and its various operations.	(8)
		ii)	Illustrate and explain UDP and its packet format.	(8)
15.	a)	i)	Describe the role of a DNS on a computer network with reference to its components.	(8)
		ii)	Outline the steps involved in FTP and its operation.	(8)
			(OR)	
	b)	i)	Elucidate the use of SMTP and HTTP protocol. Give their uses, state their strengths and weaknesses.	(10)
		ii)	Write Briefly About World-Wide-Web (WWW).	(6)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MEOE01 – Design of Machine Elements and Machining

(Approved Design Data Book is permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How is the moment of inertia used in design?
2. What do you understand by preferred numbers?
3. What are the steps to be taken to control the lateral deflection of a shaft?
4. Sketch the symbolic representation of a double U butt joint.
5. When is concentric helical spring preferred?
6. Suggest your views for the evaluation of the life of hydro-dynamic bearings.
7. Distinguish between orthogonal and oblique cutting processes.
8. List the factors that affect the life of single point cutting tool.
9. What is meant by relief angle in cutting tools?
10. State the benefits of CIM.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The connecting rod of a steam engine is subjected to an axial load of 60 kN which is completely reversed. Determine the required diameter of the rod if it is made of 20 MN_2 steel having factor of safety as 1.5. (16)

(OR)

b) At a critical point on a machine part made of ductile material, the principal stresses are 500 kg/sq. cm and 400 kg/sq. cm. Find the safe tensile stress using any three theories of failure when the stresses are of the same and opposite nature. (16)

12. a) A shaft transmits 10 kW at 720 rpm. The overhang of the shaft is 300 mm and at the extreme right end a force, due to a pulley of 2 kN magnitude is applied. Design a suitable shaft. (16)

(OR)

b) Find the suitable size of the weld for the given configuration in figure.1 The permissible shear strength is 80 MPa. Assume suitable data if needed. (16)

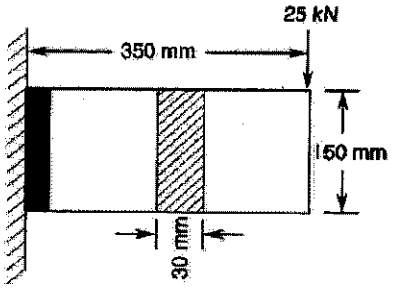

Figure.1.

13. a) Design a suitable spring for the exhaust valve of a petrol engine. The spring should be capable of exerting a net force of 360 N when the valve is open and 220 N when it is closed. The maximum inside diameter of the spring is 25 mm. The compression in spring is 8 mm. (16)

(OR)

b) A sleeve bearing is 80 mm in diameter and 60 mm in length. The journal speed is 600 rpm. The oil supply is SAE 30 at the inlet temperature of 40°C. The radial load on the bearing is 2.5 kN. Design a suitable journal bearing. (16)

14. a) i) Sketch and discuss the Merchant force circle with all the assumptions made in it. (10)

ii) Calculate the percentage increase in tool life when cutting speed is reduced by 50 %. Take n= 0.5 and C = 400 for standard tool life equation. (6)

(OR)

b) Discuss the performance of cutting fluids used in various metal cutting processes and share your views on the drawbacks. (16)

15. a) Explain the construction and working of a shaper with a neat sketch. (16)

(OR)

b) i) Discuss how the honing machine helps to achieve a good surface finish with the help of a sketch. (10)

ii) Briefly discuss any two work-holding devices used in a boring machine. (6)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME603 – Design of Machine Elements

(Approved Design Data Book is permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the significance of toughness in machine design.
2. Write the distortion energy theory and mention its uses.
3. What is meant by stub shaft?
4. List two advantages of rigid coupling over flexible coupling.
5. Distinguish between compound and differential screws.
6. Suggest the minimum weld size of butt joints for welding 15 mm thickness plates.
7. Why do you use Wahl's stress factor in Spring design?
8. Identify the applications of web-type flywheel.
9. Give four bearing materials.
10. Write the Mechanical Advantage of class III lever and justify.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A cold drawn steel rod having an ultimate strength of 620 MPa, an yield strength of 400 MPa and an endurance strength of 345 MPa is subjected to bending moment fluctuating between 200 Nm and 400 Nm. Determine the diameter of the rod required based on a factor of safety of 2.5. Use the Soderberg relation. (16)

(OR)

b) A bolt is subjected to a direct load of 25 kN and shear load of 15 kN. Considering any three theories of failure, determine a suitable size of the bolt, if the material of the bolt is made of C15. (16)

12. a) A turbine shaft transmits 500 kW at 900 rpm. The permissible shear stress is 80 N/mm^2 while twist is limited to 0.5° in a length of 2.5 m. Calculate the diameter of shaft. Take G is 0.8 x 10^5 N/mm^2. If the shaft chosen is hollow with ratio of internal to outer diameter of 0.6, calculate the percentage saving in the material. (16)

(OR)

b) Design and draw a cast iron protected type flange coupling to connect two shafts of 36 mm diameter transmitting 15 kW at 720 rpm. The overload capacity is 1.25 times the average torque. The bolts and keys are made of C20 steel and the flanges are made of FG 200. (16)

13. a) An air compressor cylinder of effective diameter 300 mm is subjected to air pressure of 1.5 N/mm^2. The cylinder head is connected by means of 8 bolts having yield strength of 350 N/mm^2 and endurance limit of 240 N/mm^2. The bolts are tightened with an initial pre-load force of 1.5 times that of the external force. A copper gasket is used to make the joint leak proof. Assume stress concentration factor of 2.5 and factor of safety of 2. Determine the required size of the bolt. (16)

(OR)

b) A plate 100 mm wide and 10 mm thick is welded to another plate by a single transverse fillet weld and a double parallel fillet weld as shown in the figure 1. The maximum working tensile and shear stresses are 75 N/mm^2 and 55 N/mm^2, respectively. Find the length of the respective welds. Assume over travel length equal to 12.5 mm. (16)

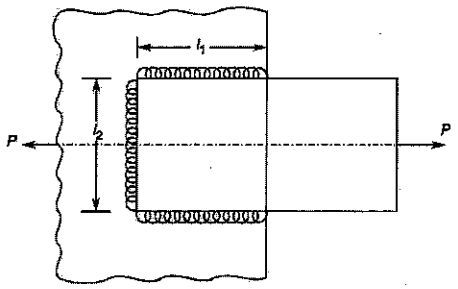

Figure.1.

14. a) Design a helical valve spring for operating load range of 90 N to 135 N. The 90 N load acts when the valve is closed and the 135 N force acts when the valve is open. The deflection of the spring is 7.5 mm. Assume the suitable data if needed. (16)

(OR)

b) Design a cylinder for a four-stroke water-cooled diesel engine developing 4 kW at 1500 rpm. Assume that the indicated mean effective pressure at the full load condition is 700 kN/m^2. Assume the suitable data if needed. (16)

15. a) Design a journal bearing for generator to carry a radial load of 3000 N. The journal having 50 mm diameter rotates at 1500 rpm. The viscosity of oil at the operating temperature is 25 cP. Assume the suitable data if required. (16)

(OR)

b) Design a closed cylindrical pressure vessel with dish end which is required to contain air at a pressure of 4 MPa. The shell is of 500 mm inside diameter. (16)

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC503 – Digital Signal Processing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is in place computation in DIT-FFT?
2. For sequences $x_1(n)$ and $x_2(n)$: x1(n) = (2,1,1,2) and x2 (n) = (1, -1, -1,1). Compute circular convolution.
3. Find the transfer function of normalized Butterworth filter of order 1 by determining the pole values.
4. Obtain the direct form -I form realisation for the system
   y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2).
5. What are the desirable characteristics of windows?
6. Distinguish between IIR and FIR filters.
7. What is meant by Limit cycle oscillation in digital filters?
8. How would you relate the steady state noise power due to quantisation to the 'b' bits representing binary sequences?
9. What is the need of anti-imaging filter after up sampling a signal?
10. What is multirate signal processing?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the 4-point DFT of a discrete time sequence (8)
    X(n) = {1,1,1}. plot $|X(K)|$ and $\angle X(K)$.

    ii) Find linear convolution using overlap add and overlap-save method of (8)
    the following sequences
    x(n) = {1,2, -1,2,3, -2, -3, -1,1,1,2, -1}; h(n) = {1,2,3}.

(OR)

b) i) State and explain Circular time shift and circular convolution (8)
property of DFT.

ii) Find the 8-point DFT of the sequence using radix-2 DIT algorithm. (8)
X(n) = {1, -1,1, -1,0,0,0,0}.

12. a) Determine H(z) for a Butterworth filter satisfying the following constraints (16)

$0.8 \leq |H(\omega)| \leq 1.0$; $0 \leq \omega \leq \pi/4$

$|H(\omega)| \leq 0.2$; $\pi/2 \leq \omega \leq \pi$.

Assume T = 1 sec. Apply bilinear transformation method.

(OR)

b) Design a Chebyshev digital low pass filter to meet specification: In the pass and extending from 0 to 0.25 Π, a ripple of not more than 2 dB is allowed. In the stop and extending from 0.4Π to Π, attenuation can be more than 40 dB. Use Bilinear transformation method. (16)

13. a) i) Design a digital high pass filter to meet the following specifications: (10)
Cut off frequency: 250 Hz
Sampling rate: 1000 samples/sec
Filter length: 7. Use Hamming window.

ii) Determine the direct form realisation of system function (6)
$H(Z) = 1 + 2z^{-1} - 3z^{-2} - 4z^{-3} + 5z^{-4}$

(OR)

b) i) The desired frequency response of a low pass filter is given by (10)
$H_d(w) = \begin{cases} e^{-j2\omega} & |\omega| \leq \Pi/4 \\ 0 & \Pi/4 \leq |\omega| \leq \Pi \end{cases}$. Determine the filter coefficients h(n) using Hanning window.

ii) Realize the following system function using minimum number of multipliers (6)
$H(Z) = 1 + \frac{1}{3}z^{-1} + \frac{1}{4}z^{-2} + \frac{1}{4}z^{-3} + \frac{1}{3}z^{-4} + z^{-5}$.

14. a) i) Find the effect of coefficient quantization on pole location of the given second order IIR system, when it is realized in direct form I and in cascade form. Assume a word length of 4 bits through truncation (10)
$H(Z) = \frac{1}{1-0.9Z^{-1}+0.2Z^{-2}}$.

ii) For the given transfer function $H(Z) = H_1(Z)\ H_2(Z)$, where $H_1(Z) = \frac{1}{1-0.9z^{-1}}$ and $H_2(Z) = \frac{1}{1-0.8\,z^{-1}}$. Determine the output round off noise power. Calculate the value if b = 3 (excluding sign bit). (6)

(OR)

b) i) Find the steady state variance of the noise in the output due to quantization of input for the first order filter, y(n) = ay(n-1) +x(n). (6)

ii) Explain the characteristics of a limit cycle oscillation with respect to the system described by the difference equation, (10)
y(n) = 0.95y(n-1) + x(n). Determine the dead band of the filter.

15. a) i) Explain Decimation and interpolation both in time and frequency domain with necessary illustrations. (8)

ii) Write a short note on pipeline operation of TMS320C54X processor. (8)

(OR)

b) i) Explain various addressing modes of TMS320C54X processor. (8)

ii) Explain various arithmetic instructions of TMS320C54X processor. (8)

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS503 – Java Programming

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the meaning of each keyword in **public static void main (String args[ ])?**
2. How **for each** is different from **for** loop in Java?
3. List the two ways of creating thread in java.
4. What is the output of the following program segment? Justify your answer

```
final class A
{
int x, y;
public void add()
{
}
}
Class B extends A
{
}
```

5. Mention the stages involved in applet life cycle.
6. Compare **MouseListener** and **MouseMotionListener** interfaces in applet.
7. Write a java code for adding an event to **JButton** in swing.
8. Differentiate **JList** and **JComboBox** in swing.
9. Write down the syntax of methods in **ServerSocket** Class.
10. How will you connect database with java?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in detail about various types of looping statements in java with examples. (16)

(OR)

b) Explain in detail about the working of one dimensional and two dimensional arrays with examples. (16)

12. a) How will you implement multiple inheritance in java? Demonstrate with programming example. (16)

(OR)

b) Define a package named factorial that contains the method fact() to find the factorial of a given number. By importing the package factorial, Find the value of $nc_r=n!/(n-r)!\ r!$. Write a code in java for the above scenario. (16)

13. a) Write a Java Applet Code to accept the lines of text in **TextArea** and print the number of lines , words and characters in three different **Labels** on clicking the **Button** named "Count". (16)

(OR)

b) Write a Java Applet Code to accept the line of text in a **TextField** and on clicking on the **Button**, it should display the abbreviation of the inputted text in a **Label. (Hint: Input: Life Insurance Corporation, Output: LIC)** (16)

14. a) Describe about Grid Layout and Box Layout Managers in java with programming example. (16)

(OR)

b) Explain the usage of JTrees and JTables in swing with the programming example. (16)

15. a) Explain how will you execute TCP Client/Server program in java? Illustrate with an example. (16)

(OR)

b) Compare **Statement** class and **PreparedStatement** class in JDBC. Explain the usage of both the classes with the programming example. (16)

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE503 – Water Resources Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define hydrology.
2. Illustrate average annual rainfall.
3. What do you mean by reservoir?
4. List the types of reservoirs.
5. Define recharge.
6. What is aquitard?
7. Define recuperation.
8. Define Lacey's theory.
9. Define drainage.
10. Write the types of drainage systems.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain recording types of rain gauge with a sketch. (8)

ii) Discus the methods used for finding the average annual rainfall. (8)

(OR)

b) Describe the method of estimation of evaporation. (16)

12. a) i) Explain investigation for reservoir planning. (8)

ii) Explain the site selection for a reservoir. (8)

(OR)

b) What is sedimentation? Discuss the factors affecting it. (16)

13. a) i) Explain confined and unconfined aquifers with sketches. (8)

ii) Derive the discharge equation for steady flow in an unconfined aquifer. (8)

(OR)

b) Explain the two types of testing for finding the yield of a well. (16)

14. a) i) Discuss the various types of open and tube wells. (8)

ii) Explain Kennedy's theory for design of canals. (8)

(OR)

b) Explain various types of canal lining and materials used for it. (16)

15. a) i) Discuss the various causes of water logging. (8)

ii) Describe the remedial measures to control water logging. (8)

(OR)

b) Discuss the types of drainage systems with sketches. (16)

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B.E. Degree Examinations – April/May 2023

VII Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCEE03 – Ground Water Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the Components' of the hydrologic cycle.
2. Differentiate between confined and unconfined aquifer.
3. State Darcy's law.
4. State any two of the assumptions given by Dupuit Forchheimer.
5. List the advantages of Electrical Resistivity method.
6. What is meant by Collector Wells?
7. Define potable water.
8. Distinguish surface water from ground water.
9. Quote the methods of watershed management.
10. What is conjunctive use of irrigation water?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With a neat sketch explain the Hydrologic Cycle. (12)

ii) Write short notes on porosity. (4)

(OR)

b) i) What is meant by Permeability? Describe the procedure for conducting any one of the laboratory permeability test. (12)

ii) Write a note on spring and mention its types. (4)

12. a) i) Derive an expression for general ground water flow. (10)

ii) Give a detailed note on Specific Yield and Specific Retention. (6)

(OR)

b) i) Discuss about the unsteady radial flow in confined aquifer with its suitable equations. (10)

ii) Explain in detail about Jacob method. (6)

13. a) i) Describe the procedure of exploring the availability of ground water by seismic reflection and refraction methods. (12)

ii) Write short notes on well logging. (4)

(OR)

b) i) Discuss about the Remote Sensing techniques for exploring the ground water. (12)

ii) Explain briefly about infiltration galleries. (4)

14. a) i) Explain the laboratory procedure to determine the chloride and turbidity. (12)

ii) Recommend acceptable quality standards as per BIS 10500: 1983 for fluoride and nitrates. (4)

(OR)

b) i) Enumerate the importance, necessity and scope of ground water in Irrigation. (12)

ii) What are the adverse effects due to sea water intrusion? (4)

15. a) With a suitable case study, discuss about the artificial recharge of groundwater. (16)

(OR)

b) With a suitable case study, discuss about the large scale rain water harvesting techniques. (16)

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(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

VII Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEEE16 - Power Quality

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the power quality term as per IEEE.
2. What is meant by power frequency variations in power quality?
3. List out the three levels of possible solutions to voltage sag and momentary interruption problems.
4. Name the devices used for voltage regulation.
5. List the sources of over voltage.
6. When does Ferro resonance occur in a power system?
7. List the sources of harmonics.
8. Differentiate inter harmonic and sub harmonics.
9. What is the need for Power Quality Monitoring?
10. Name few devices used for Power Quality Monitoring.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the following electrical power quality issues in detail with examples i)Voltage Imbalance ii)Transient. (10)

ii) Explain briefly about international standard of power quality. (6)

(OR)

b) i) Discuss about the Computer Business Equipment Manufactures Associations (CBEMA) and ITI curves. Explain the events described in the curves. (10)

ii) Discuss about the Computer Business Equipment Manufactures Associations (CBEMA) and ITI curves. Explain the events described in the curves. (6)

12. a) i) Discuss the need for estimating sag performance and explain the different methods of estimating voltage sag Performance. (10)

ii) Explain any one voltage sag mitigation techniques with necessary circuit diagram and waveform. (6)

(OR)

b) Discuss the source and effects of different categories of long duration voltage variations that affect the power quality. (16)

13. a) Enumerate the different sources of transient over voltages and discuss the capacitor switching transient in detail. (16)

(OR)

b) i) Describe different methods of protection of transformers and cables against voltage transients. (10)

ii) List the advantages of computer analysis tools? Describe about PSCAD and EMTP for transient studies. (6)

14. a) i) Analyse how commercial and industrial loads are responsible for harmonic distortion. (8)

ii) Explain the IEEE and IEC standards on harmonics distortion. (8)

(OR)

b) i) Discuss the effects of harmonic distortion on transformers and motors. (8)

ii) Write the need for harmonic mitigation. Also explain active and passive filters. (8)

15. a) i) With neat sketch, explain the power line disturbance analyzer with a block diagram. (8)

ii) Enumerate the parameters monitored by using spectrum analyzer and explain. (8)

(OR)

b) i) With the help of a block diagram, explain the functioning of flicker meter. (8)

ii) Elaborate the perspectives of DG technologies and its effects on power quality. (8)

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B.E. Degree Examinations – April/May 2023

VII Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTMEE24 – Process Planning and Costing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term route sheet.
2. List down the advantage of tooling selection process in process planning.
3. Describe any two important quality assurance methods in selection of jigs and fixtures.
4. Define Economics of process planning.
5. What is the difference between costing and estimation?
6. What is overhead cost?
7. List out the various elements to be considered while calculating the cost of a welded joint.
8. What is meant by tong hold loss in forging?
9. Distinguish between feed and depth of cut.
10. Define machine hour rate.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the process planning activities in detail. (8)

ii) Elaborate the selection process of production equipment and tooling. (8)

(OR)

b) i) Define material evaluation? Explain in detail. (8)

ii) State about CAPP? Explain its types and advantages. (8)

12. a) i) Explain about how process parameters are calculated for various production processes. (8)

ii) List and explain the various factors to be considered for selection of measuring instruments. (8)

(OR)

b) i) List the procedures to be followed for the selection of jigs and fixtures? Explain in detail. (8)

ii) Outline the different types of inspection methods. Explain in detail. (8)

13. a) i) What are the various types and sources of data required for the cost estimator? Explain in detail. (8)

ii) Explain the procedure followed for estimating the cost of an industrial product. (8)

(OR)

b) i) Explain the data requirements and sources for cost estimation. (8)

ii) Explain any one method of calculating depreciation cost with an example. (8)

14. a) i) Explain in detail about the cost estimation for forging. (8)

ii) Explain the procedures to be followed while estimating the cost in a foundry. (8)

(OR)

b) i) In what way estimation criteria is varied in foundry compared to welding? (8)

ii) List and explain the various elements which are to be considered while calculating the cost of a welded joint. (8)

15. a) i) Explain the procedure of estimating the machining cost per piece in machining large number of bolts on a turret lathe. (8)

ii) Explain the importance of machine time calculation. (8)

(OR)

b) i) Estimate the planning time for a casting 1.25 m long and 0.5 m wide which is machined on a planer having cutting speed of 12 m/min and a return speed of 30 m/min. Two cuts are required: one roughing with a depth of 3.125 mm and a feed of 0.1 mm/rev and other finishing with a depth of 0.125 mm and using a feed of 0.125 mm. (8)

ii) Explain the machining time calculation methods for shaping and planning. (8)

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V Semester (Full Time)

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CIVIL ENGINEERING

18CE502 – Mechanics of Soils

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. The natural water content of a saturated soil is 30%. If the specific gravity of solids of the soil is 2.7. Find its porosity
2. Give the relationship between γ,G, e and S_r.
3. Mention the assumptions of Boussinesq's solution.
4. What is effective stress?
5. What is Seepage Velocity?
6. Write short explanatory notes on quick sand condition.
7. List the factors affecting compaction
8. Define: Coefficient of compressibility.
9. UCC strength of a clay was observed as 110 kN/m^2. What is its shear strength?
10. Why triaxial shear test is considered better than direct shear test?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Briefly explain about the I.S Soil Classification system. (16)

(OR)

b) A soil has a liquid limit of 45%, plastic limit of 20% and flow index of 50%. Determine its toughness index. If the natural water content is 25%, find its consistency index and comment on the state of its consistency. Also, classify the soil as per BIS if the fraction passing through 75-micron sieve is 60%. (16)

12. a) A 12 m thick layer of clay is underlined by a 4 m thick layer of sand. The water table is at a depth of 5 m from the ground surface. The unit weight of clay above the water table is 17 kN/m^3 and below the water table is 20 kN/m^3. Unit weight of sand is 19.1 kN/m^3. Draw the variation of total stress, pore water pressure and effective stress distribution diagrams with depth. (16)

(OR)

b) An elevated structure is supported on a tower with four legs. The legs rest on piers located at the corners of a square of side 7 m. if the value of vertical stress increment due to this loading (considering 4 equal concentrated loads is 25 kPa, at a point 8 m below the centre of the structure, find the magnitude of this concentrated load. (16)

13. a) Calculate the coefficient of permeability of a soil sample 6 cm in height and 50 cm^2 in cross sectional area, if a quality of water equal to 430 CC passed down in 10 minutes under an effective constant head of 40 cm. On oven drying, the test specimen weighed 4.98N. Taking specific gravity of the solids as 2.65. Calculate the seepage velocity of water during the test. (16)

(OR)

b) Explain the Constant Head permeability test in detail and list the properties of flow net. (16)

14. a) Briefly discuss about Standard Proctor Compaction Test. (16)

(OR)

b) A 2 cm thick laboratory soil sample reaches 50 % consolidation in 45 seconds under double drainage condition. Find how much time will be required for a 12 m thick layer in the field to reach the same degree of consolidation if it has drainage on one side only. (16)

15. a) Briefly discuss about the Direct shear test with neat diagram and its Limitations. (16)

(OR)

b) Two samples of soil were tested in a triaxial machine. The all-round pressure maintained for the first sample was 200 kN/m^2 and failure occurred at an additional axial stress of 770 kN/m^2. For the second sample these values were respectively 500 kN/m^2 and 1350 kN/m^2. Find C and φ values for the given sample. (16)

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V Semester (Full Time)

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COMPUTER SCIENCE AND ENGINEERING

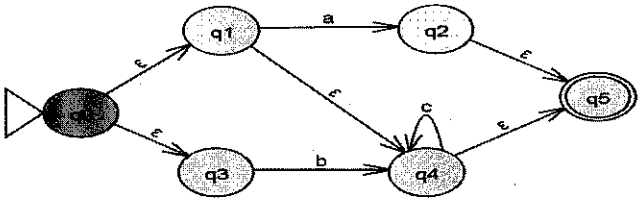
18CS502 – Theory of Computation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate DFA and NFA.
2. Find the ε-closure of all the states in the given automata.



3. Write a regular expression for the language, the set of all strings of 0's and 1's such that every pair of adjacent 0's appears before any pair of adjacent 1's.
4. State the decision properties of regular language.
5. Grammar G: S→SbS | a, is ambiguous? Justify.
6. List the closure properties of Context Free Grammar.
7. State the formal definition of Turing Machine.
8. What is mean by restricted Turing Machine?
9. Differentiate recursive and recursively enumerable languages.
10. When we say a problem is decidable? Give example for undecidable problem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Prove the ON/OFF switch statements by mutual induction. (10)

ii) Construct a DFA that accepts the string over an alphabet {0, 1}, number of 0's is multiples of 3. (6)

(OR)

b) i) Prove that the language L is accepted by an NFA, then there exist a DFA that accepts L. (8)

ii) Construct the equivalent DFA for the following ε-NFA. (8)

	a	b	c	ε
→p	{p}	{q}	{r}	Φ
q	{q}	{r}	Φ	{p}
*r	{r}	Φ	{p}	{q}

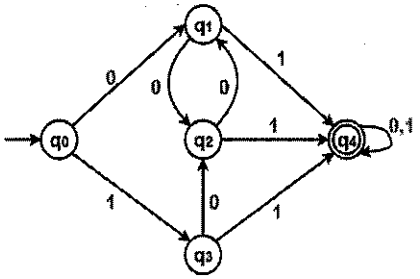
12. a) i) Find the regular expression for the following DFA (10)

	0	1
→*p	s	p
q	p	s
r	r	q
s	q	r

ii) Show that L = $\{0^n1^{2n} \mid n \geq 1\}$ is not regular. (6)

(OR)

b) i) Construct the minimal state DFA for the following automata. (10)



ii) Mention the closure properties of regular language. Prove any two properties. (6)

13. a) i) Construct a PDA to accept the language L = $\{a^nb^{2n} \mid n \geq 1\}$ by final state. (8)

ii) Convert the grammar (8)

S→0S1 | A

A→1A0 | S | ε, into a PDA P that accepts the same language by empty stack. Check whether 0110 belongs to L(P).

(OR)

b) i) Construct the CFG which accepts L(A) where A= $(\{q_0,q_1\},\{a,b\},$ $\{x, z_0\},\delta,q_0,z_0,\Phi)$ δ is given by (8)

$\delta(q_0,a,z_0) = \{(q_0,xz_0)\}$

$\delta(q_0,a,x) = \{(q_0,xx)\}$

$\delta(q_0,b,x) = \{(q_1,\varepsilon)\}$

$\delta(q_1,b,x) = \{(q_1,\varepsilon)\}$

$\delta(q_1,\varepsilon, z_0) = \{(q_1,\varepsilon)\}$

$\delta(q_1,\varepsilon,x) = \{(q_1,\varepsilon)\}$

ii) Convert the following CFG into CNF (8)

S→aAa | bBb

A→C | a

B→C | b

C→CDE | ε

D → A | B | ab

14. a) i) Design a Turing machine that accepts all palindromes over {0, 1}. (8)

ii) Explain the various programming techniques for Turing machine construction. (8)

(OR)

b) Construct a Turing Machine M for f(x, y)=x*y is stored in the tape in the form of 0^x10^y . Illustrate the multiplication for 7*3. (16)

15. a) i) Show that "If a language L and its complement L' are both recursively enumerable. Then L is recursive". (8)

ii) Prove that halting problem of Turing Machine is undecidable. (8)

(OR)

b) i) Explain the NP –complete problem with example. (8)

ii) Describe restricted satisfiability problem with example. (8)

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V Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE502 – Control Systems

(Polar Chart, Semi-log graph sheet and ordinary graph sheet to be provided)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the components of a feedback control system?
2. What is signal flow graph? Give any two properties of signal flow graph.
3. Name the test signals used in control system.
4. Mention two advantages of generalized error constants over static error constants.
5. Write the correlation between time domain and frequency domain Specifications.
6. What is phase cross-over frequency?
7. State Nyquist stability criterion.
8. What are the requirements for BIBO stability?
9. Why compensation is necessary in feedback control system?
10. When lag/lead and lag-lead compensation are employed?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write differential equations governing mechanical rotational system shown in figure.1. Draw Torque-voltage and Torque – current electrical analogous circuits and verify by writing mesh and node equations. (10)

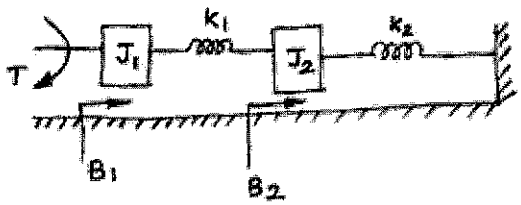

Figure.1.

ii) Explain how Synchros is used as error detector. (6)

(OR)

b) i) Using block diagram reducing technique, find the closed loop transfer function C(s)/R(s) for the system shown in figure.2. (10)

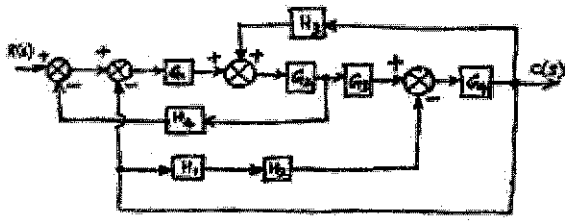

Figure.2.

ii) Drive the transfer function of an armature controlled DC servomotor. (6)

12. a) i) Determine the unit step input response for a positional control system with velocity feedback is shown in Figure.3. (10)

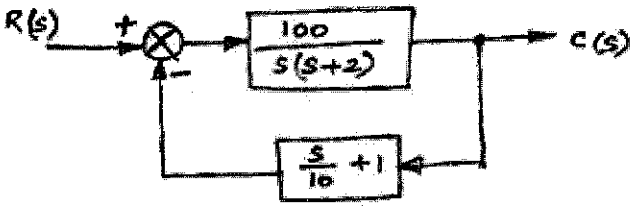

Figure.3.

ii) Derive an expression for peak time of a typical second order under damped system. (6)

(OR)

b) i) A unity feedback control system is characterized by the following open-loop transfer function. Determine steady state error for unit step, unit ramp and unit parabolic input. Also determine the damping ratio, and natural frequency of the dominant roots $G(s) = \frac{1}{s(1+0.5s)(1+0.2s)}$. (10)

ii) Discuss the effect of the PI controller on the performance of a second order system. (6)

13. a) Consider a unity feedback system having an open loop transfer function is $G(s) = \frac{K}{s(1+0.5s)(1+4s)}$. Sketch the polar plot and determine the value of 'K' so that i) gain margin is 20 dB and phase margin is 30°. (16)

(OR)

b) i) Sketch Bode plot for the given open loop transfer function and determine the system gain K for the gain cross over frequency to be 5 rad/sec. $G(s)\,H(s) = \frac{K\,S^2}{(1+0.2S)(1+0.02S)}$. (12)

ii) Explain how the closed loop frequency response is determined from open loop frequency response using Nichols chart. (4)

14. a) i) Sketch the root locus for the unity feedback system whose open loop transfer function is $G(s)\,H(s) = \frac{K}{S(S+4)(S^2+4S+20)}$. (12)

ii) Briefly explain how the stability of a control system is determined using Routh-Hurwitz criterion. (4)

(OR)

b) Draw the Nyquist plot for the unity feedback control system whose open loop transfer function $G(S)\,H(S) = \frac{K}{S(S+4)(S+10)}$. Determine the range of K for which closed loop system is stable. (16)

15. a) i) Consider a unity feedback system with Open loop transfer function $G(S) = \frac{K}{S(S+8)}$. Design a lead compensator to meet the following specifications. (12)

1) Percentage peak overshoot = 9.5%,
2) Natural frequency of oscillations, w_n = 12 $rad/sec.$
3) Velocity error constants, K_v = 10 sec^{-1}.

ii) Draw the electric network realization of a lag compensator. Also draw its frequency response characteristics. (4)

(OR)

b) Consider a unity feedback system whose open loop transfer function is $G(s) = \frac{K}{S(S+4)(S+8)}$. Design a phase lag series compensator to meet the following specifications. (16)

i) Velocity error constants, K_v = 80 sec^{-1},
ii) Phase margin, to be at least 33°.

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V Semester (Full Time)

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MECHANICAL ENGINEERING

18ME502 – Instrumentation and Control

(Polar graph and graph sheet to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is transducer?
2. Classify sensors.
3. Define Resolution?
4. What is the function of amplifier?
5. Define analog to digital converter.
6. What are the types of Counters?
7. Explain open loop and closed loop systems.
8. Name the test signals used in time response analysis.
9. Discuss about the servomechanism.
10. Show the important of frequency response.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Classify the sensor and explain with example. (8)

ii) List the components of generalized measurement system with examples. (8)

(OR)

b) i) Discuss errors in measurement and its types. (8)

ii) Explain the generalized performance of zero order, first order and second order system with example. (8)

12. a) i) Elucidate in detail about Wheatstone Bridge. (8)

ii) What is a chopper? Explain the working of step-up chopper and step - down chopper with neat diagram. (8)

(OR)

b) i) Classify an amplifier. Mention the applications of amplifier. (8)

ii) Elucidate the working of any type of voltage to frequency converters (VFC). (8)

13. a) i) What is DMA? Explain the operations of DMA and mention its advantages, disadvantages. (8)

ii) Write a brief note on programmable logic controller and with a neat sketch? (8)

(OR)

b) i) What is Data acquisition? Explain the importance of data acquisition. (8)

ii) Explain detail about multi-channel data acquisition system. (8)

14. a) i) Derive the equation of static position error coefficient and static velocity error coefficient. (8)

ii) Derive the equation of static acceleration error coefficient. (8)

(OR)

b) i) Derive the equation of steady state error when the input is unit parabolic signal? (8)

ii) Explain static velocity error coefficient. (8)

15. a) The open loop transfer function of a unity feedback system is given by $G(s) = \frac{1}{s(1+s)(1+2s)}$. Sketch the polar plot and determine the gain margin and phase margin. (16)

(OR)

b) A unity feedback control system has $G(s) = \frac{1}{s(1+0.4s)(1+0.1s)}$. Draw the Bode plot and obtain the gain and phase cross over frequencies. (16)

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III Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTCY301 – Environmental Science and Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term Deforestation.
2. Mention the factors causing soil erosion.
3. What are the components of an ecosystem?
4. Explain endangered and endemic species.
5. What is meant by BOD and COD?
6. Define Noise pollution.
7. Elaborate on acid rain.
8. Inspect disaster management system.
9. list the advantages of the rain water harvesting.
10. Write the expansion for HIV and AIDS.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Identify and discuss briefly ill-effects' of deforestation.	(8)
		ii)	Explain the adverse environment impacts of modern agriculture.	(8)
			(OR)	
	b)	i)	Explain the environmental damage caused by mining activities.	(8)
		ii)	Discuss various types of land degradation with causes and solution.	(8)
12.	a)	i)	Discuss the components of the ecosystem.	(8)
		ii)	Briefly explain the energy flow through ecosystem.	(8)
			(OR)	
	b)	i)	Explain the factor that gives threat to biodiversity.	(8)
		ii)	Briefly explain the conservation of bio-diversity.	(8)

13. a) i) Explain the causes, effects and control measures of air pollution. (8)

ii) Define particulate matter? How it is controlled. (8)

(OR)

b) i) Explain the causes, effects and control measures of water pollution. (8)

ii) Discuss the sources, consequences and control measures of Noise pollution. (8)

14. a) Write short notes on Green House Effects. (8)

Critically examine Ozone layer depletion with names of chemical causing gone layer depletion. (8)

(OR)

b) List out the types of solid waste. Explain the concept of solid waste processing and solid waste management. (16)

15. a) i) Elaborate on is sustainable development and explain its concepts? (8)

ii) What is rain water harvesting? Explain its needs and significance. (8)

(OR)

b) i) Write notes on wasteland reclamation. (8)

ii) Identify causes of population explosion and discuss the Consequences. (8)

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III Semester (Part Time)

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ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC305 – Electronic Measurements and Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between Accuracy and Precision.
2. What measurements can be measured using a Digital multimeter?
3. Compare the relation between Signal generator and Signal analyzers.
4. What are the waveforms generated by a Function generator?
5. Write some of the applications of CRO.
6. List the advantages of DSO.
7. Classify Bridges and give examples for each.
8. How will you measure Inductance?
9. What is Strain gauge? List its types.
10. Compare the difference between active and passive Transducer.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)		Explain about different types of Errors that occur in measurements.	(16)
			(OR)	
	b)		Explain the Constructional details and the difference between Series and Shunt type ohmmeter.	(16)
12.	a)		Explain Sine wave and Square wave Signal generators in detail.	(16)
			(OR)	
	b)		Draw block diagram and explain the working of Function generator.	(16)
13.	a)	i)	Discuss about Frequency Measurement using Lissajous method.	(8)
		ii)	Explain the working of Dual Trace Oscilloscope.	(8)
			(OR)	
	b)	i)	Discuss the various features of MSO with suitable applications.	(8)
		ii)	Write short notes on Digital storage Oscilloscope.	(8)

14. a) Explain the basic principle and operation of Wheatstone bridge and derive the expression for unknown resistance. (16)

(OR)

b) Explain Maxwell's bridge and Schering Bridge Measurement Techniques. (16)

15. a) Explain the principle of the following transducer

i) Thermistor (8)

ii) LVDT. (8)

(OR)

b) Write short notes on

i) Piezo electric transducer (8)

ii) Data Acquisition System. (8)

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III Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE304 – Structural Analysis - I

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define static and kinematic indeterminancy of a structure.
2. What is the condition at which maximum absolute bending moment occurs in the simply supported beam when an UDL of length less than span of the beam move on it?
3. Explain the term 'Influence line diagram' and state its uses.
4. Draw the influence line diagram for the reactions of a simply supported beam 10 m span.
5. Find the bending moment at a section 4 m from the left end of a three hinged parabolic arch due to UDL of 10 kN/m over entire span 30 m.
6. What is Rib shorting effect in two hinged arch?
7. What is the need for cable structures?
8. Draw typical sketch of a suspension bridge and indicate it important components.
9. What is shape function?
10. State upper bound theorem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Two wheel loads of 70 kN and 150 kN cross a span of 12 kN from left to right. The 70 kN wheel is 3 m ahead of the 150 kN wheel. Find the following force values and their locations. (16)
    i) The absolute maximum positive shear
    ii) The absolute maximum negative shear
    iii) The absolute maximum bending moment

(OR)

b) A series of concentrated loads of 10 kN, 16 kN, 24 KN, 8 kN & 12 kN having 7 m, 6 m, 5 m & 7 m distance respectively apart between them passes over the span of 50 m with 12 kN load leading. Find the maximum bending moment at section 20 m from the left support. (16)

12. a) Five wheel loads 10 kN, 20 kN, 15 kN, 16 kN and 24 kN spaced at 1m intervals roll on a girder of span 20 m, from left to right, with the 10 kN load leading. Find the absolute maximum Bending moment on the girder. Use influence lines. (16)

(OR)

b) Draw the influence line diagrams for shear force and bending moment for a section at 5 m from the left support of a simply supported beam, 20 m long. Hence determine the maximum shear force and bending moment at the section due to an uniformly distributed load of length 8 m and intensity 10 kN/m. (16)

13. a) A three hinged parabolic arch has a horizontal span of 30 m with a central rise of 5 m. A point load of 10 kN moves across the span from left to right. Calculate the maximum positive and negative moments at a section 8 m from the left hinge. (16)

(OR)

b) Derive the expression for the thrust in a two hinged parabolic arch carrying a point load P at a distance one fourth span from left support. Assume $l=l_o\sec\theta$. (16)

14. a) A cable is used to support five equal and equidistant loads over a span of 30 m. find the length of the cable required and its sectional area if the safe tensile stress is 140 N/mm^2. The central dip of the cable is 2.5 m and loads are 5 kN each. (16)

(OR)

b) A suspension cable of span 50 m is stiffened by a three hinged girder. The dead load is 10 kN/m. Determine the maximum bending moment in the girder due to the passage of a concentrated load of intensity 100 kN from left to right. Determine the maximum tension in the cable. (16)

15. a) A uniform beam of span 4 m and fully plastic moment M_p is simply supported at one end and rigidly clamped at other end. A concentrated load of 15 kN may be applied anywhere within the span. Find the smallest value of M_p such that collapse would first occur when the load is in its most unfavourable position. (16)

(OR)

b) A two span continuous beam ABC has span lengths AB = 8 m and BC = 8 m and carries a UDL of 25 kN/m completely covering the spans AB and BC. A and C are simple supports. If the load factor is 1.70 and the shape factor is 1.2 for the 'I' section, find the section modules needed. Assume yield stress for the material as 250 N/mm^2 (16)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME501 – Heat and Mass Transfer

(Heat and mass transfer data book and steam tables may be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down general three dimensional heat conduction equation in cartesian coordinates.
2. A fin attached to a surface shows an effectiveness of 0.9. Do you think the heat transfer rate from the surface has increased or decreased with the addition of fin? Comment on this.
3. In which mode of heat transfer is the convection heat transfer coefficient usually higher, natural convection or forced convection? Why?
4. Show the development of velocity boundary layer on a flat plate.
5. Classify the heat exchanger according flow type.
6. What is the difference between film and dropwise condensation? Which is a more effective mechanism of heat transfer?
7. Distinguish between black body and gray body.
8. What are the radiation surface and space resistances? How are they expressed? For what kind of surfaces is the radiation surface resistance zero?
9. State Fick's Law of diffusion.
10. What is meant by equimolar counter diffusion?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Steam pipe having inner and outer diameters are D_1 = 5 cm and D_2 = 5.5 cm, respectively is at T_1 = 300°C and flows in a cast iron pipe (k = 80 W/m°C). The pipe is covered with 3-cm-thick glass wool insulation with k = 0.05 W/m°C. Heat is lost to the surroundings at T_2 = 5°C by natural convection with a heat transfer coefficient of h_2 = 18 W/m² °C. Taking the heat transfer coefficient inside the pipe to be h_1 = 60 W/m² °C. (6)

1) Determine an expression for total thermal resistance for the given situation.
2) Draw thermal circuit and express all resistances in it.
3) Determine the rate of heat loss from the steam per unit length of the pipe.

ii) Three identical straight fins, 10 mm in diameter and 120 mm long are exposed to an ambient with convection heat transfer coefficient of 32 W/m^2K. The three fin materials and their thermal conductivities are : (10)

Copper : 380 W/m^2K

Aluminium: 210 W/m^2K

Mild steel : 45 W/m^2K

Calculate the following:

1) Fin efficiency.
2) Heat dissipation rate for each fin.

(OR)

b) i) 1 m long, 5 cm diameter, cylinder placed in an atmosphere of 40°C is provided with 12 longitudinal straight fins (k = 75 W/m^2K), 0.75 mm thick. The fin protrudes 2.5 cm from the cylinder surface. The heat transfer coefficient is 23.3 W/m^2K. If the surface temperature of cylinder is at 150°C, calculate the following: (10)

1) The heat transfer rate from the fins.
2) The heat transfer rate from the base area.
3) Total heat transfer rate.

ii) An aluminium sphere weighing 6 kg and initially at temperature of 350°C is suddenly immersed in a fluid at 30°C with convection coefficient of 60 W/m^2K. (6)

Find the validity of the lumped system analysis.

Find the time required to cool the sphere to 100°C.

Consider the following thermo physical properties:

C = 900 J/kg K

ρ = 2700 kg/m^2

k = 205 W/mK.

12. a) In a staggered bank tube, water is passed through the tubes while the air is passed in cross flow over the tubes. There are seven rows of tubes in the air flow direction. The temperature and velocity of air are 15°C and 6 m/s. The longitudinal and transverse pitches are both equal to 20.5 mm. The tube outside diameter is 16.4 mm and the tube surface is 70°C. Assume friction factor (f) being 0.4 and correction factor (g) being 1.04. Calculate the air side heat transfer coefficient. (16)

(OR)

b) A vertical pipe of 20 cm diameter, at a surface temperature of 100°C is in a room where the air is at 20°C. The pipe is 3 m long. What is the rate of heat loss per metre length of the pipe? (16)

13. a) i) In a double pipe counter flow heat exchanger; 10,000 kg/h of an oil having a specific heat of 2095 J/kg K is cooled from 80°C to 50°C by 8000 kg/h of water entering at 25°C. Assume overall heat transfer coefficient of 300 W/m^2 K and C_p for water as 4180 J/kg K. (12)

1) Show the Temperature distribution along the length of the heat exchanger.
2) Determine Logarithmic Mean Temperature Difference (LMTD)
3) Determine the heat transfer rate.
4) Determine the heat exchanger area for the given heat exchanger.

ii) Draw different regimes of pool boiling curve of heat flux vs excess temperature for water. (4)

(OR)

b) i) Water enters a cross flow heat exchanger (both fluids unmixed) at 5°C and flows at the rate of 466 kg/h to cool 4000 kg/h of air that is initially at 40°C. Assume overall heat transfer coefficient of 150 W/m^2 and surface area of 25 m^2. (12)

1) Determine NTU
2) Determine Effectiveness of the heat exchanger
3) Actual heat transfer rate
4) Calculate the exit temperature of air and water.

ii) Write down the assumptions made in Nusselt's analysis of film condensation. (4)

14. a) i) Calculate the shape factor F_{13} and F_{14} for the given arrangement shown in figure.1. (12)

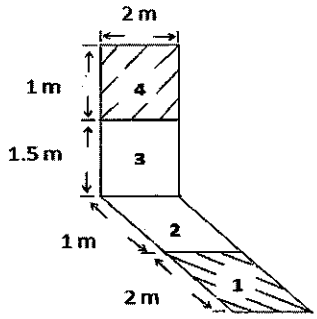

Figure.1.

ii) Emissivities of two large parallel plates maintained at 800°C and 300°C are 0.3 and 0.5 respectively. (4)

i. Draw the radiation network showing all the surface and shape resistances for this case.

ii. Find the net radiant heat exchange per square metre of these plates.

(OR)

b) i) The net radiation from the surfaces of two parallel plates maintained at temperatures T_1 and T_2 is to be reduced by 79 times. Assume the emissivity of the screens as 0.05 and that of the surface as 0.8. (12)

i. Draw the radiation network showing all the surface and shape resistances for the case of two parallel plates if no shield is present in it.

ii. Calculate the number of shields (N) to be placed between the two surfaces to achieve this reduction in heat exchange

iii. Draw the radiation network showing all the surface and shape resistances for the case of two parallel plates with N shields present in it.

ii) A heating furnace of total surface area $30m^2$ and volume $10m^3$ is maintained at a temperature of 1000^0C over its entire volume. The total pressure of the combustion gases is 1 atm, the partial pressure of water vapour is 0.1 atm and that of CO_2 is 0.3 atm. Calculate the emissivity of the gaseous mixture. (4)

15. a) A mixture of O_2 and N_2 with the partial pressures in the ratio 0.21 to 0.79 is in a container at 25^{0}C. (16)

Calculate the following for each species at total pressure of 1 bar:

i) Molar concentration

ii) Mass density

iii) Mole fraction

iv) Mass fraction

v) Average molecular weight of the mixture.

(OR)

b) Air at 25°C and atmospheric pressure, containing small quantities of iodine flows with a velocity of 5 m/s inside a 3 cm diameter tube. Take D_{AB} (iodine-air) = 0.82 X10^{-5} m^2/s. Determine the mass transfer coefficient from the air stream to the wall surface. (16)

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Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE501 – Basic Structural Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate static indeterminacy from kinematic indeterminacy.
2. What is Equivalent UDL?
3. Recall the Betti's theorem.
4. Write the demerits of Thermal stresses.
5. What are advantages of arches?
6. Define: Linear arch.
7. List out the components of suspension bridge with sketch.
8. What is the necessity to use stiffening girder in cable stayed bridges?
9. Derive the Shape factor for rectangular section.
10. Under what circumstances plastic hinge is developed?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A simply supported girder has a span of 20 m. A moving load consisting of a uniformly distributed load of 1.8 kN/m over a length of 5.5 m headed by a concentrated load of 3 kN moving at 2 m in front of the distributed load crosses the beam. Find (16)
    i) The point of the beam at which greatest bending moment occurs
    ii) The position of load where it is occurs,
    iii) The value of the greatest B.M. Use Equilibrium Equations to analyze.

(OR)

b) The following system of concentrated loads roll from left to right on a span of 15 m , 4 kN load leading; (16)

Load :	2	6	6	5	4	kN
Distance :	1.5	1.5	2	1		Meters

For a section 4 m from the left-hand support, by using ILD determine the i) the maximum bending moment ii) maximum shear force.

12. a) A continuous beam (ABC) has two span of AB (6 m) and BC (4 m). Hinged support is provided at A and roller supports are provided at B and C. Moreover, Internal hinge is provided at middle of span BC. Using Muller Breslau Principle, develop ILD for B.M at section 2m from A. Also draw ILD for reactions at supports A,B and C. (16)

(OR)

b) In the given truss, the number BD is initially shorter by 10 mm than it's required length. Area = 10,00 mm^2 and E = 2 x 10^5 MPa for all the members. Find the forces in all the numbers. (16)

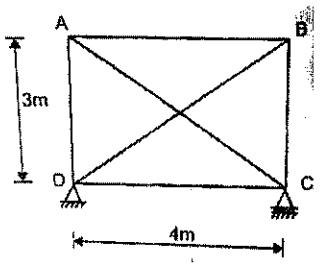

Figure.1.

13. a) A three hinged parabolic arched rib ACB with supports at different levels. It has horizontal span of 15 m, the hinge at the crown (C) being at 6 m horizontally from A and 2 m vertically above it. Calculate the difference between the levels of supports A and B. The arch carries a UDL of 20 kN per meter from A to C. Calculate the horizontal thrust and negative bending moment. (16)

(OR)

b) A three hinged circular arches of span 25 m and rise 5 m is subjected to two-point loads of 150 kN and 100 kN at the left and right quarter span points respectively. A UDL of 10 kN/m is acting over left half of the span. Find the reactions at supports. Also, Find the bending moment, radial shear and normal thrust at 10 m from the left support. (16)

14. a) A suspension cable of span 180 - meter hangs between two supports at the same level. It carries a UDL of 30 kN per meter over the entire span. The dip of cable is 16.5 m and the slope of anchor cable at the top of the tower is 35 degrees with the horizontal. Determine the horizontal and vertical reactions on the top of towers if i) the cable passes over here frictionless pulley ii) the cable passes over a saddle supported on frictionless rollers. (16)

(OR)

b) A cable is hung between 2 points at a horizontal distance of 120 meter. The vertical distance between two supports is 24 m. It carries three vertical loads of 60 kN, 75 kN and 30 kN at horizontal distances of 30 m, 60 m, and 90 m from the left support respectively. Determine the cable profile, maximum tension in the cable and length of cable. Also determine diameter of the cable if safe tensile capacity of material is 600 MPa. (16)

15. a) Derive the shape factor for a triangular section whose base makes perpendicular to horizontal plane. (16)

(OR)

b) Determine plastic moment for the continuous beam ABC of span 9 m, fixed at A and hinged at B and C. Span AB (6 m) carries central point load of 40 kN and span BC (3 m) carries UDL of intensity 15 kN/m. (16)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC501 – Digital Communication

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the two sources of noise in PCM system that affects the performances of the PCM system.
2. For a pulse amplitude modulated transmission of voice signal having maximum frequency equal to f_m = 3 KHz, calculate the transmission bandwidth. Given that f_s = 8 KHz and pulse duration t = $0.1T_s$.
3. What is Correlative coding?
4. Draw the Non return to zero unipolar format and Manchester format for the binary data 0110100011.
5. Define the bandwidth of M-ary PSK.
6. In BPSK system, the bit rate of NRZ data stream is 1 Mbps and carrier frequency is 100 MHz. find the symbol rate of transmission and bandwidth requirement of the channel.
7. Compare Linear block code and Cyclic code.
8. The generator polynomial of a (7, 4) cyclic code G (p) = $p^3 + p + 1$, the code vectors for the message input (1011).
9. What are the advantages and disadvantages of Spread Spectrum?
10. List the properties of Maximum length sequence.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Derive the maximization of output signal to noise ratio using matched filter receiver. (8)

    ii) Draw and explain the transmitter and receiver section of adaptive delta modulation system. (8)

(OR)

    b) i) Describe the essential operations in the transmitter and receiver of PCM systems. (8)

    ii) Compare various sampling techniques. (8)

12. a) A binary data "011100101" is applied to the input of a modified duobinary system. (16)

i) Construct the modified duobinary coder output and corresponding receiver output without precoding.

ii) Construct a new receiver output, if the third digit is reduced to zero.

(OR)

b) i) What is the effect of ISI? What information are obtained from eye diagram? (8)

ii) Derive the power spectral density of NRZ polar format. (8)

13. a) i) Describe the generation and detection of Binary Phase Shift Keying signal. (8)

ii) Derive the power spectral density of Quadrature Phase Shift Keying and draw the power spectrum. (8)

(OR)

b) i) Derive the probability of error of Minimum Shift Keying (MSK) and the method of generation and detection of MSK signaling scheme. (8)

ii) Compare the performance of BPSK and DPSK. (8)

14. a) i) For the given (7, 4) linear block code, find all the code vectors, whose generator matrix is given by (8)

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

ii) Explain the properties of Cyclic codes. (8)

(OR)

b) i) Discuss briefly about Viterbi algorithm. (8)

ii) Determine CRC for the frame 110101011 and the generator polynomial is $x^4 + x + 1$ and write the transmitted frame. (8)

15. a) i) Explain the direct sequence spread spectrum coherent PSK transmitter and receiver. (8)

ii) Describe the applications of spread spectrum modulation scheme. (8)

(OR)

b) i) Discuss in detail about FHSS. (8)

ii) Discuss on the performance parameters of Direct sequence spread spectrum system. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18CSOE06 – Computer Organization and Architecture

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare single bus structure and multiple bus structure.
2. Identify the 2's complement of -22 & -15.
3. State the conditions for overflow.
4. Mention the steps involved in carry save addition.
5. Define a stall in pipelining.
6. Identify the steps involved in execution of a complete instruction.
7. List the types of ROM.
8. Illustrate memory hierarchy based on speed, size and cost.
9. State the purpose of DMA.
10. List some standard I/O interfaces.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain different types of addressing modes with example. (16)

(OR)

b) Differentiate the types of computers. Also, depict and explain the functional units of a computer with examples. (16)

12. a) i) Given x =11 and y = -8 compute the product p = x * y with Booth's Algorithm. (8)

ii) Find 11/8 using non-restoring division. (8)

(OR)

b) i) Formulate C4 for a 4-bit carry lookahead adder using generate and propagate functions. (8)

ii) Explain ripple carry adder with example. (8)

13. a) i) An instruction pipeline consists of 4 stages: Fetch (F), Decode field (D), Execute (E), and Result-Write (W). The 5 instructions in a certain instruction sequence need these stages for the different number of clock cycles as shown by the table below. Find the number of clock cycles needed to perform the 5 instructions. Show the steps. (8)

Instructions	F	D	E	W
1	1	2	1	1
2	1	2	2	1
3	2	1	3	2
4	1	3	2	1
5	1	2	1	2

ii) Explain how hazards influence the instruction set. (8)

(OR)

b) i) Sketch single bus organization structure and explain the steps involved in performing an operation. (8)

ii) Interpret hardwired control technique with example. (8)

14. a) Discuss deeply about the mapping functions in Cache memory. (16)

(OR)

b) Examine the concept of virtual memory and address translation. (16)

15. a) Explain about interrupts. How interrupts from multiple devices are handled? (16)

(OR)

b) Show how data is transferred on PCI bus. Explain. (16)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECPE808 – Physics of Sensors

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the applications of emerging sensor technologies.
2. Distinguish between Capacitive and inductive type displacement sensor.
3. What is eddy current proximity sensor?
4. What are the different types of strain gauge?
5. What type of sensor is tachogenerator?
6. What is the use of rotameter?
7. Give the temperature and resistance range of thermistor.
8. Classify photodiodes and specify its characteristics.
9. How chemical sensors differs from biosensors?
10. Distinguish force and pressure micro sensors.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Classify different types of sensors.	(8)
		ii)	Describe the construction and working of photoelectric sensor.	(8)
			(OR)	
	b)	i)	Explain briefly about the dynamic characteristics of sensors.	(8)
		ii)	What is meant by characterization of a sensor? Explain briefly about Hall effect sensor.	(8)
12.	a)	i)	Describe the basic working principle of Tactile sensor.	(8)
		ii)	Discuss in detail various types of proximity sensors and analyse the same.	(8)
			(OR)	
	b)	i)	Explain Piezoelectric sensors with neat diagram.	(8)
		ii)	Distinguish between Diaphragm pressure and capsule pressure.	(8)

13. a) i) How does an ultrasonic sensor work? Explain in detail. (8)

ii) What is the actual flow, if the operating pressure is higher then the designed pressure? (8)

(OR)

b) i) What is the basic principle of electromagnetic flow meter? (8)

ii) Compare Float level sensor, Pressure level sensor and variable capacitance sensor. (8)

14. a) i) Sketch the schematic of photo resistive sensor and how it can be used for smart lighting system? (8)

ii) Design a Thermo transistor sensor and bimetallic strip thermometer with detailed specifications. (8)

(OR)

b) i) Analyze infrared thermography and how it is utilized in medical imaging system? (8)

ii) Design a temperature monitoring system for a smart home using thermistor sensor. (8)

15. a) i) Analyze the different principles of micro actuators and how one-way effect is differs from two-way effect? (8)

ii) Design a piezo resistive pressure sensor with detailed specifications. (8)

(OR)

b) i) Design a biosensor for monitoring immune system of a human body using an optical transducer. (8)

ii) Sketch the rotational speed sensor using A 200 μm thick tuning fork arrangement for industrial automation systems. (8)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MTE21 – Ferrous and Non Ferrous Alloys

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List austenite and ferrite stabilisers.
2. Give few applications of HSLA steels.
3. What is ferritic stainless steel?
4. Why Fe-18%Cr-8%Ni alloy is so special?
5. Suggest alloys for bus conductor, bus bars and anodes for vacuum tubes.
6. Name few high temperature applications of cupronickel alloys.
7. What are the aluminum alloys chosen for aircraft applications? Why?
8. How are Mg-Al and Mg-Al-Zn alloys grain refined?
9. What are TCP phases in Nickel based super alloys?
10. Give the desirable properties of ZA casting alloys.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the aging mechanism of maraging steel for the improvement of its properties. (8)

ii) Explain the strengthening mechanism of micro alloy steels for the improvements of the mechanical properties. (8)

(OR)

b) Explain the composition, properties and applications of following steels. (16)

a) High carbon steels,

b) Ultra high strength steels,

c) creep resistant steels.

12. a) i) Write note on few important grades, its composition properties and microstructure of Austenitic Stainless Steel. (10)

ii) Discuss intergranular corrosion of Austenitic Stainless Steel. And suggest the remedial measures to remove IGC in Austenitic Stainless Steel. (6)

(OR)

b) i) Explain the precipitation mechanism, properties and microstructure of 17-7PH stainless steel. (12)

ii) List the application of above stainless steel. (4)

13. a) i) What is brass? List the alloys of Brass. (6)

ii) Explain the composition, properties and applications of any four Brasses. (10)

(OR)

b) i) Explain precipitation sequences and mechanisms of Cu-Be alloy. (8)

ii) Discuss in what way is the Cu-Al phase diagram at 11.8%Al is similar to Fe-Fe3C diagram at 0.8%C. (8)

14. a) i) Write the classification of wrought and cast Aluminum alloys. (6)

ii) Discuss the heat treatment of Al –Li alloy. Show its microstructure and its potential applications. (10)

(OR)

b) i) How Ti and its alloys are classified based on its phases present in it? (4)

ii) Explain the composition, properties and applications of alpha and near alpha Ti alloys. (12)

15. a) i) Discuss the strengthening and undesirable phases in Nickel based super alloys. (8)

ii) What is ODS alloys? Give its heat treatment, properties and applications. (8)

(OR)

b) i) What are the advantages and disadvantages of Zinc alloy in Engineering design? (8)

ii) Explain the suitability of Lead –Tin alloys as solder and bearing materials. (8)

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(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

V & VI Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING/MECHANICAL ENGINEERING

18EEOE01 – Renewable Energy Sources

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Specify the need for reserves of Energy resources.
2. List the advantages of renewable energy resources.
3. Mention few methods of solar radiation measurements.
4. Compare flat plate collectors and liquid plate collectors.
5. Mention the role of drag and lift forces in wind turbines.
6. Compare horizontal and vertical Wind Energy Systems.
7. Compare the updraft and downdraft gasifiers.
8. How cogeneration is beneficial?
9. Specify the components of ocean thermal energy conversion system.
10. List the different types of Fuel cell systems?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Brief about environmental aspects of energy utilization.	(6)
		ii)	Elaborate about the renewable energy scenario in Tamilnadu.	(10)
			(OR)	
	b)		Discuss the impact of renewable energy generation in low-emission and resource-efficient greening of India's economy.	(16)
12.	a)	i)	Write short notes on photovoltaic effect in solar cells.	(6)
		ii)	Design a basic photovoltaic system for power generation and elaborate its working principle to extract solar energy.	(10)
			(OR)	
	b)		With a neat sketch, elucidate the physical principle of conversion of solar radiation into heat using concentrating collector type.	(16)

13. a) i) Discuss the basic principle of wind energy conversion and derive its expression for maximum power in wind. (10)

ii) Specify the basic components of a wind energy conversion system with a neat block diagram. (6)

(OR)

b) i) Discuss the working principle of any two types of Wind turbine generator. (10)

ii) Specify the advantages and disadvantages in wind energy conversion system. (6)

14. a) Compare fixed bed type and fluidized bed type of gasifiers. (16)

(OR)

b) Illustrate the working of Floating drum type and Fixed dome type of biogas plant. (16)

15. a) Compare the working principle of open cycle and closed cycle Ocen Thermal Energy Conversion system. (16)

(OR)

b) With a neat sketch, elaborate the main components and working of Hydrogen fuel cell system. (16)

Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTMEE16 – Nuclear Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the importance of determining Half Time period.
2. Comment on the term mass-energy equivalence.
3. Suggest the most commonly used nuclear fuel and state why?
4. How does the critical mass determined for a nuclear fusion reaction?
5. What are the useful byproducts of a reactor?
6. What do you mean by reprocessing of nuclear fuels?
7. What is called doubling time in breeding reactor?
8. What do you understand by the critical size of the reactor?
9. What are solid radioactive waste materials?
10. Write about the possible biological damages due to radiations from nuclear reactors.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Compare various nuclear models of an atom.	(8)
		ii)	Briefly explain and comment on the predictions of the shell model.	(8)
			(OR)	
	b)	i)	Explain the Transmission method for determining the Nuclear cross section.	(8)
		ii)	Discuss the types of scattering cross section.	(8)
12.	a)	i)	Explain nuclear fission process for U-235 with help of a neat sketch.	(8)
		ii)	Describe the nuclear fusion reaction process with an example.	(8)
			(OR)	
	b)	i)	With neat sketch, explain any one nuclear fuel cycle.	(8)
		ii)	Outline the production process of Beryllium and explain its uses.	(8)

13. a) i) Explain FLUOREX process with neat diagram and compare with other processes. (8)

ii) List the spent fuel processing methods and explain any one method with a sketch. (8)

(OR)

b) i) Explain the stages of solvent extraction in nuclear reactors and suggest the most efficient method. (8)

ii) Discuss briefly the applications of extracted solvents. (8)

14. a) i) Explain with necessary examples about isotopes of nuclear fuels. (8)

ii) Explain any one method of Electro-refining method. (8)

(OR)

b) i) Explain the TBP and Thorax processes in detail. (8)

ii) Explain the Redox process of separation in detail. (8)

15. a) i) How would you analyze the components of nuclear safety? (8)

ii) Discuss the criteria for the nuclear and radiation accidents and how do you evaluate the nuclear accidents? (8)

(OR)

b) i) Discuss the long-term effects and beneficial effects of nuclear radiation. (8)

ii) Distinguish between low level and high-level radioactive wastes. (8)

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCEE36 – Prefabricated Structures

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by Modular coordination?
2. What are the important aspects to be taken for consideration while during erection of precast elements?
3. What are the advantages of Large panel construction?
4. Compare the benefit of shear wall over the conventional load bearing brick masonry wall.
5. List out the factors governing joint deformation.
6. Mention some important requirements of the joint flexibility.
7. Differentiate between rigid joint and hinge joint in prefabricated construction.
8. Write the use of expansive joints.
9. Define Progressive collapse.
10. What is meant by Abnormal Load?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail about the need of Prefabrication with merits and demerits. (8)

ii) Explain the principle involved in Prefabrication. (8)

(OR)

b) i) Explain the steps involved in the preparation of precast elements in plant process. (8)

ii) Briefly explain the various types of production techniques followed in precast industry. (8)

12. a) Explain in detail about wall panel construction in prefabricated structures. (16)

(OR)

b) Explain about various types of roof and floor slabs used in precast structures. (16)

13. a) Discuss with sketches the concept of disuniting of structures in prefabrication. (16)

(OR)

b) Illustrate the design of cross section based on efficiency of the materials. (16)

14. a) Discuss in detail with sketches the different types of Beam to Column Connections used in framed precast concrete structures. (16)

(OR)

b) Explain in detail about the design of expansion joints. (16)

15. a) Discuss the codal provisions to calculate the equivalent design load when it is subjected to earthquake loading. (16)

(OR)

b) Briefly explain about the different types of progressive collapses which occurs in the multistorey building with neat sketches. (16)

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME203 – Manufacturing Technology - II

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List the applications of gear hobbing.
2. What is gear finishing? Why it is done?
3. Write the principle of CO_2 molding process.
4. What is meant by degasification of the melt?
5. List a few explosives used in explosive forming techniques.
6. Identify the materials that are suited for electro hydraulic forming.
7. What are the basic requirements of dielectric fluid used in EDM?
8. List the applications of Water Jet Machining process.
9. Give the classification of RP systems.
10. List a few materials used for Fusion Deposition Modeling.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the principle of operation of gear hobbing and gear shaping. (10)

ii) Make a comparison between the three ways of gear manufacturing process with examples. (6)

(OR)

b) i) Examine the techniques used for gear finishing. (10)

ii) Identify the factors to be considered for inspection of good quality gears. (6)

12. a) i) Discuss the basic principle, process variables and characteristics of squeeze casting. (10)

ii) Analyse the relative merits, demerits and applications of CLA process and Full mould process. (6)

(OR)

b) i) Discuss the basic principle, process variables and characteristics of electro slag casting. (10)

ii) Analyse the relative merits, demerits and applications of Rheo-casting and Thixo-casting. (6)

13. a) i) With neat sketch explain the basic principle, process variables, characteristics and applications of water hammer forming. (10)

ii) Identify the factors to be considered while selecting a high speed forming. (6)

(OR)

b) i) With neat sketch explain the basic principle, process variables, characteristics and applications of Electrohydraulic forming. (10)

ii) Identify the three ways by which the Magnetic forming can be accomplished. (6)

14. a) i) Examine the process of wire cut EDM with respect to process equipment. (10)

ii) Identify the significant process parameters used in the EDM process? Explain. (6)

(OR)

b) i) Describe the principle and equipment for Abrasive Jet machining. (10)

ii) Identify the process parameter which controls the AJM machining quality. (6)

15. a) i) Explain the process details on the quality of product in SLA. (10)

ii) Analyse the suitable measures to reduce distortions in SLA process. (6)

(OR)

b) i) Analyse the effect of part building, part finishing and part deposition orientation on accuracy of rapid prototyping model. (10)

ii) Discuss the machine details of SGC. (6)

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B.E. Degree Examinations – April/May 2023

I Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME103 – Manufacturing Technology - I

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Name any two abrasive cutting tool materials.
2. Write the Taylor's equation of tool life.
3. Distinguish between universal chuck and four jaw chuck.
4. List any two taper turning methods.
5. Differentiate between up milling and down milling.
6. Why flutes are provided in a twist drill?
7. Name any four bonds used in grinding wheels.
8. Define 'Dressing of grinding wheel'.
9. Give the classification of NC machine tools.
10. Name the basic types of control systems in numerical control.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss with sketches the various types of chips formed during machining of different materials and the conditions under which they are generated. (16)

(OR)

b) i) Differentiate between orthogonal cutting and oblique cutting. (4)

ii) Explain the different types of tool-wear. (12)

12. a) Draw a block diagram of a centre lathe showing the parts bed, carriage, head stock, tailstock and lead screw and also explain their functions. (16)

(OR)

b) i) What is a capstan lathe and how does it differ from turret lathe? Discuss. (6)

ii) A 120 mm long, 11 mm diameter 18/8 stainless steel rod is machined to 10 mm by turning on a lathe. The spindle rotational speed is 320 rpm and the feed is 0.5 mm/rev. Calculate cutting time, material removal rate, and power dissipated. Assume the specific energy requirement for stainless steel as 4.4 W-s/mm^3. (10)

13. a) i) Explain with sketches the following operations: slab milling, face milling, end milling. (12)

ii) Draw the universal milling machine and mark the various parts. (4)

(OR)

b) Discuss briefly with sketches the different hole making processes. (16)

14. a) Discuss the fine finishing processes; Lapping, Honing and super finishing. (16)

(OR)

b) i) Discuss briefly the factors considered in the selection of a grinding wheel. (12)

ii) Sketch a twist drill and mark the various parts. (4)

15. a) i) Explain the differences between direct numerical control and computer numerical control. (10)

ii) What are their relative advantages? (6)

(OR)

b) i) List the types of interpolations used in numerical control. Give their specific applications. (8)

ii) List and explain the advantages of computer aided NC programming. (8)

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B.E. Degree Examinations – April/May 2023

VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18EEOE04 – Electric Vehicles

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Mention the components of electric propulsion subsystem.
2. Write the function of differential.
3. What is range anxiety and charge anxiety?
4. Specify the drawback of Fuel cell EV.
5. Why switched reluctance motors are not widely preferred for EVs?
6. List the advantages of Field Oriented Control
7. What is the function of rest period in pulse charging of EV batteries?
8. Draw the graph for the CC and CV charging methods of EV batteries.
9. Explain V2G concept in maintaining grid stability.
10. Point out the factors on which the charging station is decided upon?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Classify the electric vehicle and their electrification levels.	(8)
		ii)	Compare the EV with ICE. Also discuss in terms of benefits and challenges.	(8)
			(OR)	
	b)	i)	Explain in detail the various components of the EV subsystems	(10)
		ii)	Discuss the EV market with respect to Indian and Global Scenario.	(6)
12.	a)		Draw and explain the power flow in parallel hybrid HEVs.	(16)
			(OR)	
	b)		Draw and explain the power flow in complex hybrid Front electric and rear hybrid HEVs	(16)
13.	a)	i)	Explain in detail why induction motor and PMSM are preferred over DC motor for medium powered EVs.	(10)
		ii)	Explain briefly about the PWM controller.	(6)

(OR)

b) i) Explain in detail the field oriented control of induction motor. (10)

ii) Draw & Explain the Constant Torque and Constant HP characteristics of speed control of electric motor. (6)

14. a) i) Explain the battery parameters SoC and DoD related to charging of batteries. (8)

ii) Compare plug-in charging and battery swapping technology. (8)

(OR)

b) Discuss in brief the various charging technologies for EV. (16)

15. a) Compare the level 1, level 2, level 3 charging of AC and DC charging methodologies. (16)

(OR)

b) i) On what factors the selection of charging station is performed for the EV? (10)

ii) Explain the V2G and G2V concept in EV domain. (6)

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B.E. Degree Examinations – April/May 2023

III & IV Semester (Full Time)

(2018 Regulations)

CIVIL/ELECTRICAL AND ELECTRONICS/METALLURGICAL ENGINEERING

18MA302 – Statistics and Numerical Methods

(Normal curve table, Chi Square Table to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Kurtosis.
2. The first three central moments of a distribution are 0, 15, – 31. Find the moment coefficient of skewness.
3. What is meant by level of significance?
4. State any two applications of Chi-square test.
5. Newton-Raphson method is used to compute a root of the equation $x^2 - 13 = 0$ with 3.5 as the initial value. Find the first iteration value.
6. A 2nd degree polynomial, $f(x)$ has values of 1, 4 and 15 at $x = 0$, 1 and 2, respectively. Find the value of the integral $\int_0^2 f(x)\,dx$ by trapezoidal rule.
7. Using Euler's method, find the solution of the initial value problem $\frac{dy}{dx} = log(x + y), y(0) = 2$ at $x = 0.2$ by assuming $h = 0.2$.
8. What are the advantages of R.K. method over Taylor's method.
9. Write the Bender – Schmidt recurrence equations.
10. Write the standard five-point formula to solve the Laplace's equation $u_{xx} + u_{yy} = 0$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) In a certain distribution, the first four moments about the point $x = 4$ are – 1.5, 17, – 30 and 308. Find the moments about mean and about origin. Also, Calculate β_1 and β_2. (16)

(OR)

b) Fit a second-degree parabola to the data (16)

x	1929	1930	1931	1932	1933	1934	1935
y	352	356	357	358	360	361	361

12. a) i) A sample of heights of 6400 Englishmen has a mean of 67.85 inches and a S.D of 2.56 inches, while a sample of heights of 1600 Australians has a mean of 68.55 inches and a S.D of 2.52 inches. Do the data indicate that Australians are on the average taller than Englishmen? (8)

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

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

(OR)

b) i) A random sample of 10 boys had the following I.Q's: 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q of 100? Find a reasonable range in which most of the mean I.Q. values of samples of 10 boys lie. (8)

ii) A company keeps records of accidents. During a recent safety review, a random sample of 60 accidents was selected and classified by the day of the week on which they occurred. (8)

Day:	Mon	Tue	Wed	Thu	Fri
No. of accidents:	8	12	9	14	17

Test whether there is any evidence that accidents are more likely on some days than others.

13. a) i) Using Gauss-Seidel method, solve the following system. Start with $x = 1,\ y = -2,\ z = 3$. (8)

$x + 3y + 52z = 173.6$

$x - 27y + 2z = 71.31$

$41x - 2y + 3z = 65.46$

ii) Using Lagrange interpolation, find $y(4)$ from the following data. (8)

x	1	3	5	7
y	24	120	336	720

(OR)

b) i) The following data gives the velocity of a particle for 20 seconds at an interval of 5 seconds. Find the initial acceleration using entire data. (8)

Time(sec)	0	5	10	15	20
Velocity(m/sec)	0	3	14	69	228

ii) Calculate the magnitude as the error (correct to two decimal places) in the estimation of the following integral using Simpson's 1/3 rule $\int_0^4 (x^4 + 10)\, dx$ using step size 1. (8)

14. a) i) Evaluate $y(1.2)$ corrected to three decimal places, by modified Euler method, given that $\frac{dy}{dx} = (y - x^2)^3, y(1) = 0$ taking $h = 0.2$. (8)

ii) Use the fourth order R.K method to compute y for $x = 0.1$, given $y' = \frac{xy}{1+x^2}, y(0) = 1, take\ h = 0.1$ (8)

(OR)

b) i) Using Taylor series method, find y at $x = 0.1$ corrected to four decimal places from $\frac{dy}{dx} = x^2 - y, y(0) = 1$, with $h = 0.1$. (8)

ii) Using Milne's method, find $y(4.4)$ given $5xy' + y^2 - 2 = 0$ given $y(4) = 1, y(4.1) = 1.0049, y(4.2) = 1.0097$ and $y(4.3) = 1.0143$. (8)

15. a) i) Solve $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0, y = 0, x = 3, y = 3$ with $u = 0$ on the boundary and mesh length 1 unit. (8)

ii) Solve by Crank-Nicholson method, $u_t = u_{xx}, 0 < x < 1, t > 0$; $u(x, 0) = 100x(1 - x)$, $u(0, t) = 0, u(1, t) = 0$ taking $h = 0.25$ for one time step. (8)

(OR)

b) i) Solve by Bender-Schmidt method, $u_t = u_{xx}$ subject to $u(0, t) = 0, u(1, t) = 0$ and $u(x, 0) = sin(\pi x), 0 < x < 1$. (8)

ii) Solve numerically, $4u_{xx} = u_{tt}$ with the boundary conditions $u(0, t) = 0, u(4, t) = 0$ and the initial conditions $u_t(x, 0) = 0$ and $u(x, 0) = x(4 - x)$, taking $h = 1$. (8)

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B.E. Degree Examinations – April/May 2023

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. Find a basis and dimension of the subspace W of R^4 spanned by $(1,-4,-2,1), (1,-3,-1,2)$ and $(3,-8,-2,7)$.
2. Let $F: R^3 \to R^3$ defined by $F(x,y,z) = (x,y,0)$. Find the Kernel of F and its dimension.
3. State Newton's forward interpolation formula.
4. Find the third divided difference with the arguments *2, 4, 9, 10* of the function $f(x) = x^3 - 2x$.
5. State Simpson's $^3/_8$ *th rule*.
6. Evaluate $I = \int_1^2 \frac{dx}{5+3x}$ with 4 subintervals using the Trapezoidal rule.
7. Find (0.2) , given that $\frac{dy}{dx} = 1 - y$, $y(0) = 0$ using Euler's method with $h = 0.1$.
8. Write Milne's predictor and corrector formula.
9. Using finite difference method, solve for y given the differential equation $\frac{d^2y}{dx^2} + y + 1 = 0$, $x \in (0,1)$ and the boundary conditions $y(0) = y(1) = 0$ with $h = \frac{1}{2}$
10. Write the standard five-point formula for Laplace equation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Determine the first vector can be expressed as a linear combination of the other three $(2,-5,3), (1,-3,2), (2,-4,-1)$ and $(1,-5,7)$. Justify your answer. (8)

ii) Let V be a vector space over a field F. Then S=$\{v_1, v_2, \ldots, v_n\}$ is a basis for V iff every element of V can be uniquely expressed as a linear combination of elements of S. (8)

(OR)

b) i) Let V be a finite dimensional vector space over a field F. Any linearly independent set of vectors in V is part of a basis. (8)

ii) Consider the linear mapping $F: R^2 \to R^2$ defined by $F(x, y) = (3x + 4y, 2x - 5y)$ and the following basis $S = \{(1,2), (2,3)\}$. Find the matrix A relative to the basis S. (8)

12. a) i) Find $f(x)$ as a polynomial in x for the following data by Newton's divided difference formula (8)

x	−4	−1	0	2	5
$f(x)$	1245	33	5	9	1335

Hence find $f(1)$.

ii) Obtain a relation of the form $y = ab^x$, for the following data by the method of least squares: (8)

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	127.4

(OR)

b) i) The population of a town was as given. Estimate the population for the year 1925. (8)

Years (x)	1891	1901	1911	1921	1931
Population (y): (in thousands)	46	66	81	93	101

ii) Using Lagrange's interpolation formula, find y (10) from the following table: (8)

x	5	6	9	11
y	12	13	14	16

13. a) i) The table given below reveals the velocity 'v' of a body during the time 't' specified. Find its acceleration at $t = 1.0$ (8)

t	1.0	1.1	1.2	1.3	1.4
v	43.1	47.7	52.1	56.4	60.8

ii) A river is 80 meters wide. The depth 'd' in meters at a distance x meters from one bank is given by the following table. Calculate the area of cross section of the river using Simpson's rule. (8)

x	0	10	20	30	40	50	60	70	80
d	0	4	7	9	12	15	14	8	3

(OR)

b) i) Find the first two derivatives of $(x)^{1/3}$ at $x = 50$ and $x = 56$ given the table below: (8)

x	50	51	52	53	54	55	56
$y = x^{1/3}$	3.68	3.70	3.73	3.75	3.77	3.80	3.82

ii) Evaluate $\int_{-2}^{2} e^{-x/2}\, dx$ by Gauss two-point formula. (8)

14. a) i) Apply modified Euler's method to solve $\frac{dy}{dx} = e^x + xy,\ y(0) = 0$ to compute $y(0.1)$ and $y(0.2)$ (8)

ii) $\frac{dy}{dx} = y - x, y(0) = 2$. Find $y(0.1)$ correct to four decimals using Runge-Kutta fourth order method. (8)

(OR)

b) i) Solve $y'' - y = x,\ x \in (0,1)$ given $y(0) = y(1) = 0$ using finite differences dividing the interval into 4 equal parts. (8)

ii) Given $\frac{dy}{dx} = \frac{1}{2}(1 + x^2)y^2$ and (8)

$y(0) = 1, y(0.1) = 1.06, y(0.2) = 1.12,\ y(0.3) = 1.21,$

Evaluate $y(0.4)$ by Milne's predictor corrector method.

15. a) i) Evaluate the function $u(x, y)$ satisfying $\nabla^2 u = 0$ at the lattice points given the boundary values as follows: (8)

	1000	1000	1000	1000
		u_1	u_2	500
2000		u_3	u_4	0
2000				0
	1000	500	0	

ii) Approximate the solution to the wave equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$, (8)

$$0 < x < 1, t > 0, u(0,t) = u(1,t) = 0, t > 0, u(x,0) = sin 2\pi x,$$

$0 \le x \le 1$ and $\frac{\partial u}{\partial t}(x,0) = 0, 0 \le x \le 1$ with $\Delta x = 0.25$ and

$\Delta t = 0.25$ for 3 time steps.

(OR)

b) i) Using Bender-Schmidt, Solve $u_t = u_{xx}$ subject to $u(0,t) = 0, u(1,t) = 0$ and $u(x,0) = sin\ \pi x, 0 < x < 1$. (8)

ii) Using Crank-Nicholson method, solve $u_{xx} = 16u_t$ subject to $u(x,0) = 0, u(0,t) = 0$ and $u(1,t) = 100t$. Compute u for one step in t direction taking h = $\frac{1}{4}$. (8)

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IV Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCEE01 – Irrigation Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between perennial irrigation and inundation irrigation.
2. State the necessity of irrigation.
3. Give the relation between Duty and Delta.
4. Distinguish between evaporation and consumptive use.
5. Write about the Merits of furrow irrigation.
6. State irrigation schedule.
7. Mention the function of canal regulator.
8. What is canal drop?
9. State the objective of irrigation management.
10. Mention water charge assessment methods.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the types of irrigation system. (16)

(OR)

b) i) Explain the relation between physical properties of soil to irrigation. (8)

ii) Describe the effect of salts on plant growth. (8)

12. a) i) Explain the optimum utilization of irrigation water. (8)

ii) State the factors which influence consumptive use of water on any crops. (8)

(OR)

b) i) Describe the quality of water for irrigation. (8)

ii) Describe about the factors affecting the duty in irrigation field. (8)

13. a) Explain in detail the design of drip irrigation system by considering one crop. (16)

(OR)

b) i) Explain the method of irrigation efficiency and their calculation. (8)

ii) Describe the essential requirement for successful sub surface irrigation. (8)

14. a) Explain the classification of canal and their applications. (16)

(OR)

b) i) Explain the different types of cross drainage works with sketches. (8)

ii) Explain the procedure for hydraulic design of cross drainage work. (8)

15. a) i) Describe the causes of water logging. (8)

ii) Explain measures for reclamation of saline land. (8)

(OR)

b) Explain the application of agricultural drainage in enhancement of productivity. (16)

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE302 – Surveying and Geomatics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the fundamental difference between plane and geodetic surveying?
2. Convert the following quadrantal bearing into whole circle bearing
   a) N 30° 45' E b) S 80° 00' W.
3. Distinguish between line of collimation and axis of telescope.
4. What are the methods of contouring?
5. Difference between transiting and swinging of theodolite.
6. What do you mean by triangulation?
7. Define analytic lens.
8. What is subtense bar?
9. Write the advantages of total station.
10. What are the types of segments?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What do you mean by ranging a line? Explain the procedure of ranging a line by indirect method. (16)

(OR)

b) i) Explain the Principles of chain surveying? (10)

ii) The following bearing were observed in running a closed traverse: (6)

Stations	FB	BB
AB	192° 45'	13° 00'
BC	40° 30'	222° 30'
CD	23° 15'	200° 30'
DE	242° 45'	62° 45'
EA	330° 15'	147° 45'

At what station do you suspect the local attraction? Determine the correct magnetic bearings. If declination was 15° 15' E, what are the true bearings?

12. a) i) Explain the classification of Levelling. (10)

ii) The following staff readings were observed successively with a level, the instrument have been moved after third and eighth readings: 0.820, 1.150, 2.250, 2.620, 3.150, 1.605, 0.920, 2.600, 2.900, 1.125, 0.605, 2.265 m. Calculate the R.L of points if the first reading was taken with a staff held on a bench mark of 110.0 m. Carry out the arithmetic check. (6)

(OR)

b) Discuss the effects of curvature and refraction in levelling. Find the correction due to each and the combined correction. (16)

13. a) i) Mention different types of permanent adjustments of a theodolite and their objects. (8)

ii) Find the elevation of the top of a chimney from the following: (8)

Inst. station	Reading on B.M	Vertical angle	Remarks
A	0.860	18 ° 36 '	R.L of B.M = 420.500
B	1.220	10 ° 12 '	Distance AB = 50 m

Station A, B and the top of the chimney are in the same vertical plane.

(OR)

b) Describe the methods of finding out area of a closed theodolite traverse. (16)

14. a) i) Illustrate on the Principles stadia tacheometry. (10)

ii) Determine the gradient from a point A to point B from the following observation made with a tacheometer fitted with an analytic lens. The constant of instrument was 100 and Zero and the staff was held vertically. (6)

Inst. station	Staff station	bearing	Vertical angle	Staff reading
P	A	134°	10 ° 15 '	1.360, 1.915, 2.470
	B	224°	-5 ° 6 '	1.065, 1.885, 2.705

(OR)

b) Explain the elements of a simple circular curve. (16)

15. a) i) Discuss the field procedure involved in preparing a setting out of a proposed building. (8)

ii) Explain in detail the components of EDM instrument. (8)

(OR)

b) i) Discuss the different sources of errors in a total station. (8)

ii) Explain the characteristics of GPS Navigation and satellite navigation. (8)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18CE305 – Engineering Mechanics

(IS456 and SP 16)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Lame's theorem.
2. What do you understand by the term relative motion?
3. What is meant by uniformly accelerated motion?
4. State varignon's theorem.
5. Define angle of repose.
6. State Perpendicular axis theorem.
7. State D'Alembert's principle.
8. What is meant by coefficient of restitution?
9. Write down the principle of Impulse and Momentum.
10. State Law of Conservation of Energy.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The guy wire of a tower is anchored by means of a bolt at A figure.1. The force in the wire is 75 kN. Determine (16)

    i) The components of F_x, F_y and F_z of the force

    ii) The angles θ_x, θ_y and θ_z defining the direction of force.

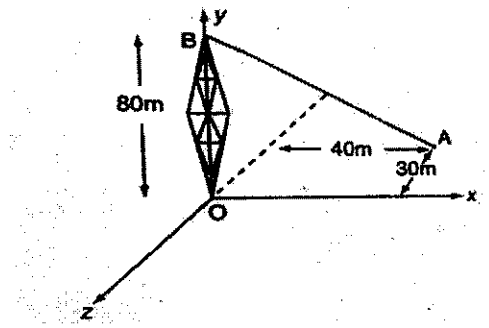

Figure.1.

(OR)

b) From the following system of forces as shown in figure.2, find out the magnitude and direction of resultant force. (16)

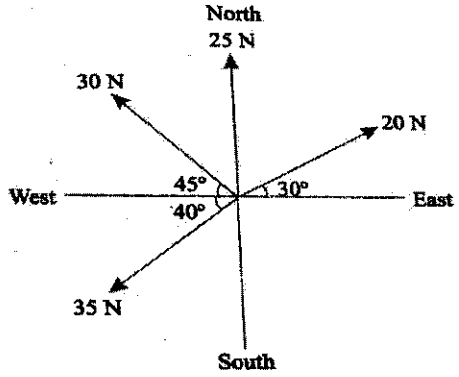

Figure.2.

12. a) A 4.80 m long beam is subjected to the forces shown in figure.3. (16)

Reduce the given system of forces to

i) An equivalent force- couple system at A

ii) An equivalent force- couple system at B

iii) A single force or Resultant.

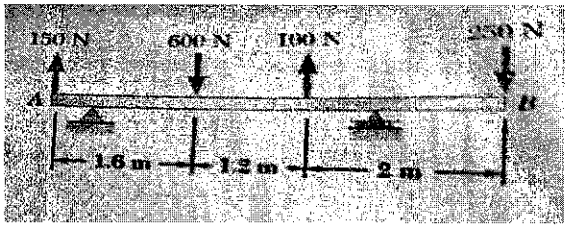

Figure.3.

(OR)

b) Find the reaction at A and B for the beam shown in figure.4. (16)

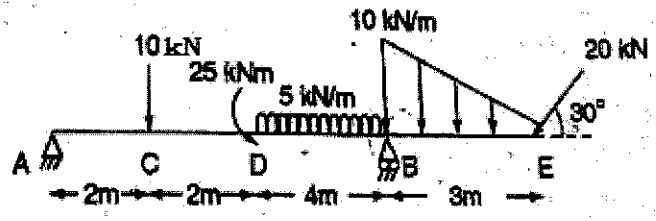

Figure.4.

13. a) Determine the Moment of Inertia and radius of gyration for the following section shown in figure.5 (Dimensions are in cm). (16)

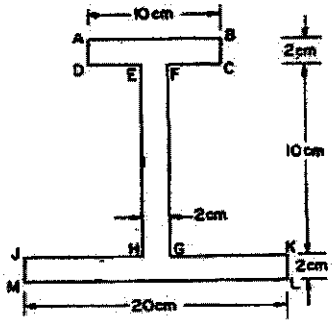

Figure.5.

(OR)

b) Find the tension in the cable and the force P required to move the blocks towards the right. Cofficient of friction between B and Plane = 0.20, Coefficient of friction between A and Plane = 0.30. θ_1 = 40° and θ_2 = 15°. (16)

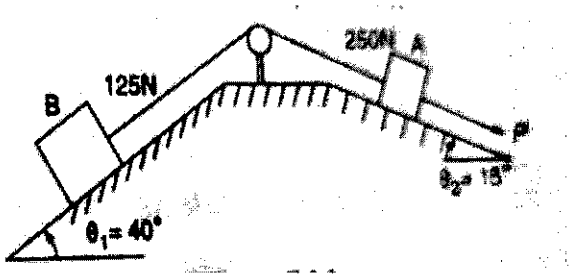

Figure.6.

14. a) i) A stone is dropped into a well is heard to strike the water after 5 seconds. Find the depth of the well, if the velocity of the sound is 340 m/s. (8)

ii) A particle, falling under gravity, falls 21 meters in a certain second. Find the time required to cover next 25 meters. (8)

(OR)

b) i) Explain in detail about various classification of impact on elastic bodies. (8)

ii) The ram of a pile driver has a mass of 800 kg and it is released from 2 m above from the top of the 2400 kg pile. if the ram rebounds to a height of 0.1m above after impact with the pile calculate (8)

i) Velocity of the pile immediately after impact

ii) The coefficient of restitution e.

15. a) Block A weighing 700N and block B weighing 1400 N as shown in figure.7 start from rest. The coefficient of friction between block A and the surface of inclined plane is 0.2. Determine the velocity of block A when it moves along the plane starting from rest after 5 seconds. Assume pulley to be weightless and frictionless. (16)

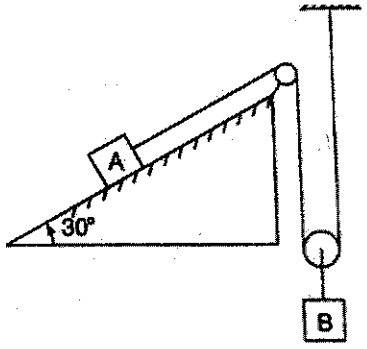

Figure.7.

(OR)

b) In the pulley system shown in figure.8 the masses of blocks A and B are 24 kg and 12 kg respectively. The masses of the pulley and rope can be neglected. Determine the velocity of the blocks when block A moves by 2.0 m assuming that the blocks start from rest. (16)

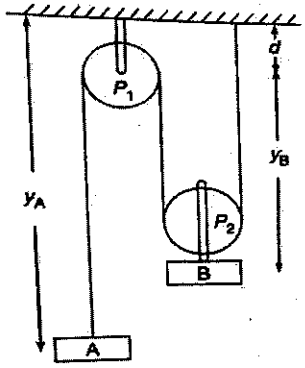

Figure.8.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18MA301 – Probability and Statistics

(Normal curve table, Chi Square Table to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. If you twice a flip a balanced coin, what is the probability of getting atleast one head?
2. The first two moments of a distribution about a random variable X=4 are 1, 4. Show that the variance is 3.
3. Determine the mean of exponential distribution.
4. State Chebychev's inequality.
5. The joint probability density function of random variables (X,Y) is $f(x,y) = K\,x\,y\,e^{-(x^2+y^2)}, X > 0 \,\&\, Y > 0$ then compute the value of K.
6. Distinguish between Correlation and Regression.
7. List the four central moments.
8. Define Leptokurtic.
9. State the assumptions for t – test.
10. Write two applications of Chi-square test.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A certain firm has plant A, B and C producing IC chips. Plant A produces twice the output from B and B produces twice the output from C. The probability of a non defective product produced by A, B, C are respectively 0.85, 0.75 and 0.95. A customer receives a defective product. Find the probability that it can came from plant B. (8)

ii) A random variable X has the following probability function (8)

x	0	1	2	3	4
$P(X)$	k	$3k$	$5k$	$7k$	$9k$

i) Find the value of 'k' .

ii) Find $P(x < 3)$ & $P(0 < x < 4)$.

iii) Find the distribution function of x.

(OR)

b) i) A continuous random variable x has the density function (8)
$f(x) = \begin{cases} 2(x-1), 1 < x < 2 \\ 0\ ,\ elsewhere \end{cases}$ then evaluate $E(x)$ and $E(x^2)$.

ii) Determine the moment generating function of a random variable X whose probability function $P(X = x) = 1/2\text{^}x\ , x = 1, 2, \ldots$ Hence find it's mean. (8)

12. a) i) Define Binomial distribution, Obtain it's MGF, Mean and Variance. (8)

ii) A manufacturer of cotter pins knows that 5% of the product is defective. If he sells cotter pins the boxes of 100 and guarantees that not more than 4 pins will be defective. What is the approximate probability that a box will fail to meet the guaranteed quality. (8)

(OR)

b) i) The daily consumption of milk in excess of 20,000 gallons is approximately exponentially distributed with θ = 3000. The city has a daily stock of 35,000 gallons. What is the probability that of two days selected at random, the stock is insufficient for both days. (8)

ii) In a Normal distribution, 31% of the items are under 45 and 8% are over 64. Calculate the mean and variance of it. (8)

13. a) The joint probability mass function of (X, Y) is given by (16)
$P(x = x, y = y) = k\,(2x + 3y), x = 0, 1, 2\,;\ y = 1, 2, 3.$ Find all the Marginal and conditional probability distributions. Also Find the probability distribution of $(X + Y)$.

X	Y		
	1	2	3
0	$3k$	$6k$	$9k$
1	$5k$	$8k$	$11k$
2	$7k$	$10k$	$13k$

(OR)

b) Determine the Correlation coefficient & Obtain the lines of Regression from the data given below: (16)

x	62	64	65	69	70	71	72	74
y	126	125	139	145	165	152	180	208

14. a) Fit a straight line by method of least square to the following data, also estimate the value of y at x = 70. (16)

x :	71	68	73	69	67	65	66	67
y :	69	72	70	70	68	67	68	64

(OR)

b) In a certain distribution, the first four moments about the point $x = 4$ are $-1.5, 17, -30$ and 308. Find the moments about mean and about origin. Also calculate β_1 and β_2. (16)

15. a) Two independent samples I & II of sizes 9 and 7 from a normal population had the following values of the variables. Do the estimates of the population variance differ significantly at 5% level. (16)

I	18	13	12	15	12	14	16	14	15
II	16	19	13	16	18	13	15	-	-

(OR)

b) i) The lengths of 12 samples of Egyptian cotton taken from a consignment 48, 46, 49, 46, 52, 45, 43, 47, 47, 46, 45, 50. Test if the mean length of the consignment can be taken as 46. (8)

ii) On the basis of information noted below, find out whether the treatment is comparatively superior to the conventional one. (8)

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Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

II & III Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS /MECHANICAL ENGINEERING

18PH202 – Physics – Wave and 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. Write the expression to find the frequency of vibrating strings.
3. State Fermats Principle.
4. Define Mirage effect.
5. Give the principle of superposition of waves.
6. Define dispersive power of grating.
7. Define population Inversion.
8. List out the characteristics of laser.
9. Write down the properties of matter waves.
10. State Heisenberg Uncertainty principle.

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) Derive the wave equation for progressive and stationary wave. (16)

12. a) Explain the propagation of light from the effect of translation and refraction by matrix method. (16)

(OR)

b) Describe Astronomical telescope and derive an expression for its magnifying power. (16)

13. a) Describe Newton's rings experimental arrangement and explain how it is used to determine the wavelength of sodium light. (16)

(OR)

b) Describe the construction and working of Michelson Interferometer and explain how this can be used for measuring the wavelength of monochromatic light. (16)

14. a) i) Derive the relation between Einstein's coefficient. (12)

ii) Explain any two types of pumping methods in Laser. (4)

(OR)

b) i) Explain the construction and working of CO_2 laser with its energy level diagram. (12)

ii) Discuss the applications of Lasers in the field of medicine. (4)

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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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18EE203 – Basic Electrical Engineering for Metallurgy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Kirchhoff's Current and Voltage Law.
2. Calculate the resistance of a wire of length 1000 m and cross sectional area of $0.2mm^2$, if the specific resistance of wire is $2*10^{-8}\Omega m$. If the above wire is drawn to four times its original length, what is its resistance now?
3. A series R-C circuit with R=30 Ω and C=170 μF has 230V, 50Hz AC supply connected to it. Find the impedance & current.
4. List the advantages of three phase AC system over single phase AC system.
5. Why transformer rating is in kVA?
6. Draw the B-H characteristics of magnet.
7. Write the significance of capacitor provided in single phase Induction motor.
8. Why single phase Induction motor is not self-starting?
9. Differentiate between MCCB and ELCB with their characteristics.
10. List the types of Batteries.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the current through 4 Ω resistor in the given circuit by applying Kirchhoff's laws. (8)

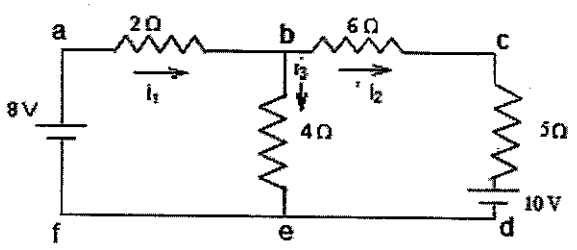

Figure.1.

ii) Use Thevenin's theorem to find the current through 5 Ω resistance. (8)

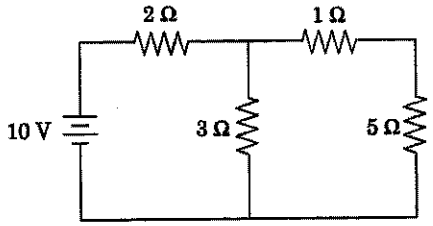

Figure.2.

(OR)

b) i) Referring to the two source circuit depicted in the circuit shown in Figure.3 below, calculate the total current flowing through 2 Ω resistor using superposition theorem. (8)

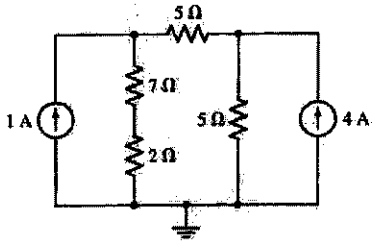

Figure.3

ii) Derive an expression and draw the current response for RL series circuit when it is excited by DC input. (8)

12. a) i) Write the properties of series and parallel resonance. (8)

ii) The RLC series circuit having a resistance of 60 Ω, inductance of 0.45 H and a capacitance of 89.6 μF are connected across 230 V, 50 Hz a.c supply. Calculate i) impedance ii) power iii) power factor (iv) current. (8)

(OR)

b) i) Draw the complete phasor diagram for voltages and currents in star connected three phase system and derive the relationship between line and phase values of voltages and currents. Also derive the expression for 3 phase power. (8)

ii) Define maximum value, average value, form factor and peak factor of single phase system. (8)

13. a) i) With a suitable phasor diagram, differentiate ideal and practical transformer. (8)

ii) List the different losses in transformer and explain the technique to reduce the same. (8)

(OR)

b) i) With suitable derivation, justify that Auto transformer saves Cu loss. (8)

ii) From the first principle, obtain the equivalent circuit of a transformer referring to primary side. (8)

14. a) i) Explain the speed control methods of DC shunt motor with neat diagram. (8)

ii) With a neat diagram, explain the constructional details of three phase Induction motor (8)

(OR)

b) i) Explain the operating principle of single phase induction motor with the aid of double filed revolving theory. (8)

ii) List the methods of controlling the speed of 3 phase Induction motor and explain. (8)

15. a) i) List the components of LT switchgear and explain their function. (8)

ii) What is the need of earthing? and explain how it will be installed in houses and commercial buildings? (8)

(OR)

b) i) In a residential house, there are 10 lamps of 40 watts each. On an average, they burnt for 5 hours each day. Find the energy consumed in 1 month. If the house owner has to pay rupees 2 for each kWh of energy consumed, find his monthly bill. (8)

ii) What is power factor? And explain the methods to improve it. (8)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18EE101 – Basic Electrical and Electronics Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. State sperposition theorem.
2. Compare series and parallel circuits.
3. What is real power and reactive power?
4. Define power factor.
5. List the applications of DC motor.
6. List the losses in transformers.
7. Compare inverting and non inverting amplifier.
8. Draw the circuit of differential amplifier.
9. Compare UPS and SMPS.
10. List the types of house wiring.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive and explain the procedural steps of Superposition theorem. (16)

(OR)

b) Discuss on star delta transformation and derive the transformation from star to Delta and Delta to star. (16)

12. a) Enumerate the voltage and current relations in star delta connections. (16)

(OR)

b) A Series circuit having pure resistance of 40 ohms, pure inductance of 50.07 mH and a capacitor is connected across a 400 V, 50 Hz supply. This R, L, C combination draws a current of 10 A. Calculate power factor of the circuit and capacitor value. (16)

13. a) Construct and report on the working of three phase induction motors and its applications. (16)

(OR)

b) Construct and report on the working of transformers and its efficiency. (16)

14. a) Explain in detail the V-I characteristics of zener diode. (16)

(OR)

b) Explain in detail the working principle BJT for CE Configuration with the Characteristics. (16)

15. a) i) What is the purpose of earthing? (4)

ii) Give a detailed view on the basics of house wiring tools and components. (12)

(OR)

b) i) Write a note on MCB, ELCB, MCCB. (4)

ii) Explain the Various types of batteries and its applications. (12)

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18CM201 – Basic Civil and Mechanical Engineering

Time : 3 Hours | Maximum Marks : 100

Part –I (4 x 2 = 8 Marks)

Basic Civil Engineering

Part A

Answer ALL Questions

1. Define Hooke's law.
2. List some building materials.
3. Define bond in masonry.
4. Why dams are needed?

Part B (2 x 16 = 32 Marks)

Answer ALL Questions

5.	a)	i)	Define stress, strain, modulus of rigidity.	(8)
		ii)	Explain the stress strain curve with a sketch.	(8)
			(OR)	
	b)	i)	Discuss the properties of good quality bricks.	(8)
		ii)	Describe the classification of surveying.	(8)
6.	a)	i)	Write the objectives of foundation.	(8)
		ii)	Discuss any two types of flooring with their merits.	(8)
			(OR)	
	b)	i)	Explain with neat sketches any two types of brick masonry.	(8)
		ii)	Explain types of dams with sketches.	(8)

Part - II (6 x 2 = 12 Marks)

Basic Mechanical Engineering

Part A

Answer ALL Questions

7. List the types of boiler.
8. What is a turbine.
9. Compare water cooling and air cooling system.

10. How does diesel engine work?

11. Write the difference between Vapour compression and Vapour absorption refrigeration system.

12. Define air conditioning.

Part B (3 X 16 = 48 Marks)

Answer ALL Questions

13. a) i) Explain the working of a Kaplan turbine. (8)

ii) Write down the differences between boiler mountings and accessories. (8)

(OR)

b) Define the working principle of single acting and double acting Reciprocating pump with sketch. (16)

14. a) i) Differentiate between Spark Ignition (SI) and Compression Ignition (CI) Engines. (8)

ii) Explain connecting rod and crank shaft components of an internal combustion engine with neat sketches. (8)

(OR)

b) Describe the working a Two Stroke Petrol engine with neat sketch. (16)

15. a) i) Describe with neat sketch of vapour absorption refrigeration system. (8)

ii) Outline on the following terminologies (8)

1) Refrigeration effect

2) Ton of Refrigeration

3) Coefficient of performance

4) Specific Heat.

(OR)

b) i) Compare the window and split type air conditioner. (8)

ii) What is air conditioning? How is the air conditioning system classified? (8)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

ECE/EEE /MECHANICAL ENGINEERING

18CSOE05 – Java Programming

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the primitive data types in Java.
2. Differentiate between >> operator from >>> operator.
3. Identify an exception that can be handled when computing square root of a number.
4. Find out the construct supported by Java to group similar operational entities under a single head.
5. Which are the methods in Applet that are called after you restore the Applet window from minimization?
6. How can you run an Applet?
7. Develop the code in Java to display a file dialog box to save a file.
8. Differentiate Grid Layout and Grid Bag Layout managers.
9. Develop a code in Java to delete a file "NoMore.txt".
10. When do you use JDBC in Java programming?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Tabulate the operators supported by Java in the order of precedence. Specify the name of the operator, associative property of the operator, type of operator in terms of number of operands, type of operator based on nature of operation and group same precedent operators in a single row. Apply the operations over values a = -15 and b = 3 and report the results. Assume missing values and change values only if necessary to illustrate the special nature of operation. (16)

(OR)

b) Develop a program in Java to check if any two digits are same in the input integer number with at least 5 digits. For example, if the input is 524310, the output is "Number with unique digits". If the input is 124153, the output is "Digits repeat in input". (16)

12. a) Develop a class to represent a matrix and include methods to perform addition, subtraction, transpose, and multiplication. (16)

(OR)

b) A dictionary is a data structure that stores a set of (key, value) pairs. Given the key, the value can be retrieved. Develop a class in Java to represent the dictionary data structure and provide necessary functions to enable storage and retrieval process of the (key, value) pairs. Illustrate and explain the operation of dictionary data structure using a driver function that creates and uses the features of dictionary data structure. (16)

13. a) Explain the life cycle of an Applet with a neat sketch and explain the methods an Applet uses to track the mouse events. (16)

(OR)

b) Explain how AWT components can be used in an Applet with suitable example. (16)

14. a) Develop a stand-alone application for a calculator supporting at least four operations. Display two text fields to collect two operands and one drop box to choose the operator. Place an 'equal to' button and clicking it should perform the intended operation over the given operands. Display the result of operation in Bold face Bookman old style font. (16)

(OR)

b) Develop a stand-alone application for collecting the biodata of a student. It should include controls for collecting Name, Address, Gender, and Marital status. List a group of options for hobbies so that the user can select more than one hobby if required. Display the collected details in a dialog box. (16)

15. a) Explain the steps involved in writing a set of student information containing Name, ID and marks for 3 courses to a file. Read the written information from the file and compute CGPA for every student and display. (16)

(OR)

b) Explain how a Java application can store and retrieve data from a backend database with an example. (16)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSPE807 – Cloud Computing

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down any four characteristics of Cloud Computing.
2. Differentiate between Parallel processing and Distributed systems.
3. List out the characteristics of Virtualized Environment.
4. What is the major difference between Para Virtualization and Full Virtualization?
5. Define Load Balancing.
6. Write short notes on Admission Control.
7. Write short notes on UrlFetch and MemCache.
8. What are the uses of Amazon Elastic Block Store?
9. Define BLOB. What are the two types of BLOBs? And explain it.
10. What are the current states of Data Security in the Cloud?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)			Explain the concept of Hardware Architecture for Parallel Processing.	(16)
				(OR)	
	b)			Describe in details about the Cloud Reference Model.	(16)
12.	a)	i)		Write short notes on Machine Reference model.	(8)
		ii)		Describe about Hardware Level Virtualization.	(8)
				(OR)	
	b)	i)		Explain in detail about Hardware virtualization techniques.	(8)
		ii)		Illustrate about VMware: full virtualization.	(8)
13.	a)			Explain in detail about SLA management in cloud.	(16)
				(OR)	
	b)			Discuss in detail about Map Reduce Programming Model with suitable example.	(16)

14. a) Explain in detail about Amazon Web Services. (16)

(OR)

b) Describe about Google App Engine in detail. (16)

15. a) Illustrate about Cloud Computing and Digital Identity. (16)

(OR)

b) Explain in detail about Cloud Scientific Application. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

VI & VIII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINERING

18MAOE03 – Sampling Theory and Numerical Methods

(Statistical tables may be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write down any two properties of χ^2 -distribution.
2. What are Type-I and Type-II errors?
3. Evaluate $\sqrt{5}$ using Newton -Raphson method.
4. Using Gauss elimination method solve: $5x + 4y = 15, 3x + 7y = 12$.
5. State Lagrange's interpolation formula.
6. Evaluate $\int_{1/2}^{1} \frac{1}{x} dx$ by Trapezoidal rule, dividing the range into 4 equal parts.
7. Apply Taylor's method to find $y(0.1)$ given $y' = 1 + y, y(0) = 1$.
8. Write the truncation error of the Euler's method.
9. Write down the Bender-Schmidt recurrence relation for one dimensional heat equation.
10. Write down the standard five point formula to solve $\nabla^2 u = 0$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A normal population has mean 0.1 and S.D 2.1. Find the probability that mean of a sample of size 900 will be negative. (8)

ii) The means of two large samples of 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of SD 2.5 inches? (8)

(OR)

b) i) Given a sample mean of 83, a sample SD of 12.5 and a sample size of 22, test the hypothesis that the value of the population mean is 70 against the alternative that it is more than 70. Use the 0.025 significant level. (8)

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

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

12. a) i) Solve by Gauss Jordan method: (8)
$10x - 2y + 3z = 23, 2x + 10y - 5z = -33, 3x - 4y + 10z = 41.$

ii) Use the iteration method to solve the equation $3x - log_{10}x = 6.$ (8)

(OR)

b) i) Using Gauss-Seidal method, solve: (8)
$20x + y - 2z = 17, 3x + 20y - z = -18,\ 2x - 3y + 20z = 25.$

ii) Find a least squares straight line for the following data : (8)
X : 1 2 3 4 5 6
Y : 6 4 3 5 4 2 and estimate (predict) Y at X = 4.

13. a) i) Find y *at* $x = 5$ by Newton's divided difference formula for the data (8)

x	0	2	3	4	7
y	4	26	58	112	466

ii) Find $y'(0)$ *and* $y''(4)$ from the following table. (8)

x	0	1	2	3	4
y	1	2.718	7.381	20.086	54.598

(OR)

b) i) Using Newton's forward interpolation formula to find the cubic polynomial which takes places the following values: (8)

x	0	1	2	3
$f(x)$	1	2	1	10

ii) Evaluate $\int_{0.5}^{0.7} e^{-x}\sqrt{x}\ dx$ using Simpson's 1/3rd rule by taking 5 ordinates. (8)

14. a) i) Using Taylor series method, find y at $x = 0.2$ and $x = 0.4$ given $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$. (8)

ii) Using Adam's method, find $y(4.4)$ given (8)
$5xy' + y^2 = 2,\ y(4) = 1,\ y(4.1) = 1.0049,\ y(4.2) = 1.0097,\ y(4.3) = 1.0143.$

(OR)

b) i) Using Fourth order Runge- Kutta method, find $y\ for\ x = 0.1$ given (8)
$y' = x + y^2, y(0) = 1$.

ii) Using Milne's predictor-corrector method , find $y(0.8)$ given (8)
$y' - x^3 - y = 0\ , y(0) = 2,\ y(0.2) = 2.073,\ y(0.4) = 2.452\ and\ y(0.6) = 3.023$

15. a) i) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + 10(x^2 + y^2 + 10) = 0$ over the square mesh with sides $x = 0, y = 0\ , x = 3,\ y = 3$ with $u = 0$ on the boundary and mesh length 1 unit. (8)

ii) Using Bender - Schmidt's method, solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ given $u(0,t) = 0, u(1,t) = 0, u(x,0) = sin\pi x, 0 < x < 1$ and h= 0.2. Find the values of u up to t=0.1. (8)

(OR)

b) i) Solve by Crank- Nicholson's scheme: $16\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, 0 < x < 1, t > 0$ given $u(x,0) = 0, u(0,t) = 0, u(1,t) = 100t$. Compute u for one step in t-direction taking h = 0.25. (8)

ii) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ in the square region bounded by (8)
$x = 0, x = 4, y = 0, y = 4$ and with bounded conditions $u(0,y) = 0$, $u(4,y) = 8 + 2y\ u(x,0) = \frac{x^2}{2}$ & $u(x,4) = x^2$ taking $h = k = 1$ by mesh points by always correcting the computed values to two places of decimals.

Register Number:

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MTE11 – Transport Phenomena

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Difference between Absolute and gauge pressure.
2. Explain the terms i) Dynamic Viscosity ii) Kinematic Viscosity. Give their dimensions.
3. Give the expression for loss of head due to friction.
4. Compare laminar flow and turbulent flow.
5. State Fourier's law of heat conduction.
6. Define Biot number.
7. What do you understand by gray body and black body?
8. Define emissive power.
9. State Fick's law of diffusion.
10. Give two examples of convective mass transfer.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow. (8)

ii) Explain briefly the working principle of U-tube differential manometer with neat sketch and derive its equation to find out the pressure difference. (8)

(OR)

b) i) What is Hagen Poiseuille's formula? Derive an expression for Hagen's Poiseuille's formula. (8)

ii) Describe Reynolds experiments to demonstrate the two types of flow. (8)

12. a) i) Explain the principle of venturimeter with a neat sketch. Derive the expression for the rate of flow of fluid through it. (8)

ii) A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 20 cm of mercury. Determine the rate of flow. Take C_d = 0.98. (8)

(OR)

b) i) What is pitot – tube? How will you determine the velocity at any point with the help of pitot tube? (8)

ii) A pipeline carrying oil of specific gravity 0.87, changes in diameter from 200 mm diameter at a position A to 500 mm diameter at a position B which is 4 metres at a higher level. If the pressure at A and B are 9.81 N/cm^2 and 5.886 N/cm^2 respectively and the discharge is 200 litres/s. Determine the loss of head and direction of flow. (8)

13. a) i) Briefly explain the modes of heat transfer with a suitable example. (8)

ii) A wall of a furnace is made up of 13 cm thick of fire clay of thermal conductivity 0.6 W/mK and 60 cm thick of red brick of conductivity 0.8 W/mK. The inner and outer surface temperatures of wall are 1000°C and 75°C. Determine the amount of heat loss per square metre of the furnace wall. (8)

(OR)

b) i) Explain the types of convection and Differentiate between natural and forced convection. (8)

ii) Explain in detail about lumped heat capacity method. What is the role of Biot number and also list out the assumptions necessary for a lumped capacity unsteady state analysis? (8)

14. a) i) List the salient features of black body radiation. (8)

ii) Calculate the shape factor for the configuration shown in figure.1 (8)

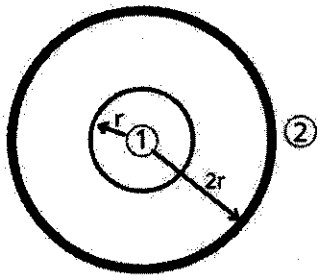

Figure.1.

(OR)

b) i) State and Explain the fundamental laws of radiation. (8)

ii) Emissivities of two large parallel planes maintained at 800°C and 300°C are 0.3 and 0.5 respectively. Find the net radiant heat exchange per square metre for these plates. (8)

15. a) i) Discuss the factors affecting the diffusivity in solids, liquids and gases. (8)

ii) The molecular weights of the two components A and B of a gas mixture are 24 and 28 respectively. The molecular weight of gas mixture is found to be 30. If the mass concentration of the mixture is 1.2 Kg/m^3., determine the following (8)

1. density of component A and B
2. Mass fractions.

(OR)

b) i) State and explain Fick I and II laws of diffusion with relevant examples from metallurgical processes. (8)

ii) What is Dimensional analysis? Explain any one method of dimensional analysis with an example. (8)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MTOE02 – Surface Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the five types of wear.
2. State the roles of lubrication in surface engineering.
3. What is furnace fusing?
4. Write the principles of jet kote process.
5. Justify the white layer in nitrided steels.
6. What is the principle of diffusion processes?
7. What is CBN in thin film coatings?
8. Name any two applications for thin film coatings.
9. Define glazing.
10. What are wear tiles?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the procedure and process parameters involved in electroplating of nickel. (8)

ii) Explain the causes and remedies for hydrogen embrittlement. (8)

(OR)

b) i) Explain the process of electrochemical conversion coatings and its applications. (8)

ii) Differentiate between electroplating and electroless plating processes. (8)

12. a) i) Explain the procedure for shielded metal arc welding and its importance in hard facing. (8)

ii) Explain the need for surface preparation before thermal spray process. (8)

(OR)

b) i) Explain the procedure for Detonation gun coating process for hard facing of steels for wear resistant applications. (8)

ii) Briefly explain the applications of different hard facing consumables. (8)

13. a) i) Explain the properties and applications of chromizing. (8)

ii) Explain the procedure for siliconizing and its applications. (8)

(OR)

b) i) Explain the procedure for selecting suitable diffusion coating process for enhancing the corrosion resistance of steels. (8)

ii) Explain the changes in microstructure and properties of medium carbon steels after boronizing treatment. (8)

14. a) i) Describe any three applications of thin film coatings with examples. (8)

ii) Explain the procedure for coating using thermal evaporation and condensation method. (8)

(OR)

b) i) Describe the procedure involved in producing TiC coatings over steel substrates. (8)

ii) Explain the properties and applications of Diamond coatings. (8)

15. a) i) Explain the principle and applications of electron beam hardening process. (8)

ii) Explain the advantages and applications of ceramic coatings over metallic materials. (8)

(OR)

b) i) Explain any one method to produce composite coatings for thermal barrier applications. (8)

ii) Explain the advantages and applications of centrifugal cast wear coatings. (8)

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B.E. Degree Examinations – April/May 2023

III Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC302 – Electronic Circuits - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Discuss the advantages of negative feedback in amplifiers.
2. Describe the effect of gain in amplifier when voltage shunt and series feedback is employed.
3. If L1 = 1 mH, L2 = 2 mH and C = 0.1 nF, Observe the frequency of oscillation for Hartley oscillator.
4. Outline the equivalent circuit of an oscillator.
5. Identify the ideal response and actual response of tuned amplifiers with diagram.
6. Compare single tuned and synchronously tuned amplifiers.
7. Illustrate how the diode act as a comparator?
8. Design the circuit of RC integrator and mention the condition under which the circuit behaves as an integrator.
9. When the oscillator is called as a free running blocking oscillator?
10. Classify the voltage and current time base generators.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the current series feedback amplifier with neat block diagram and derive the expressions for Rif and Rof. (8)

ii) Outline the voltage series amplifier with block diagram and derive for Rif and Rof. Draw a two-stage amplifier with voltage series feedback. (8)

(OR)

b) i) With an example Circuit, Determine the method of identifying the feedback topology. Also determine the feedback factor. (8)

ii) The current-series feedback types of transistor amplifier for the given circuit diagram have the following parameters such as Rs = 1KΩ, RL = 1KΩ, Re = 100Ω, hfe = 80 and hie = 2kΩ. Show GM, β, GMf, Rif, Rof. (8)

12. a) i) Show the working of a Hartley oscillator with a neat circuit diagram and derive the frequency of oscillation. (8)

ii) In the Colpitts oscillator, C1 = 0.2μF and C2 = 0.02μF. If the frequency of the oscillator is 10 kHz, find the value of the inductor. Also find the required gain for Oscillation. (8)

(OR)

b) i) Demonstrate the working principle of RC phase shift oscillator circuit diagram also derive the expression for frequency of oscillation and condition for sustained oscillation. (8)

ii) Show the frequency of oscillation for the Clapp oscillator with C1 = 0.1 μF, C2 = 1 μF, C3 = 100pF and L = 470 μH. (8)

13. a) i) Build the circuit diagram and equivalent circuit of a capacitor coupled single tuned amplifier and derive the expression for 3dB bandwidth. Sketch also the frequency response of the amplifier. (8)

ii) Analyse about stability of tuned amplifiers and mention the need of neutralization. (8)

(OR)

b) i) Design the circuit diagram of a two-stage synchronously tuned amplifier and also its equivalent circuit. Create the expression for bandwidth. (8)

ii) Classify the neutralization techniques that are used in the stability of tuned amplifier. With the help of neat circuit diagram explain anyone. (8)

14. a) i) Illustrate the operation of collector coupled astable multivibrator with neat diagrams and waveforms. (8)

ii) Determine how Schmitt trigger circuit can be evolved from a bistable circuit Formulate the expression for UTP and LTP in Schmitt trigger with circuit diagrams. (8)

(OR)

b) i) Evaluate the working principle of Bistable multivibrator with neat diagrams. (8)

ii) Compose the triggering methods for bistable multivibrator and explain it by necessary diagrams. (8)

15. a) i) Describe the operation of a RC controlled astable transistor blocking oscillator with circuit diagram and waveforms. (8)

ii) Show the equivalent circuit of monostable oscillator with base timing and explain its operation. (8)

(OR)

b) i) Illustrate the working of UJT (saw tooth generator) with suitable circuit and waveforms and explain. (8)

ii) Analyse the expression for the oscillating frequency of UJT. (8)

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B.E. Degree Examinations – April/May 2023

III Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE303 – Design of Reinforced Concrete Elements

(IS456 – 2000 and SP16 are permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the purpose of providing the distribution steel in one way slab along long span.
2. Mention the factors influencing the bond strength of concrete.
3. The provision of minimum stirrup reinforcement is mandatory in all reinforced concrete beams. Why?
4. Why is the partial safety factor for concrete (γc) greater than that for reinforcing steel (γs) in the consideration of ultimate limit states?
5. Compare the behaviour of tied columns with spiral columns, subject to axial loading.
6. Classify the columns based on types of loading.
7. Draw the stress strain curve for Fe 415 steel.
8. Quote the main considerations that generally govern the thickness of a two - way slab.
9. List the situations in which combined footings are preferred to isolated footings.
10. What is meant by eccentric loading on a footing, and under what circumstances does this occur?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Design a rectangular beam section, 300 mm wide and 550 mm deep (overall), subjected to an ultimate twisting moment of 25 kNm, combined with an ultimate bending moment of 60 kNm and an ultimate shear force of 50 kN. Assume M20 concrete, moderate exposure conditions and Fe 415 steel. (16)

(OR)

b) Explain the action of a reinforced concrete beam (with shear reinforcement) with the aid of truss analogy model. (16)

12. a) Design a simply supported slab to cover a hall with an internal dimensions 4.0 m x 5.0 m. The slab is supported on masonry wall 230 mm thick. Assume a live load of 3 kN/m^2 and a finish load of 1 kN/m^2. Use M20 concrete and Fe 415 steel. Assume that the slab corners are free to lift up. (16)

(OR)

b) A rectangular RC beam of overall size 230 x 450 mm is subjected to a factored bending moment of 210 kNm. Compute the required reinforcement, assuming effective cover for compression and tension reinforcement as 50 mm. Use M20 concrete, Fe 415 steel, 30 mm clear cover. (16)

13. a) Enumerate the differences between the balanced, under reinforced and over reinforced sections. (16)

(OR)

b) Differentiate between the elastic methods, ultimate load method and limit state method. (16)

14. a) A corner column (300 mm X 450 mm) located in the lowermost storey of a system of braced frames, is subjected to factored loads: P_u = 1350 kN, M_{ux} = 120 kNm, M_{uy} = 70 kNm. The unsupported length of the column is 4 m. Design the reinforcement in the column, assuming M 20 concrete and Fe 415 steel. (16)

(OR)

b) Elucidate the role of interaction diagrams in design of columns. (16)

15. a) Design the staircase slab, which is having 10 steps of tread size 300 mm, riser size150 mm, and width of landing 1500 mm. The stairs are simply supported on beams (300mm width) provided at the first riser and at the edge of the upper landing. Assume a finish load of 0.8 kN/m^2 and a live load of 5.0 kN/m^2. Use M 20 concrete and Fe 415 steel. Assume mild exposure conditions. (16)

(OR)

b) Design a reinforced concrete footing for a 230 mm thick masonry wall which supports a load (inclusive of self-weight) of 210 kN/m under service loads. Assume a safe soil bearing capacity of 150 kN/m^2 at a depth of 1 m below ground. Assume M20 grade concrete and Fe 415 grade steel. (16)

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B.E. Degree Examinations – April/May 2023

III Semester(Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE304 - Power Electronics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the VI characteristics of a power diode.
2. Write the use of snubber circuit.
3. Define firing angle in SCR.
4. Why the input power factor of a semi converter is better than full converter?
5. List the advantages of switched mode regulator.
6. Draw the power circuit of a step down chopper.
7. Write the different types of multi level inverter.
8. What is the necessity to reduce the harmonics content in inverter?
9. Write the firing angle range of a single phase AC voltage regulator feeding RL load.
10. What is matrix converter?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) With neat sketch, describe the construction and operation of a SCR. Also draw and explain the VI characteristics of SCR. (16)

(OR)

b) i) Explain the construction and operation of IGBT with static characteristics. (12)

ii) Draw the switching characteristics of MOSFET. (4)

12. a) With power circuit, explain the operation of a single phase fully controlled rectifier feeding RL load. Also derive the expression for average output voltage. (16)

(OR)

b) i) Draw the power circuit of three phase semi converter and explain the operation. (8)

ii) With sketch, discuss the effect of source inductance in the operation of single phase rectifier. (8)

13. a) i) With neat sketch, describe the operation of a buck boost converter. Also derive the expression for average output voltage. (10)

ii) The input voltage of a buck boost converter is 220V. Find the value of average output voltage for a duty ratio of (i) 0.3 (ii) 0.75. (6)

(OR)

b) i) Write and explain the procedure to design an inductor and capacitor used in DC-DC buck converter. (10)

ii) Name the two control strategies of DC-DC converter and write the merits and demerits of both control techniques. (6)

14. a) i) With neat sketch, explain the operation of single phase bridge inverter feeding RL load. Derive the expression for RMS output voltage. (10)

ii) List different methods of voltage control in inverters and explain any one technique in detail. (6)

(OR)

b) With diagram, explain the operation and switching pattern of three phase bridge inverter in 120° mode with star connected resistive load. (16)

15. a) With neat sketch, describe the operation of single phase AC-AC voltage regulator with RL load. Also derive the expression for RMS output voltage. (16)

(OR)

b) i) Discuss the operation of a single phase to single phase cyclo converter with sketch. (8)

ii) Draw the power circuit of matrix converter and discuss its operation. (8)

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B.E. Degree Examinations – April/May 2023

III Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC304 – Transmission Lines and Waveguides

(Smith Chart is to be Provided)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define attenuation constant and phase constant.
2. What is meant by distortion less line?
3. Compute the VSWR of a $75\,\Omega$ transmission line when it is terminated by a load impedance of $50 + j30\,\Omega$.
4. List the applications of smith chart.
5. Write Maxwell's equations in point form.
6. Mention the characteristic of TEM waves.
7. Write the formula for cutoff wavelength of the TM_{11} mode in a standard rectangular waveguide.
8. What is meant by dominant mode of the wave?
9. What are the advantages of circular waveguides over rectangular waveguides?
10. Define a cavity resonator and also give its application.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Derive the transmission line differential equations and obtain the general solutions for the voltage and current on the transmission line. (10)

ii) Write a detailed note on reflection on a line not terminated in its characteristic impedance. (6)

(OR)

b) i) Explain about different types of transmission line. (10)

ii) A transmission line has $Z_0 = 745 \angle 12^0\,\Omega$ and is terminated in $Z_R = 200\,\Omega$. Calculate the reflection loss and return loss in dB. (6)

12. a) i) Derive an expression for Input impedance of the dissipation less line. (8)

ii) Derive the input impedance of a quarter wave line and discuss its applications. (8)

(OR)

b) i) Derive the input impedance of open circuited and short circuited line and sketch the variations of normalized value of reactance with distance S. (8)

ii) A transmission line has standing wave ratio $S = 2.5$ and and voltage minima exits at 0.15 λ from the load. Find the load and input impedance for a line if 0.45 λ length. Use smith chart. (8)

13. a) Discuss the transmission of TM waves between parallel perfectly conducting planes with necessary expressions for the field components. (16)

(OR)

b) Discuss the attenuation of TE and TEM waves between parallel planes with necessary expressions and diagrams. (16)

14. a) Describe the field components of TE waves in a rectangular waveguide with necessary expressions and also plot the field configurations for the TE_{10} mode. (16)

(OR)

b) Derive the field configuration, cut off frequency, velocity of propagation for TM waves in rectangular waveguide. (16)

15. a) i) Derive the expressions for field components of TM waves guided along circular waveguide. (10)

ii) A circular waveguide has an internal diameter of 6 cm. For a 9 GHz signal propagated in it in the TE_{11} mode, calculate the cutoff frequency and characteristic impedance $[(ha)^1_{11} = 1.84]$. (6)

(OR)

b) i) Explain the field components of TE waves in a rectangular cavity resonator with relevant expressions. (10)

ii) Write a brief note on excitation of modes in circular waveguides. (6)

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B.E.Degree Examinations –April/May 2023

IV Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE406 - Concrete Technology

(IS10262-2019 to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. List out any four types of cement.
2. Differentiate initial setting time and final setting time of cement.
3. Plot the stress strain curve for concrete and mark salient points.
4. Write down the various nondestructive tests for concrete.
5. Write down the various design methods available for mix proportioning.
6. Distinguish between nominal mixes and design mixes.
7. Discuss in what circumstances gunite and shotcrete will be performed.
8. List the various applications of fibre reinforced concrete.
9. Assess the coefficient of variation for standard deviation of 3.6 and mean of 36.
10. What all are the acceptance and rejection criteria for concrete?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain the characteristics of good fine aggregates.	(8)
		ii)	Explain the crushing test and impact test on coarse aggregate.	(8)
			(OR)	
	b)	i)	Describe the effect of retarders, accelerators on cement concrete and give three examples of each.	(8)
		ii)	Explain briefly about Portland pozzolana cement.	(8)
12.	a)	i)	Write short notes on segregation and bleeding.	(4)
		ii)	What is meant by workability? and mention the tests available for measuring workability.	(12)
			(OR)	

b) i) Write short notes on ultrasonic pulse velocity test. (4)

ii) Explain the test procedures for calculating compressive strength, tensile strength and flexural strength of the concrete. (12)

13. a) Design a M45 grade concrete with following data: (16)
OPC 43 grade cement, maximum size of aggregate = 20 mm, exposure condition = Severe, Slump = 125 mm, minimum cement content = 320 kg/m^3, Specific gravity of angular coarse aggregate = 2.8, specific gravity of fine aggregate = 2.7, Water absorption of fine aggregate = 1 %, Water absorption of coarse aggregate = 0.5 %, Fine aggregate conforming to grading zone II. Assume if any data required.

(OR)

b) Briefly explain the mix proportioning of concrete using ACI method. (16)

14. a) i) What is shotcrete? Explain the procedure of shotcreting a surface. (10)

ii) Write short notes on shoring. (6)

(OR)

b) i) Explain about fibre reinforced concrete and its advantages. (10)

ii) Discuss the applications of structural light weight concrete. (6)

15. a) Assess the coefficient of variation for given set of crushing strength values. Crushing strengths are 43, 48, 40, 38, 36, 39, 42, 45, 37, 35, 39, 41, 49, 46, 36, 38, 32, 39, 41 and 40. (16)

(OR)

b) Discuss about frequency of sampling, acceptance and rejection criteria for concrete. (16)

Register Number:

Government College of Engineering : Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS405 – Microprocessors and Microcontrollers

Time : 3 Hours

Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Identify the difference between a MP and CPU.
2. Mention any four miscellaneous instructions in 16 bit processor.
3. Define Bus.
4. Analyze the need for co-processor.
5. Define the terms A/D and D/A convertor.
6. Summarize the modes used by the DMA processor to transfer data.
7. Elaborate that how to set 8051 in idle mode?
8. Classify operand addressing mode in 8051.
9. Summarize the interrupt service routine.
10. Sketch the ADC interfaced with 8051.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the internal architecture of 8086 Microprocessor with neat diagrams. (16)

(OR)

b) i) Recall about Assembler directives. (4)

ii) Define interrupts and their types. Write in detail about interrupt service routine. (12)

12. a) How would you explain the system bus timing of 8086? (16)

(OR)

b) i) Develope the different schemes used for establishing priority in multiprocessor configuration. (8)

ii) Compare closely coupled configuration with loosely coupled configuration. (8)

13. a) With neat diagram, describe the internal structure of key board and display controller. (16)

(OR)

b) List the steps involved in interfacing an alarm controller with 8086 microprocessor and explain in detail. (16)

14. a) Describe the memory organization and SFR area of 8051microcontroller. (16)

(OR)

b) Recognize the different addressing modes in 8051 microcontroller with an example. (16)

15. a) i) Discuss about serial port interface of 8051. (8)

ii) Show how to interface an LCD display with µC? (8)

(OR)

b) Describe the basic operation of a stepper motor and also discuss how to interface a stepper motor to 8051. (16)

Register Number:

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC405 – Control Systems

(Ordinary graph sheet, semi log sheet, polar plot to be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Why negative feedback system is invariably preferred in closed loop system?
2. Define transfer function and mention its applicability in control system.
3. What are the standard test signals used for time domain analysis?
4. Find the unit impulse response of system $H(s) = 5s/(s+2)$ with zero initial conditions.
5. What are the characteristics of phase lead network?
6. Give the specifications used in frequency domain analysis.
7. Find the range of $'K'$ for closed loop stable behavior of system with characteristic equation $2s^4 + 12s^3 + 22s^2 + 12s + K$ using Routh Hurwitz stability criterion.
8. Define about Nyquist stability criterion.
9. Write the state model of n^{th} order system.
10. Define Observability of a system.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Write the differential equations governing the Mechanical system shown in figure.1 given below and determine the transfer function. (16)

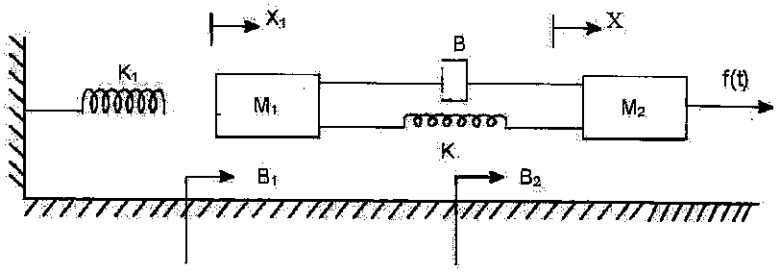

Figure.1

(OR)

b) Find the overall gain C(S) / R(S) for the signal flow graph shown in figure.2. (16)

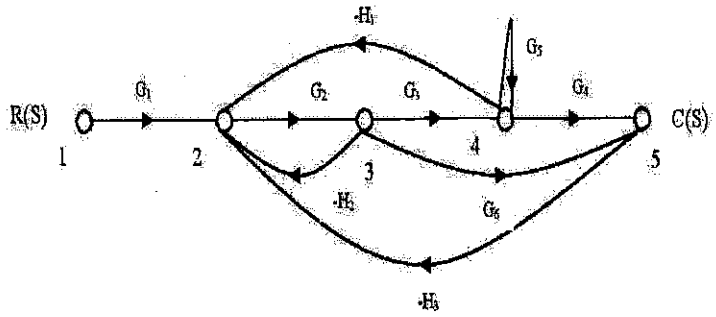

Figure.2

12. a) i) Derive the time response analysis of a first order system for step, ramp input. (12)

ii) What are the time domain specifications? Define any two. (4)

(OR)

b) i) Determine the type and order of the system with following transfer functions. (4)

1. $H(s) = \frac{(s+4)}{(s-2)(s+8)}$ 2. $H(s) = \frac{5}{s^3(s^2+s+1)}$.

ii) With a neat diagram explain the function of PID compensation in detail. (12)

13. a) Sketch the Bode plot for the following transfer function and determine the system gain K for the gain cross over frequency to be 5 rad/sec. (16)

$G(s) = \frac{K.s^2}{(1+0.2s)(1+0.02s)}$.

(OR)

b) i) Write short notes on parallel compensation. (4)

ii) Write down the procedure for designing Lead compensator using Bode Plot. (12)

14. a) Draw the Nyquist plot and find the stability of the following open loop transfer function of unity feedback control system $G(s)H(s) = \frac{K(s+1)}{s^2(s+10)}$. (16)

If the system is conditionally stable, find the range of K for which the system is stable.

(OR)

b) The open loop transfer function of a unity feedback system is given by $G(s) = \frac{K(s+9)}{s(s^2+4s+11)}$. Sketch the root locus of the system. (16)

15. a) i) Consider the following system with differential equation given by $\dddot{y} + 6\ddot{y} + 11\dot{y} + 6y = 6u$.Obtain the state model in diagonal canonical form. (12)

ii) Draw the state model of a linear SISO system and obtain its corresponding equations. (4)

(OR)

b) i) State the properties of state transition matrix. (4)

ii) Consider the system defined by $X = Ax + \dot{B}u\,, Y = Cx$ where (12)

$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$; $B = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$; $C = [10 \quad 5 \quad 1]$.

Check the controllability and observability of the system.

Register Number:

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

VI & VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP14 - Wind and Solar Energy Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Betz limit.
2. What does tip speed ratio depends on?
3. Mention two important wind turbine generator installations in India.
4. What are merits of wind energy conversion system?
5. What are the instruments used for measuring solar radiation and sunshine?
6. Define the terms: i) Declination angle ii) Altitude angle.
7. What is MPPT?
8. Why power converters are needed in solar energy conversion system?
9. List the merits of Hybrid energy systems.
10. Define real and reactive powers.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Comment on the environmental impacts of wind energy conversion system.	(8)
		ii)	Explain in detail about the history of wind power.	(8)
			(OR)	
	b)	i)	State the essential features to be considered for site selection for a wind form.	(8)
		ii)	Draw the wind speed and power curve and explain in detail.	(8)
12.	a)	i)	Explain the construction and working principle of vertical axis wind turbine system.	(8)
		ii)	Evaluate the suitability of various types of generators for wind power generations.	(8)
			(OR)	
	b)		Explain in detail about the doubly fed Induction Generator based wind power generation with a neat block diagram.	(16)

13. a) i) List the reasons for variation in solar radiation reaching the earth than received at the outside of the atmosphere. (8)

ii) Draw the layout of solar geometry and explain in detail. (8)

(OR)

b) i) Explain in detail about the Sun- Observer relation. (8)

ii) Illustrate the different methods to estimate the solar energy available. (8)

14. a) i) Illustrate the construction and working principle of solar photovoltaic system. (8)

ii) Explain how the variation of insulation and temperature affects the I-V characteristics of a solar cell. (8)

(OR)

b) Explain in detail about the Fuzzy Logic based MPPT algorithm with flowchart and block diagram. (16)

15. a) i) List the power quality issues in Hybrid solar and wind based system. (8)

ii) List the Challenges of Grid Integration of Wind and solar Power on Power System Grid Integrity. (8)

(OR)

b) With a neat sketch, explain about the Grid connected solar PV and wind based Hybrid system. List its merits. (16)

Register Number:

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT302 – Mineral Dressing, Fuels and Furnaces

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the physical characteristics of an ore relevant to mineral dressing.
2. What is Sampling? List the different methods to carry out sampling.
3. What is the principle of froth flotation?
4. What is Jigging? What is the need for Jigging?
5. Which is best form of coal - Caking or non-caking coal? Justify.
6. What is Cracking? What are the two types of cracking?
7. Why and how does heat loss occur in a furnace?
8. What is the principle of Resistance furnaces? List the various resistor elements used in it.
9. Recommend a method to stabilize the dolomite bricks.
10. What is a refractory? Classify the refractories.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What is Milling? Explain any two types of mills with required sketches. (16)

(OR)

b) What is grinding? Explain open circuit grinding and closed circuit grinding with required sketches. (16)

12. a) i) What is the principle of classification? Why is it important in mineral beneficiation? Name the different types of classifiers used in mineral beneficiation and explain any one classifier in detail. (8)

ii) Explain any two Magnetic separation processes with required sketches. Also, list the advantages and applications. (8)

(OR)

b) i) Analyze the best process to separate hydrophobic valuable minerals from hydrophilic waste gangue. Explain it with a neat sketch. (8)

ii) What is the need for thickening in mineral dressing? Explain in detail about thickeners and filters. (8)

13. a) i) Classify the fuels and list the advantages, disadvantages and applications of all the types of fuels. (8)

ii) Describe Otto-Hoffmann's process for manufacturing of coke. (8)

(OR)

b) i) Briefly explain about the distillation and cracking of crude petroleum with the required diagram. (8)

ii) Name the gas used in the production of synthetic ammonia and explain the process of manufacturing that gas. (8)

14. a) Which furnace is used in the production of cast iron? Also, briefly explain about the construction, advantages and applications of the same with a neat sketch. (16)

(OR)

b) Select a furnace for heat treatment operation of large quantity materials with same composition and explain the furnace in detail. (16)

15. a) What are the properties of refractories? How to test the refractories for refractoriness and porosity? Explain briefly. (16)

(OR)

b) Which is the refractory used in glass making furnaces? Explain its manufacture, properties and applications. (16)

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B.E. Degree Examinations – April/May 2023

III & IV Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING /METALLURGICAL ENGINEERING

18CY301 – Biology for Engineers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term glycosidic linkage.
2. List out the name and structures of three trisaccharides.
3. Compare Endoenzymes and fexoenzyme.
4. Explain the mechanism of Non-competitive inhibitors.
5. Identify the reason for the denaturation of proteins.
6. Build and name different step in translation phase of protein synthesis.
7. Identify the energy flow and tropic levels from second law of thermodynamics in biological systems.
8. Distinguish between exergonic and endergonic reaction.
9. List out the different component in DNA.
10. Examine the different types of bases present in RNA and DNA.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the reaction of amino acids with equations. (8)

ii) Outline the structure of water soluble vitamins. (8)

(OR)

b) Summarize the properties of glucose and also explain the cyclic structure of glucose. (16)

12. a) i) List out different structural feature of enzyme. (8)

ii) Show the property of enzyme with proper examples. (8)

(OR)

b) Spell the significance of K_m and V_{max} and also derive Michaelis-Menten equation. (16)

13. a) i) Organize the secondary structure of Protein. (8)

ii) Identify different type of bonds and forces in protein. (8)

(OR)

b) Model the reaction of Proteins and also explain the color reaction of protein. (16)

14. a) i) List the different types of photosynthetic pigments. (8)

ii) Inspect the structure of ATP. (8)

(OR)

b) Examine the different steps involved in Preparatory and payoff phases in glycolysis. (16)

15. a) i) Compare RNA and DNA. (8)

ii) List out the different types of RNA and its functions. (8)

(OR)

b) i) Analyze the different step involved in replication of DNA. (8)

ii) Examine the characteristic of genetic code. (8)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE302 – Electromagnetic Fields

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Divergence theorem.
2. Mention the applications of Gauss's law.
3. Write poission's and laplace's equation.
4. What is meant by dielectric polarization?
5. State Ampere's circuital law.
6. Write Lorentz force equation and mention its significance.
7. Give the relation between magnetic flux density and magnetic field intensity.
8. Write down the expression for magnetic field at the centre of the circular coil.
9. Mention the properties of uniform plane wave.
10. Write down the wave equation for E and H in free space.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Determine the curl of these vector fields (8)

1. $\vec{P} = x^2yz\vec{a}_x + xz\vec{a}_z$
2. $\vec{Q} = \rho \sin\phi\, \vec{a}_\rho + \rho^2 z\vec{a}_\phi + z\cos\phi\, \vec{a}_z$
3. $\vec{T} = \frac{1}{r^2}\cos\theta\vec{a}_r + r\sin\theta\cos\phi\, \vec{a}_\theta + \cos\theta\, \vec{a}_\phi$.

ii) Find the force in Newton on charge Q_1 = 20 μC situated at (0, 1, 2) m due to charge Q_2 = -300 μC situated at (2, 0, 0) m. (8)

(OR)

b) i) State and prove Gauss's law. (8)

ii) Given the two points A(x = 2, y = 3, z = -1) and B(r = 4, θ = 25°, Φ = 120°). Find the spherical co-ordinates of A and cartesian co-ordinates of B. (8)

12. a) Derive the expression for electric field intensity due to infinite line charge. (16)

(OR)

b) i) A potential field is given as $V = 100e^{-5x}\sin 3y\cos 4z$ Let point $P\left(0.1, \frac{\pi}{12}, \frac{\pi}{24}\right)$ be located at a conductor free space boundary, at point P, find the magnitudes of (10)

1. V
2. Electric Field Intensity
3. Electric Flux Density.

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

13. a) State and explain Ampere's circuit law and show that the field strength at the end of a long solenoid is one half of that at the centre. (16)

(OR)

b) i) Derive an expression for the inductance of toroid. (8)

ii) Derive an expression for the force between two long straight parallel current carrying conductors. (8)

14. a) Derive and explain Maxwell's equations both in integral and point forms. (16)

(OR)

b) i) Develop an expression for induced emf of Faraday's disc generator. (8)

ii) Compare field theory and circuit theory. (8)

15. a) i) Obtain the electromagnetic wave equation for free space in terms of electric field. (8)

ii) State and prove poynting's theorem. (8)

(OR)

b) Define Brewster angle and derive its expression. Also define loss tangent of a medium. (16)

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME302 – Engineering Mechanics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. A force of magnitude 500 N is directed along AB where A is (0.6, 0, 1.4) and B is (1.7, 1.3, 0) m. Write the vector form of the force.
2. State Varignon's Theorem.
3. State the analytical conditions for equilibrium of coplanar forces in a plane.
4. What is free body diagram?
5. Define first moment of an area about an axis.
6. Find the radius of gyration of rectangular area of MI about its base 6×10^5 mm^4 and cross-sectional area 300 mm^2.
7. Define co-efficient of friction.
8. State the laws of friction.
9. What is meant by elastic impact? Give its types.
10. A body of mass 5 kg is moving with a velocity of 40 m/s. What will be the kinetic energy of the body?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the force F4, so as to give the resultant of the force system shown in figure.1. (8)

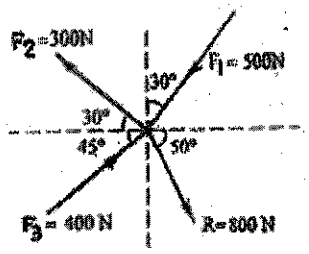

Figure.1.

ii) A force is represented in a vector form P = 20i - 8j - 14k N. Determine the projection of this force on a line which originate from (2, -4, 5) and passes through the point (5, 2, -4). Also find the angle between the force and the line. (8)

(OR)

b) i) Determine the tension in the cables AB, AC and AD if the crate shown in figure.2 is weighing 9.07 kg. (8)

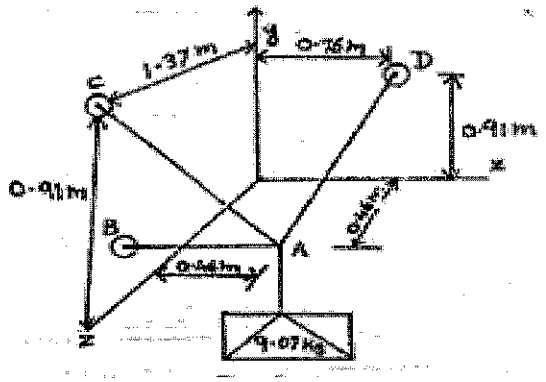

Figure.2.

ii) Two spheres A and B of weight 1000 N and 750 N respectively as kept as shown in figure.3. Determine the reactions at all contact points 1, 2, 3 and 4. Radius of A = 400 mm and B = 300 mm. (8)

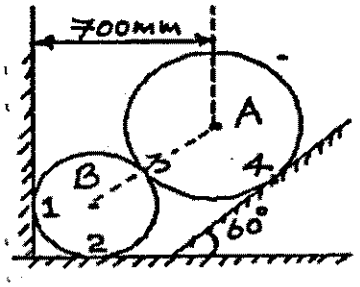

Figure.3.

12. a) A beam ABCDEF of 7.5 m long and span 4.5 m is supported at B and E. The beam is loaded as shown in figure.4. Determine the reactions at B and E? (16)

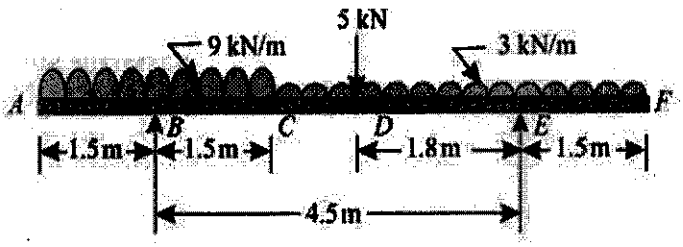

Figure.4.

(OR)

b) A force F with a magnitude of 100 N is applied at the origin of the axes x-y-z as shown in figure.5. The line of action of 'F' passes through a point 'A' whose co-ordinate are 3 m, 4 m and 5 m. (16)

Determine,

i) The x, y, z scalar components of F

ii) The projection of F_{xy} on F on the x-y plane

iii) The projection of F along the line OB.

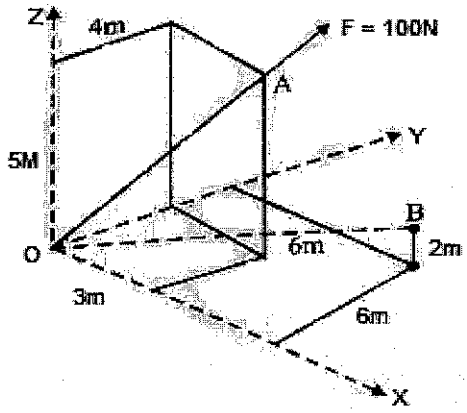

Figure.5.

13. a) Determine the moments of inertia of the area shown in figure.6 with respect to the centroidal axes parallel and perpendicular to the side AB. (16)

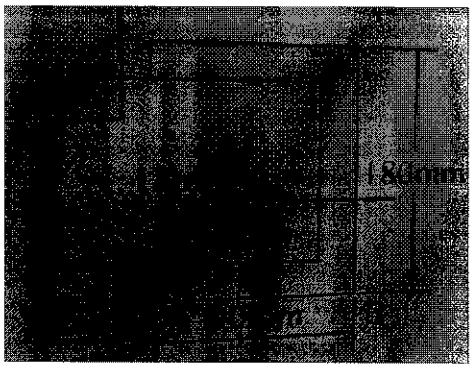

Figure.6.

(OR)

b) Calculate the moment of inertia about its bottom edge of the section shown in figure.7. (16)

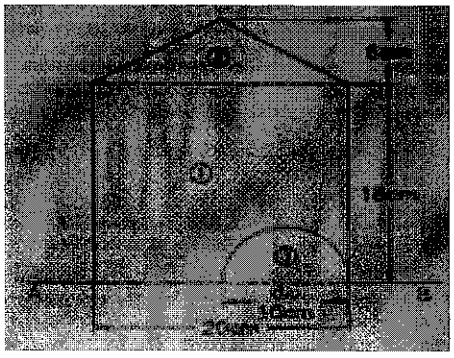

Figure.7.

14. a) Determine whether the block shown in figure.8 having a mass of 50 kg is in equilibrium and find the magnitude and direction of the friction force. Take $\mu_s = 0.38$ and $\mu_k = 0.32$. (16)

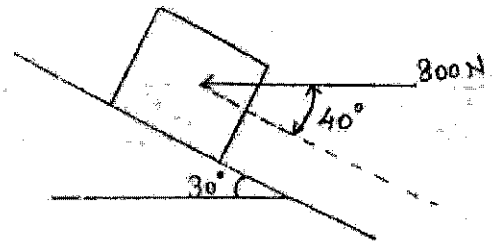

Figure.8.

(OR)

b) The screw of a jack is square threaded with two threads per 10 millimeter. The outer diameter of the screw is 60 mm. the coefficient of friction is 0.15. Find the force required to be applied at the end of the lever, 900 mm long. (16)

i) To lift a load of 50 kN and

ii) To lower it.

15. a) A particle is projected in air with a uniform velocity 70 m/s at an angle of 40° with the horizontal. Determine (16)

i) Horizontal range,

ii) The maximum height attained by the particle, and

iii) The time of flight.

(OR)

b) Block P of weight 100 N and block Q of weight 50 N are connected by a cord that passes over a smooth pulley as shown in figure.9. Find the acceleration of the blocks and the tension in the cord when the system is released from rest. Neglect the mass of the pulley. Use the principle of work and energy. (16)

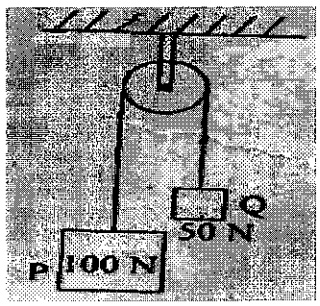

Figure.9.

Register Number:

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE203 – Control System

(Semilog Sheet, Graph sheet to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the different classifications of a control system?
2. State Mason's gain formula.
3. List out the time domain specifications.
4. Define order and type of a system. Also give an example.
5. Write the BIBO stability criterion.
6. Define Root locus.
7. Define resonance peak magnitude and resonance peak frequency.
8. State Nyquist stability criterion.
9. State the need for compensator in control system design.
10. Write the expression for maximum Lead Angle.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Compute the transfer function $\frac{E_o(s)}{E_i(s)}$ for the network shown in figure.1. (8)

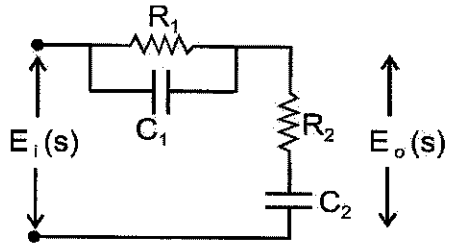

Figure.1.

ii) Derive the transfer function of Field controlled DC servo motor and clearly state the assumption made. (8)

(OR)

b) i) Obtain the differential equations governing the mechanical rotational system. Also obtain analogous electric circuits based on torque-current analogy. (8)

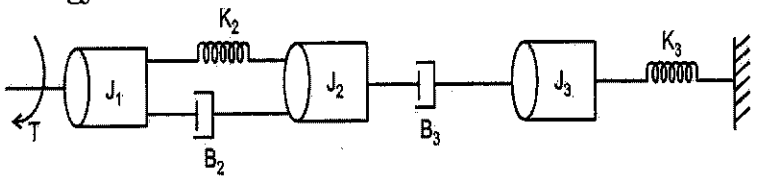

Figure.2.

ii) Using block diagram reduction technique, find $\frac{C}{R}$ (8)

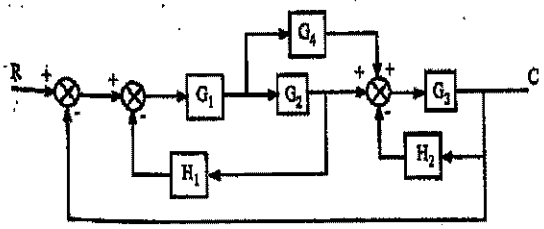

Figure.3.

12. a) i) The forward path transfer function of a certain unity negative feedback control system is given by $G(s)=\frac{9}{s(s+3)}$. Step input is given to the system. Compute the rise time and settling time for an error of ± 5%. (8)

ii) Obtain the unit ramp response of first order system. (8)

(OR)

b) The overall transfer function of a unity feedback control system is $\frac{C(s)}{R(s)}=\frac{10}{s^2+6s+10}$. Find positional, velocity and acceleration error constants and steady state error for a unit step input, ramp input and parabolic input. Also determine the steady stare error of the input in $r(t) = 1 + t + t^2$. (16)

13. a) i) A unity feedback system has forward path transfer function $G(s)=\frac{K}{(s^3+6s^2+11s+6)}$. Using Routh Criterion find out the range of values of K for Stability. (8)

ii) Consider the characteristics polynomial $Q(s) \approx s^5+s^4+4s^3+24s^2+3s+63=0$ (8)

Using Routh-Hurwitz method, predict whether the system is stable or not. If not stable, how many poles are in the right half of S-plane?

(OR)

b) A unity feedback control system has an open loop transfer function $G(s)=\frac{K}{s(s^2+4s+13)}$. Sketch the root locus plot. Also comment on the stability of the system. (16)

14. a) Draw Bode plot and obtain the phase margin, gain margin, gain cross over frequency and phase cross over frequency for open loop transfer function $G(s)=\frac{50(s+1)}{s(s+3)(s+5)}$. (16)

(OR)

b) The open loop transfer function of unity feedback system is $G(s)=\frac{K}{s(s+2)(s+10)}$. Sketch Nyquist plot and identify the range of 'K' for stability of the system. (16)

15. a) The open loop transfer function of a unity feedback control system is given by $G(s)=\frac{K}{s(s+1)}$. Design a phase lead compensate or for the system to satisfy the following specifications. Phase margin of the system is $\geq$ 40 degrees and steady state error for ramp input is $\leq$ 1/15. The gain cross over frequency must be less than 7.5 rad/sec. (16)

(OR)

b) The open loop transfer function of a unity feedback control system is given by $G(s)=\frac{K}{s(s+4)(s+80)}$ Produce a suitable lag compensator so that phase margin is at least 35° and velocity error coefficient $K_v = 30\ sec^{-1}$. (16)

Register Number:

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCEE20 – Repair and Rehabilitation of Structures

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the importance of Maintenance.
2. Relate repair and rehabilitation of structures.
3. State the effect of selecting poor quality material for construction.
4. Show the possible decisions that can be made after evaluating the strength of a structure.
5. State the applications of Sulphur infiltrated concrete.
6. List out the types of corrosion inhibitors.
7. How to stop excessive deflection of concrete beam?
8. List any four reasons for leakage of structure.
9. What are dilapidated structures?
10. List out preplanning activities for demolition of structures.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Elaborate in detail about the facets of maintenance and its importance. (8)

ii) Explain the various method of inspections based on method and interval. (8)

(OR)

b) i) Evaluate the various causes for deterioration of concrete structures. (8)

ii) Enumerate the assessment procedure for evaluating a damaged structure. (8)

12. a) i) List out function of quality control during concrete constructions. (8)

ii) Elaborately explain about the effect of temperature on concrete. (8)

(OR)

b) i) Explain about the Building cracks and its remedial measures with neat sketches. (8)

ii) Explain about the design and constructional errors for concrete building. (8)

13. a) i) Discuss the types of polymer concrete composites with their advantages. (8)

ii) Explain the behavior of steel fibre reinforced concrete as a repair material. (8)

(OR)

b) i) Explain in detail the types of corrosion protection methods. (8)

ii) Summarize the process of epoxy injection. (8)

14. a) i) Explain the method of strengthening of existing column on the structures. (8)

ii) Explain the repair procedure of structures by using chemicals. (8)

(OR)

b) i) Discuss the access and repair a structure distressed due to marine atmosphere. (8)

ii) Explain about rehabilitate a structures due to fire. (8)

15. a) i) What are the allied activities accompanying the demolition process. (8)

ii) Explain the procedure for demolishing beam with help of neat sketch. (8)

(OR)

b) i) Describe the procedure to demolishing the overhead tank situated at thickly populated area. (8)

ii) Explain about the impulsion method of demolition of structures. (8)

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEEE11 – Energy Management System and SCADA

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the objectives of Energy Management system.
2. List the data required to calculate the performance of plant energy.
3. How to improve the efficiency of power transformers?
4. List the various types of energy efficient motors.
5. Explain the need of cogeneration.
6. A 3 ϕ AC load draws 8 KW power at 400 V supply voltage and 15 A line current. Calculate the power factor of the load.
7. List the features of display units in Man-Machine communication system.
8. Write the significances of regulatory functions in SCADA systems.
9. Compare testing and commissioning in power system sector.
10. Write the significance of fiber optical channels in SCADA systems.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the basic steps for developing electrical energy balance with any one example. (8)

ii) Explain why managerial skills are as important as technical skills in energy management? (8)

(OR)

b) i) What are the base line data that an audit team should collect while conducting detailed energy audit? (8)

ii) Explain what are the benefits of benchmarking energy consumption? (8)

12. a) i) Explain the multitasking solid-state meter for the energy management systems. (8)

ii) A potential transformer has a ratio of 1000 / 100 V and has following parameters: (8)
Primary resistance = 96 Ω, Secondary resistance = 0.88Ω
Primary reactance = 67.2 Ω, Total equivalent reactance = 115 Ω.
No load current is 0.03 A at 0.4 power factor lagging.
Calculate,
i) Phase angle error at no load.
ii) Burden in VA at unity power factor at which the phase angle will be zero.

(OR)

b) i) List the burdens on Instrument transformer. (8)

ii) Describe the relationship between the parameter for cost analysis of energy utilities. (8)

13. a) i) Discuss the various lighting standards for the different places. (8)

ii) Explain how to optimize the light energy for the industries. (8)

(OR)

b) i) Discuss how the harmonics are generated and explain the impact on energy management. (8)

ii) Explain how co-generation is advantageous over conventional power plant. (8)

14. a) i) Explain the data acquisitions systems. Also explain the advantages and limitations. (8)

ii) Explain the function of Intelligent Electronic Devices (IED) with suitable practical example. (8)

(OR)

b) i) Explain the multi-control centre systems. Also mention their salient features. (8)

ii) Write the applications and benefits of SCADA system. (8)

15. a) i) What is redundant dual processor and explain the function in power system sector? (8)

ii) Discuss the function of distributed centers and power pool management system. (8)

(OR)

b) i) Write the role of SCADA in system installation, testing and commissioning of power system network. (8)

ii) What is IEC61850 ring configuration? And explain the significance in Energy management system. (8)

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTMEE13 – Maintenance Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the necessities of maintenance management?
2. What is meant by MTBF and MTTR?
3. Mention the importance of machine reconditioning.
4. Differentiate breakdown and preventive maintenance.
5. State the types of reliability.
6. Mention the need of failure analysis.
7. What are the benefits of CMMS system?
8. Write the conditions for breakdown.
9. What are the lubrication monitoring techniques?
10. What is the use of correction monitoring?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the maintenance practices on various production machines. (16)

(OR)

b) What are the objectives of maintenance in the organization and what different types of organization are used in Indian industries? (16)

12. a) What are the steps involved in spare parts procurement and inventory control? Explain it briefly. (16)

(OR)

b) Interpret the different elements of preventive maintenance and repair planning module. (16)

13. a) i) Explain about the reliability maintenance. (8)

ii) Briefly explain the bath tub curve in reliability engineering. (8)

(OR)

b) i) Explain series and parallel reliability model. (8)

ii) With an example, explain the Weibull probability distribution. (8)

14. a) i) Explain about the work order flow. (8)

ii) Explain the master files and maintenance files. (8)

(OR)

b) Discuss in detail about CMMS, its uses and effectiveness in maintenance. (16)

15. a) Write about the monitoring of wear debris analysis in the lubrication. (16)

(OR)

b) i) Explain the temperature and vibration monitoring. (8)

ii) What is leakage monitoring? Explain some of the leakage mediums used for condition monitoring. (8)

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B.E. Degree Examinations – April/May 2023

VIII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE63 – Robotics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by pitch, yaw and roll?
2. Classify the robot anatomy.
3. List some examples of Robot End Effector.
4. Illustrate any four important factors to be considered in the selection and design of grippers.
5. Outline segmentation.
6. Apply the principle of inductive type proximity sensor.
7. Define the degrees of freedom.
8. Compare forward and backward kinematics.
9. Determine payback period for universal robot.
10. Discuss palletizing and depalletizing.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Define the four type of basic robot configurations. (12)

ii) List out the advantages and disadvantages of four basic robot configurations. (4)

(OR)

b) i) List out the robot parts and their functions. (12)

ii) Define Joint Notation Scheme. (4)

12. a) i) Explain the design and selection of robot gripper. (10)

ii) Explain and discuss about Magnetic Grippers. (6)

(OR)

b) i) Explain about the various types of Gripper mechanisms. (10)

ii) Explain with neat sketch of Pneumatic actuators system. (6)

13. a) i) Develop the Machine vision systems for pick and place robot. (12)

ii) Built the following sensor: (4)
(i)Optical encoders (ii) Ultrasonic proximity sensors

(OR)

b) i) Identify the various techniques in image processing and analysis. (12)

ii) Discuss about Touch Sensor and its application. (4)

14. a) i) Distinguish between the forward and reverse transformation for 2-Degree of freedom and 3-degree of freedom arm. (8)

ii) What is the working principle of teach pendant. (8)

(OR)

b) i) Distinguish the Robot Programming Languages in detail. (8)

ii) List out the commands used in VAL programming and discuss in detail. (8)

15. a) i) Analyze the AGV & RGV types of robots in detail. (8)

ii) Design the Safety sensors and safety monitoring of Robots in detail. (4)

iii) Select the various drive system used with an industrial robot. (4)

(OR)

b) i) Distinguish any two methods for economic analysis of industrial robots. (8)

ii) Briefly explain the various steps involved for implementing the robot in industries. (4)

iii) Discuss in detail about the working of a stepper motor. (4)

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B.E. Degree Examinations – April May 2023

IV Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE404 – Design of Steel Structures

(IS 800-2007, Steel tables and IS 875 par 1, 2, 3 to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between normal bolts and HSFG bolts.
2. List the advantages of Welded connections over bolted connections.
3. Identify the various forces acting on self supporting chimney.
4. List the type of chimneys.
5. Define elastic torsional buckling.
6. Differentiate biaxial loading and uniaxial loading in beam columns.
7. Define the plate girder.
8. What all are the forces to be considered in design of gantry girder?
9. Classify the types of trusses.
10. Describe the pitch of the truss.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) An ISMB 450 beam transmits an end reaction of 260 kN to the web of a column ISHB 300 @ 577 N/m. Design and sketch a stiffened seated connection. Use M24 black bolts. (16)

(OR)

b) Design a stiffened seat welded connection to connect the ISMB 500 transferring a load of 200 kN to an ISHB 300 @ 577 N/m. (16)

12. a) A self-supporting steel chimney is 80 m high and its diameter at the top is 3 metres. Calculate the dimensions of breech (flue) opening. Adopt the wind force as per IS: 875. The location of the place is such that the intensity of wind pressure up to 30 m height is 130 kN/m^2. Assume if any data required. (16)

(OR)

b) Explain the design procedure for Self supported steel chimney. (16)

13. a) A Column in a building is 4m in height. Its bottom end is fixed and the top end is hinged. The reaction load due to the beam is 450 kN at an eccentricity of 100 mm from the major axis of the section. Design the column section. (Section Strength as governed by material failure) (16)

(OR)

b) Illustrate about the Codal provisions for Design of Beam-Column (16)

14. a) Design a welded plate girder of span 22 m to carry superimposed load of 30 kN/m. Avoid use of bearing and intermediate stiffeners. Use Fe415 steel. (16)

(OR)

b) Derive the expression for the economical depth of a plate girder. Assume moment is resisted by flange only. (16)

15. a) Design angle purlin for the following data by simplified method. Spacing of trusses = 4 m, Spacing of purlins = 1.5 m, Weight of A.C. sheets including laps and fixtures = 0.205 kN/m^2, Live Load = 0.5 kN/m^2, Wind load = 1.2 kN/m^2 (suction), Inclination of main rafter of truss = 20^o. (16)

(OR)

b) A roof truss shed is to be built in Lucknow for an industry. The size of shed is 24 m x 40 m. The height of building is 12 m at the eves. Determine the basic wind pressure. (16)

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME404 – Dynamics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between crank effort and piston effort.
2. Draw the turning moment diagram of a single cylinder double acting steam engine.
3. Why a small flywheel is required in a multi cylinder engine?
4. Write the expression for the swaying couple and state at which it is maximum and minimum.
5. What are the causes and effect of vibration?
6. Determine the natural frequency of a mass of 10 kg suspended at the bottom of two springs in parallel of stiffness 5 N/mm and 8 N/mm.
7. What is meant by torsionally equivalent length of a shaft as referred to a stepped shaft?
8. List a few instruments for frequency measurement in vibration.
9. What is meant by sensitiveness of a governor?
10. Differentiate between governor and fly wheel.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The crank and connecting rod of a reciprocating engine are 150 mm and 600 mm respectively. The crank makes an angle of 60° with the inner dead centre and revolves at a uniform speed of 300 rpm, Find by Klien construction i) velocity and acceleration of the piston, ii) velocity and acceleration of the midpoint of the connecting rod and iii) the angular velocity and angular acceleration of the connecting. rod. (16)

(OR)

b) The turning moment diagram for a multi cylinder engine has been drawn to a scale of 1mm=325 N-m vertically and 1mm=3° horizontally. The areas above and below the mean torque lines are -26,+378,-256,+306,-302,+244,-380,+261 and -225 mm^2. The engine is running at a mean speed of 600 rpm. The total fluctuation of speed is not to exceed $\pm$1.8% of the mean speed. If the radius of flywheel is 0.7 m, find the mass of the flywheel. (16)

12. a) The cranks and connecting rods of a four cylinder in-line engine running at 1800 rpm are 60 mm and 240 mm each respectively and the cylinders are spaced 150 mm apart. If the cylinders are numbered 1 to 4 in sequence from one end, the cranks appear at interval of 90° in an end view in the order of 1-4-2-3. The reciprocating mass corresponding to each cylinder is 1.5 kg. Determine the unbalanced primary and secondary forces, if any, and unbalanced primary and secondary couples with reference to central plane of the engine. (16)

(OR)

b) Four masses A, B, C and D as given below are to be balanced. (16)

	A	B	C	D
Mass(kg)	-	30	50	50
Radius(mm)	180	240	120	150

The planes containing masses B and C are 300 mm apart. The angle between planes containing B and C is 90°. B and C make angles of 210° and 120° respectively with D in the same sense. Find the magnitude and the angular positions of mass A and the position of planes A and D.

13. a) A vibrating system is defined by the following parameters: m = 3 kg, k = 100 N/m, C = 3 N-s/m. Determine the damping factor, the natural frequency of damped vibration, logarithmic decrement, the ratio of two consecutive amplitudes and the number of cycles after which the original amplitude is reduced to 20 percent. (16)

(OR)

b) A machine of mass 75 kg is mounted on springs of stiffness 1200 kN/m and with an assumed damping factor of 0.2. A piston within the machine of mass 2 kg has a reciprocating motion with a stroke of 80 mm and a speed of 3000 cycles/min. Assuming the motion to be simple harmonic, Find i) the amplitude of motion of the machine, ii) its phase angle with respect to the existing force, iii) the force transmitted to the foundation, and iv) the phase angle of transmitted force with respect to the exciting force. (16)

14. a) A single cylinder oil engine drives directly a centrifugal pump. The rotating mass of the engine, flywheel and the pump with the shaft is equivalent to a three rotor system as shown in figure.1. The mass moment of inertia of the rotors A, B and C are 0.15, 0.3 and 0.09 kg-m^2. Find the natural frequency of the torsional vibration. The modulus of rigidity for the shaft material is 84 kN/mm^2. (16)

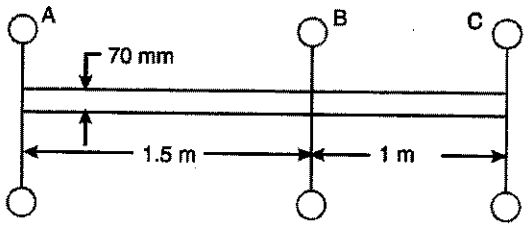

Figure.1.

(OR)

b) Discuss about vibration measuring instruments and its necessity with neat sketches. (16)

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

(OR)

b) A spring loaded governor of the Hartnell type has arms of equal length. The masses rotate in a circle of 130 mm diameter when the sleeve is in the mid position and the ball arms are vertical. The equilibrium speed for this position is 450 rpm, neglecting friction. The maximum sleeve moment is to be 25 mm and the maximum variation of speed taking in account the friction to be 5 percent of the mid position speed. The mass of the sleeve is 4 kg and the friction may be considered equivalent to 30 N at the sleeve. The power of the governor must be sufficient to overcome the friction by 1% change of speed (16)

either way at mid -position. Determine, neglecting obliquity effect of arms:

i) The value of each rotating mass

ii) The spring stiffness

iii) The initial compression of spring.

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE404 – Solid State Drives

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Explain the active load torques with example.
2. What are the conditions to be satisfied for the regenerative braking operation to take place?
3. Evaluate the necessity of DC choke coil and freewheeling diode in a converter circuit.
4. When is discontinuous conduction expected with the operation of converter fed dc drives?
5. Justify why stator voltage control is suitable for speed control of induction motors in fan and pump drives?
6. Compare CSI fed drives and VSI fed drives.
7. Justify why a self controlled synchronous motor is free from hunting oscillations?
8. Discuss the main advantages of using closed loop control in drives.
9. What are the factors which affects the energy saving in electric drive system?
10. Mention the methods to reduce the iron loss in electric drive.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Label the essential parts of electric drive. Explain its function. (8)

ii) Discuss the different modes of operation of an electrical drive. (8)

(OR)

b) i) Discuss and draw the speed-torque characteristics of various types of loads. (8)

ii) Discuss in detail about the multi quadrant dynamics of electric drives. (8)

12. a) Compose the operation of single phase controlled converter fed separately excited DC motor in continuous and discontinuous modes with neat diagram, waveforms and comment the steady state analysis. (16)

(OR)

b) Discuss the four quadrant operation of chopper fed DC drive. (16)

13. a) i) Describe the v/f control scheme of induction motor drive with a neat diagram. (8)

ii) Explain the the CSI fed induction motor drives. (8)

(OR)

b) i) Explain the modes of operation of a static Scherbius drive. (8)

ii) Explain the closed loop control of CSI fed Induction motor. (8)

14. a) Discuss the construction and working of permanent magnet synchronous motor with neat diagram. (16)

(OR)

b) Explain the constant Margin angle control technique of self controlled synchronous motor drive employing load commutated thyristor inverter. (16)

15. a) Explain the principle of operation of automatic power factor controller. (16)

(OR)

b) Explain the operation of solar powered pump drives in detail. (16)

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B.E. Degree Examinations – April/May 2023

I & II Semester (Full Time)

(2018 Regulations)

COMMON TO ALL BRANCHES

18ME101 – Engineering Graphics and Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Draw the projections of the point S which is in the HP and 30 mm in front of the VP.
2. Differentiate first angle and third angle projections.
3. Draw the neat sketch of prism and pyramid and name the features.
4. What is the difference between rigid solid and oblique solid?
5. Draw the lateral development of a pyramid.
6. Define section and sectional views.
7. Draw the frustum of cone.
8. List out the uses of isometric projection.
9. Compare the visual ray method and vanishing point method.
10. State the limitations of perspective drawing.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A line measuring 80 mm long has one of its ends 60 mm above HP and 20 mm infront of VP. The other end is 15 mm above HP and in front of VP. The front view of the line is 60 mm long. Draw the top view. (16)

(OR)

b) A hexagonal lamina of 20 mm side rests on one of its corners on the HP. The diagonal passing through this corner is inclined at 45° to the HP. The lamina is then rotated through 90° such that the top view of this diagonal is perpendicular to the VP and the surface is still inclined at 45° to the HP. Draw the projections of the lamina. (16)

12. a) A square pyramid of base end 40 mm and axis 60 mm is lying on VP on one of its triangular faces with the plane containing the axis parallel to HP and 30 mm above it. Draw the projections of the pyramid. (16)

(OR)

b) A hexagonal prism, side of base 25 mm and axis 50 mm long rests with one of its base corners on HP such that its base makes an angle of 60° to HP and its axis parallel to VP. Draw its projections. (16)

13. a) A cone of 45 mm diameter and altitude 60 mm is resting with its base on HP. A section plane parallel to VP cuts the cone at a distance of 15 mm from its center, draw the top and sectional front views. (16)

(OR)

b) A regular hexagonal pyramid of side of base 30 mm and height 60 mm is resting vertically on its base on HP such that two of the sides of the base are perpendicular to VP. It is cut by a plane inclined at 40° to HP and perpendicular to VP. The cutting plane bisects the axis of the pyramid. Obtain the development of the lateral surface of the truncated pyramid. (16)

14. a) A cylinder of 60 mm diameter and 70 mm height, stands on HP. A section plane perpendicular to VP, inclined at 45° to HP bisects the axis. Draw the isometric projection of the truncated cylinder, showing the cut surface. (16)

(OR)

b) A pentagonal pyramid, base 30 mm and axis 65 mm long rests with its base on HP. An edge of the base is parallel to VP and nearer to it. A horizontal section plane cuts the pyramid and passes through a point on the axis at a distance of 25 mm from the apex. Draw the isometric projection of the frustum of the pyramid. (16)

15. a) A pentagonal prism, side of base 30 mm and height 50 mm rests with its base on the ground plane such that one of its rectangular faces is inclined at 45° to picture plane and the vertical edge nearer to picture plane is 10 mm behind it. The station point is 45 mm infront of the picture plane, 90 mm above the ground plane and lies in a central plane which is 15 mm to the left of the vertical edge nearer to picture plane. Draw the perspective projection by vanishing point method. (16)

(OR)

b) A square pyramid of base edge 40 mm and altitude 50 mm. rests with its base on the ground plane such that all the edges of the base are equally inclined to the PP. One of the corners of the base is touching the PP. The station point is 60 mm infront of the PP, 80 mm above the ground plane and lies in a central plane which passes through the axis of the pyramid. Draw the perspective projections. (16)

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B.E. Degree Examinations – April/May 2023

V & VI Semester (Full Time)

(2018 Regulations)

CIVIL/ECE/EEE/MECHANICAL ENGINEERING

18CSOE04 – Python Programming

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write an algorithm to accept two numbers, compute the average and print the result.
2. What is identifier? and list the rules to name identifier.
3. Evaluate the expressions and find the result. a= 5, b=3, c=8 and d=6.
   (a+b)*c/d
   a+b*c/d
4. Write the syntax for while loop with flowchart.
5. How do you handle the exception inside a program when you try to open a non-existent file?
6. What is the special file that each package in Python must contain? Give an example for that.
7. Write the syntax for for-loop with flowchart.
8. Write a program to find sum of n numbers using for loop.
9. Distinguish between Procedure Oriented Programming (POP) and Object-Oriented Programming (OOP).
10. Write the Syntax for declaration of class and creation of objects.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write a program for matrix multiplication. (8)

    ii) Explain in detail about dictionaries and its operations. (8)

(OR)

    b) Do the Case study and perform the following operations in tuples (16)

- i) Maxima
- ii) Minima
- iii) Sum of two tuples
- iv) Duplicate a tuple
- v) Slicing operator
- vi) Obtaining a list from a tuple
- vii) Compare two tuples
- viii) Printing two tuples of different data types

12. a) Explain about the file reading and writing operations using format operator with python code. (16)

(OR)

b) i) Write a python program to perform linear search on a list. (8)

ii) Write a python program to store 'n' numbers in a list and sort the list using selection sort. (8)

13. a) Generalize a case study on the getting the students mark statements and analysis with exception handling. (16)

(OR)

b) i) Describe the difference between Python os and os. path modules. Also, discuss the following methods of os module a) chdir() b) rmdir() c) walk() d) listdir() e) getcwd() (8)

ii) Explain the need for Pickle module. Write Python program to save dictionary in Python Pickle. (8)

14. a) i) Discuss with an example about function composition. (8)

ii) Explain in detail about recursion with example. (8)

(OR)

b) Explain about the itertools module and it's functions with suitable examples. (16)

15. a) Differentiate method overloading and method overriding. Explain both with an example program. (16)

(OR)

b) State i) The properties of inheritance ii) The design hints for inheritance (16)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18ECOE06 – Basics of Internet of Things

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Recall the various communication APIs supported by IoT.
2. Define IoT.
3. Mention some of the steps involved in IoT design methodology.
4. Recall few applications of M2M.
5. Identify the role of sensors and actuators in IoT.
6. Mention how zigbee works.
7. Recall how logical design is performed using python.
8. Why is Raspberry Pi used for IoT devices?
9. Mention some of the challenges in using IoT for real time applications.
10. Predict the advantage in using IoT for Air pollution monitoring.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Discuss about communication models in logical design of IoT in detail.	(8)
		ii)	Discuss about role of Cloud Computing technology in IoT.	(8)
			(OR)	
	b)	i)	Explain the IoT levels with suitable example.	(8)
		ii)	Write short notes on domain specific IoT.	(8)
12.	a)		Compare IoT and M2M Methodologies. Explain the methodologies with a neat sketch.	(16)
			(OR)	
	b)		Discuss in detail about SDN and NFV for IoT.	(16)
13.	a)		Discuss the relation between RFID and IoT. Explain the role of RFID in IoT.	(16)
			(OR)	
	b)		Consider any two IoT components of your choice and discuss in detail.	(16)

14. a) i) Design a simple IoT application using Digital I/O to blink a LED in Raspberry pi with suitable connection diagram. Write a sample python script for the same. (12)

ii) Write short note on interfaces of IoT. (4)

(OR)

b) i) Discuss in detail about IoT physical devices and end points. (12)

ii) State the use of python in IoT. (4)

15. a) Explain how IoT is used for effective forest fire detection. (16)

(OR)

b) With neat block diagram explain about home intrusion detection. (16)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MEOE04 – Principles of Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the functions of management?
2. Compare Administration & Management.
3. State the characteristics of managers.
4. Brief the concept of scientific management.
5. Compare strategic planning and operation planning.
6. Write a short note on SWOT analysis.
7. Compare formal and informal organizations.
8. Define organization structure.
9. When do you prefer brainstorming?
10. What is the need for controlling?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Explain the major tendencies favoring the development of a unified global management theory.	(16)
		(OR)	
	b)	Discuss the effects of the evolution of modern management.	(16)
12.	a)	What are the factors affecting the business environment? Write a detailed note.	(16)
		(OR)	
	b)	Describe the roles that managers play in different functions.	(16)
13.	a)	Elaborate on the principles and process of planning in an organisational context.	(16)
		(OR)	
	b)	Explain the various types of organizational decisions.	(16)

14. a) With a neat diagram, explain the various types of organization structure. (16)

(OR)

b) Enumerate the concept of delegation of authority and the principles of effective delegation. (16)

15. a) Suggest a few measures to overcome the barriers in communication. Explain them. (16)

(OR)

b) Explain the various methods of performance appraisal with suitable examples. (16)

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC404 – Antennas and Wave Propagation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define radiation pattern.
2. Compare short dipole from half wave dipole.
3. State the principle of pattern multiplication.
4. Distinguish between uniform and non-uniform arrays.
5. What are the two modes of radiation of helical antenna?
6. Draw the diagram of rhombic antenna and its radiation characteristics.
7. Mention the uses of lens antenna.
8. State Huygens principle.
9. What are the effects of ground on low frequency wave transmission?
10. How are critical frequency and maximum usable frequency related?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the expression for the field quantities (E and H) for a small oscillation current element. (16)

(OR)

b) Derive the field quantities and radiation resistance of a half wavelength dipole antenna. (16)

12. a) i) Derive the field equations for array of two-point sources with spacing $\lambda/2$ with equal amplitude and phase. Also derive the direction of pattern maximum, minima and half power point directions. Draw the radiation pattern. (10)

ii) With neat sketch explain the construction and working principle of Yagi-uda antenna. (6)

(OR)

b) i) Obtain the expression for the field and the radiation pattern produced by a N element array of infinitesimal with distance of separation $\lambda/2$ and currents of unequal magnitude and phase shift 180 degree. (10)

ii) Derive the expression for input impedance of folded dipole antenna. (6)

13. a) i) With neat diagram explain the working principle of loop antenna. Derive the emf induced by the loop antenna. (8)

ii) Derive the expression for radiation resistance of circular loop antenna. (8)

(OR)

b) i) Explain how a paraboloidal antenna gives a highly directional pattern. (8)

ii) Compare flat reflector and corner reflector antennas. (8)

14. a) i) Describe rectangular apertures and derive expressions for its uniform distribution on an infinite ground plane and space. (8)

ii) A pyramidal horn antenna having aperture dimensions of a = 5.2 cm and b = 3.8 cm are used at a frequency of 10 GHz. Calculate its gain and HPBW. (8)

(OR)

b) i) Write short notes on Luneberg lens. (8)

ii) Draw the radiation pattern of horn antenna and hence describe the radiation mechanism with neat diagram. (8)

15. a) i) Describe the significant features of ground wave propagation. (8)

ii) Describe the troposphere and explain how ducts can be used for microwave propagation. (8)

(OR)

b) i) Draw the structure of ionosphere and explain the mechanism of ionosphere propagation. (8)

ii) Draw a 2-ray model of Sky wave propagation and explain it in detail. (8)

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B.E. Degree Examinations – April/May 2023

I Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE102 – DC Machines and Transformers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define co-energy.
2. Write the applications of singly & doubly excited magnetic system.
3. State the applications of various types of DC generators.
4. Define armature reaction.
5. What is back EMF?
6. Mention any four applications of DC series motor.
7. Why transformers are rated in KVA?
8. What are the typical uses of auto transformer?
9. State the different losses in transformer.
10. Define all day efficiency.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive an expression for field energy produced in a single excited magnetic field system. (16)

(OR)

b) Explain with neat diagram and sufficient expressions, the multiple excited magnetic field systems. (16)

12. a) i) Explain the constructional details of DC generator. (8)

ii) With the aid of a circuit diagram, describe the procedure for paralleling two DC generators and for transferring the load from one machine to the other. (8)

(OR)

b) i) Derive from the first principles the expression for EMF in DC generator. (8)

ii) A 4 pole lap wound DC shunt generator has a useful flux per pole of 0.6 Wb. The armature winding consists of 200 turns, each turn having a resistance of 0.003 Ω. Calculate the terminal voltage when running at 100 rpm if armature current is 45 A. (8)

13. a) Explain the operation of three point starter with a neat sketch. (16)

(OR)

b) Explain any two methods of speed control of DC shunt motor. (16)

14. a) Explain the operation of transformer in no load and loaded conditions with phasor diagrams. (16)

(OR)

b) Explain the working of auto transformer and prove that when transformation ratio approaches unity. (16)

15. a) Explain Swinburn's test for finding efficiency of a DC machine. (16)

(OR)

b) Draw and explain the circuit diagram for conducting OC and SC tests on a single phase transformer. (16)

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B.E. Degree Examinations – April/May 2023

III Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC303 – Communication Theory

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define modulation and classify.
2. Draw the frequency spectrum of SSB-SC and mention the applications of SSB.
3. Write the expressions for modulation index of PM and FM.
4. What is PLL? List the main components of PLL.
5. What does the term "noise" designate? Classify noise.
6. Which noise is named as thermal noise? How this is related to temperature and bandwidth?
7. What is the need for pre-emphasis circuit? Draw the pre-emphasis circuit.
8. Mention the function of amplitude limiter and where it is used?
9. List the properties of entropy.
10. Expand and write short notes on Discrete Memoryless Channel.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What are the ways available for generating DSB-SC-AM waves? With suitable diagram, explain any one method for the generation of DSB-SC-AM waves. (16)

(OR)

b) Illustrate the amplitude modulation process with mathematical representation and draw the phasor representation of AM wave. (16)

12. a) With neat diagram, explain narrow band FM wave is generated. Compare narrow band FM and wideband FM. (16)

(OR)

b) Discuss the Armstrong technique, an indirect method of FM generation with FM waveforms. (16)

13. a) Define internal noise and external noise. Classify internal noise and explain all in detail. (16)

(OR)

b) Discuss on narrow-band noise and representation of narrow band noise in terms of in-phase and quadrature components. List the properties of in-phase and quadrature phase components. (16)

14. a) With the model of DSB-SC receiver, discuss noise in DSB-SC linear receiver system and obtain the expression for average signal power and average noise power. (16)

(OR)

b) What are the methods used for improvement of the FM threshold reduction? Explain any one in detail. (16)

15. a) A source 'S' emits a word "COMMUNICATION". Find the following. (16)

i) Probability of occurrence of each letter

ii) amount of self-information

iii) amount of Total information

iv) Entropy of the source S.

(OR)

b) A discrete memory less source has an alphabet of seven symbols whose probabilities of occurrence are as described below. (16)

symbol	S_0	S_1	S_2	S_3	S_4	S_5	S_6
probability	0.25	0.25	0.125	0.125	0.125	0.0625	0.0625

Compute the Huffman code and efficiency for this source.

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B.E. Degree Examinations – April/May 2023

III Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE303 – Protection and Switchgear

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the qualities of protection?
2. List the various fuse element materials.
3. Draw the diagram of basic relay.
4. What is the significance of PSM curve?
5. What are the main types of stator winding faults?
6. How transformers are protected from incipient faults?
7. On what factors the arc resistance depends?
8. List the advantages of vacuum circuit breaker.
9. What is meant by voltage surge?
10. Name the most commonly used devices for protection against lightning surges.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe briefly about the various types of switchgear equipment's used in power system. (8)

ii) With a neat diagram explain the operation of double bus bar arrangements. (8)

(OR)

b) i) Discuss the construction and operation of HRC fuse. (8)

ii) List and explain the various essential features of switchgear. (8)

12. a) i) With a neat diagram explain the operation of induction type directional over current relay. (8)

ii) Derive the equation of force developed in an electromagnetic induction type relay and comment on the force equation. (8)

(OR)

b) i) With a neat diagram explain the operation of translay relay. (10)

ii) Write short notes on static relays. (6)

13. a) What are the various electrical faults occurs in alternator? Discuss about the balanced earth fault protection of alternator with a neat diagram. (16)

(OR)

b) Describe the operating principle of Merz-Price circulating current scheme for a feeders. (16)

14. a) i) Describe the theory of arc phenomenon occurs in a circuit breaker. (8)

ii) With a neat diagram explain the operation of air blast circuit breaker? (8)

(OR)

b) i) Discuss the constructional details of a typical SF6 circuit breaker? (8)

ii) Describe briefly the necessity of resistance switching. (8)

15. a) Describe briefly about the various types of lightning strokes. (16)

(OR)

b) Describe with neat diagram about the operation of the various types of lightning arresters. (16)

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B.E. Degree Examinations – April/May 2023

V Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE503 – Total Quality Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term quality.
2. Distinguish between the cost of internal failure and cost of external failure.
3. Define the term customer retention.
4. Identify the various types of sourcing.
5. Interpret the term check list.
6. Define the concept of six sigma.
7. Sketch the parts of house of quality.
8. Differentiate between control chart and variable chart.
9. Identify the benefits of documentation.
10. Recall the five stages of EMS model.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the dimensions of quality for product with an example. (8)

ii) "Various difficulties can be anticipated in the implementation of TQM Programme" – Justify the statement. (8)

(OR)

b) i) Describe about the Deming philosophy for improving quality, productivity and competitiveness. (8)

ii) Explain the six basic concepts of TQM. (8)

12. a) i) Examine the various tools used for collecting customer complaints. (8)

ii) Differentiate between sole sourcing and single sourcing. (8)

(OR)

b) i) Develop the phases of PDSC cycle and discuss each phases for any manufacturing industry. (8)

ii) Explain the basic strategy for implementing performance measures. (8)

13. a) State and explain the seven basic quality tools with their typical applications. (16)

(OR)

b) i) Examine whether six sigma can be applied to non-manufacturing process with example. (8)

ii) Define central tendency. Describe the three measures of central tendency. (8)

14. a) i) Analyse the step-by-step procedure of implementing a benchmarking process in food processing industry. (8)

ii) Identify the various phases of Quality Function Deployment and discuss in detail. (8)

(OR)

b) i) Contrast Taguchi's approach and traditional approach of quality loss cost with help of suitable sketch. (8)

ii) Identify the pillars of Total Productive Maintenance and discuss them in detail. (8)

15. a) i) Explain the documentation process in ISO 9000 system. (8)

ii) Examine the benefits of environmental management system. (8)

(OR)

b) Consider a company involved in testing the strengths of components. Currently 50 engineers are working in the company. Explain briefly the steps that the company should take to implement ISO 9001 based quality system and obtain the certificate from a certifying agency. (16)

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B.E. Degree Examinations – April/May 2023

III Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE302 - Surveying

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Classify bench mark.
2. Define contour gradient.
3. Label the fundamental axis of the theodolite.
4. Name the different cases of 'omitted measurements' in theodolite surveying.
5. State the disadvantage of tangential method of tachometry.
6. Difference between a theodolite and tacheometer.
7. Define most probable error.
8. Give the principle of least square.
9. State the advantages of total station.
10. Write the principles of GPS.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the permanent adjustment of levelling. (8)

ii) The following readings were taken with a level and 4 m staff. Draw up a level book page and reduce the levels by the height of instrument method. (8)

0.578 B.M. (= 58.250 m), 0.933, 1.768, 2.450, (2.005 and 0.567) C.P., 1.888, 1.181, (3.679 and 0.612) C.P., 0.705, 1.810.

(OR)

b) i) Explain basic principle of surveying and their classification. (8)

ii) Describe with the help of sketches the characteristics of contours. (8)

12. a) Describe the measurement of horizontal angles by Reiteration method using theodolite. (16)

(OR)

b) In order to reduce the error in measurement of vertical angle a set of measurements are taken and find the average angle as 9° 02' 05" form a height of instrument as 1.565 m to a target height 2.165 m. If the elevation of the instrument station is 189.250 m above mean sea level, find the elevation of staff station. Assume any data, if required. (16)

13. a) i) Two distances of 20 m and 100 m were accurately measured out and the intercepts on the staff between the outer stadia webs were 0.916 m at the former distance and 0.996 m at the later. Calculate the tachometric constant. (8)

ii) Explain the different between tangential and stadia tacheometry. (8)

(OR)

b) i) A tachometer is set up at an intermediate point on a traverse course PQ and the following observations are made on a vertically held staff. (8)

Staff station	Vertical angle	Staff intercept	Axial hair reading
P	8°36'	2.35	2.105
Q	6°6'	2.055	1.895

The instrument is fitted with an anallatic lens with multiplicative constant 100. Compute the length of PQ and reduced level of Q, if that of P being 321.5.

ii) Explain how a subtense bar is used with a theodolite to determine the horizontal distance between two points. (8)

14. a) Find the most probable values of the angles A, B & C from the following observation. (16)

A = 45°26'48.34"
B = 52°43' 24.62"
C = 48°34'22.78"
A+B = 98°10'12.46"
B+C = 101°77'47.65"

(OR)

b) i) Discuss various laws of weight. (8)

ii) How will you obtain error from direct observations of unequal weights on a single quantity? (8)

15. a) Describe the surveying which can be made with total station and salient features and advantages. (16)

(OR)

b) Explain characteristics of GPS navigation and satellite navigation (16)

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS304 – Operating Systems

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Operating Systems. Mention its services.
2. Analyze the concept of graceful degradation and fault tolerance system.
3. Identify the states of the process during execution with a neat sketch?
4. Differentiate between Preemptive and Non-preemptive scheduling.
5. What are the requirements that a solution to the Critical Section problem must satisfy?
6. What is resource allocation graph? Give example.
7. Identify the difference between Internal and External fragmentation.
8. Outline about Virtual Memory.
9. List out the various file attributes and mention its purposes.
10. List out the RAID levels and its characteristics.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain about Multiprocessor and Distributed Systems with neat architectures. (16)

(OR)

b) Examine the categories of System Calls and the methods used to pass parameters to the operating system. (16)

12. a) Examine the concept of Cooperating Processes using Producer-Consumer Problem with example. (16)

(OR)

b) Consider the following set of processes with the length of CPU burst given in milliseconds. Draw a Gantt Chart illustrating the execution of these jobs using Preemptive SJF and Round Robin (Quantum = 2 units) CPU Scheduling. (16)

Process	Arrival Time	Burst Time
P1	0	10
P2	1	6
P3	2	12
P4	3	15

Calculate the average waiting time and turnaround time for each of the above scheduling algorithm.

13. a) Explain about the two-process solutions in Critical Section problem with illustration. (16)

(OR)

b) Examine Banker's algorithm for the following system. (16)

Total No. of resources instances available A=10, B=5, C=7

Process	Allocation			Max		
	A	B	C	A	B	C
P0	0	1	0	7	5	3
P1	2	0	0	3	2	2
P2	3	0	2	9	0	2
P3	2	1	1	2	2	2
P4	0	0	2	4	3	3

Calculate the currently available resources (Work) and Need Matrix.
Is the system in a safe state? If a request from P1 arrives (1, 0, 2) can be granted immediately?

14. a) Explain in detail about Paging and hardware support with TLB. (16)

(OR)

b) Consider the following page reference string (16)

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

How many page faults would occur for the following replacement algorithms? Assume four frames and all frames are initially empty.

i) FIFO

ii) Optimal

15. a) Explain in detail about the file allocation methods with neat structures. (16)

(OR)

b) Consider the disk queue with request for I/O to blocks on cylinders 98, 183, 37, 122, 14, 124, 65, 67. If the disk head is start at 53, then find out the total head movement with respect to FCFS, SSTF, SCAN and C-SCAN scheduling. (16)

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III Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC304 – Network Theory and Synthesis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State reciprocity theorem.
2. State Tellegen's theorem.
3. Determine the Laplace transform of unit step function.
4. Give the convolution integral of f(t)*g(t).
5. Define selectivity.
6. Compare self-inductance and mutual inductance.
7. Y-parameters are called as short circuit admittance parameters. Justify.
8. Differentiate symmetrical and asymmetrical networks.
9. Define stability.
10. List the conditions for Hurwitz polynomial.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Using nodal analyses determine current I_1, I_2, I_3. (8)

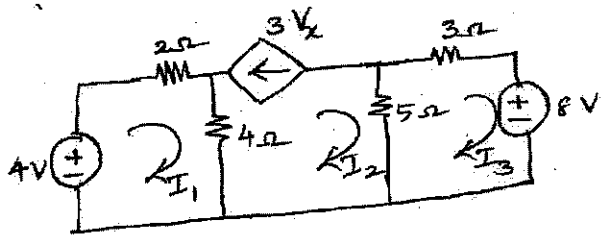

Figure.1.

ii) Using superposition theorem find voltage V_X (8)

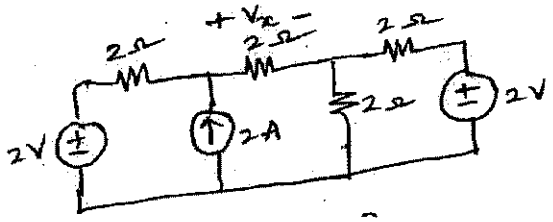

Figure.2.

(OR)

b) i) Obtain the Thevenin's equivalent circuit for the network as shown in figure.3. (8)

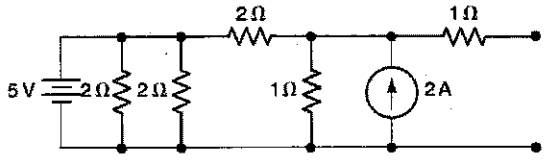

Figure.3.

ii) Determine the value of R in the circuit shown in figure.2 such that maximum power transfer takes place. Calculate the total power consumed by R. (8)

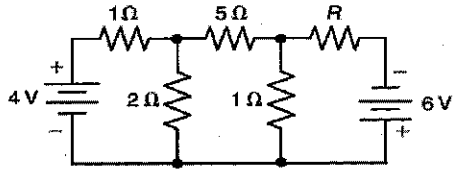

Figure.4.

12. a) i) Determine the transient response of RL series circuit with step input. (8)

ii) Discuss about driving points and transfer functions. (8)

(OR)

b) i) Determine the current i(t) in a series RLC circuit consisting of R = 5 Ω, L = 1 H and C = ¼ F, when the source voltage is given as impulse input. Assume that the circuit is initially relaxed. (8)

ii) Brief about the poles and zeros of immittance function and its properties. (8)

13. a) For a series resonance circuit, obtain the expression for bandwidth, Q-factor and variation of impedance with frequency. (16)

(OR)

b) Describe in detail about ideal transformer and tuned circuit. (16)

14. a) i) Brief about Z-parameters and derive the expressions for open circuit Z-parameters of two port network. (8)

ii) Write the importance of ABCD parameters. For a two port network, obtain the expressions for transmission parameters. (8)

(OR)

b) i) Find the Y-parameters for the network shown in figure.3. (8)

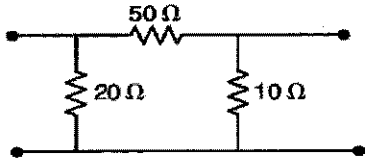

Figure.3.

ii) Find the h-parameters for the network shown in figure.4. (8)

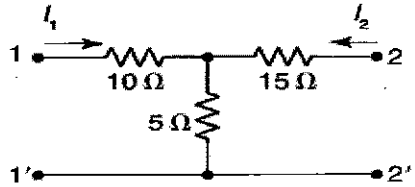

Figure.4.

15. a) i) Define positive real function. Brief about the necessary and sufficient conditions for a function to be positive real with an example. (8)

ii) Test whether the polynomial $P(s) = s^4 + s^3 + 3s^2 + 2s + 12$ is Hurwitz. (8)

(OR)

b) i) Realize Foster form-1 of the LC impedance function. (8)

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

ii) Explain in detail about the synthesis of RC and RL networks. (8)

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Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18EC308 – Basic Electronics Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare N type with P type Semiconductor.
2. List some applications of Photodiode.
3. If the collector current of a transistor is 10mA and common emitter current β is 100, determine the Emitter current.
4. Define Transistor.
5. Write De Morgans law.
6. Draw the Symbol of EX-OR gate and Draw the Truth Table.
7. List the ideal characteristics of Op amp.
8. Draw the equivalent circuit of Op amp.
9. Compare Analog signals with Digital signals.
10. List the applications of Microwave communications.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the working of PN junction diode. (8)

ii) Explain Zener diode application in detail. (8)

(OR)

b) i) With a Neat circuit Diagram and Waveforms explain the working of Half wave Bridge Rectifier. (8)

ii) With a Neat circuit Diagram and Waveforms explain the working of Centre tapped Full wave Rectifier. (8)

12. a) i) Explain the working of CE Configuration of NPN Transistor. Also obtain the (a) Input-Characteristics (b) Output Characteristics. (8)

ii) With neat sketch explain the operation of Voltage series feedback amplifier. (8)

(OR)

b) i) Explain voltage divider biasing for BJT amplifier. (8)

ii) With neat sketch explain the operation of Current series feedback amplifier. (8)

13. a) i) Covert the following (8)

a. $(67)_{10} = (?)_2$
b. $(167)_8 = (?)_2$
c. $(FA3)_{16} = (?)_2$
d. $(1011101010)_2 = (?)_{10}$.

ii) Construct and Design a Full Adder circuit. (8)

(OR)

b) i) Explain the circuit of SR Flip flop and Explain its operation. (8)

ii) Using NAND gates implement (8)

a. NOT gate
b. AND gate
c. OR gate
d. XOR gate.

14. a) i) Discuss briefly about Inverting and Non-Inverting Amplifier. (8)

ii) Explain working of weighted resistor type DAC. (8)

(OR)

b) i) Draw the circuit of Integrator using Opamp and derive its output equation. (8)

ii) Explain in detail Successive Approximation ADC with an example. (8)

15. a) i) Elucidate the Amplitude modulation in Analog communication. (8)

ii) Explain briefly about Satellite Communication system with block diagram. (8)

(OR)

b) i) Explain Frequency modulation in Analog Communication. (8)

ii) With the necessary diagram Discuss in detail about Optical Fibre Communication system. (8)

Register Number:

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

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. The reverse saturation current of a silicon PN diode is 7.5 μA at 300 K. Find the saturation current at 400 K.
2. Differentiate between Avalanche breakdown and Zener breakdown.
3. A transistor has a typical β of 100. If the collector current is 40mA. What is the value of emitter current?
4. Mention the points of superiority of FET's over BJT's.
5. Give the significance of h-parameters.
6. Draw the small signal equivalent circuit of a CSJFET.
7. The CMRR of an amplifier is 100 dB. Calculate common mode gain if the differential gain is 1000.
8. Write down the need of cascading the amplifiers.
9. The voltage gain without negative feedback is 40 dB. What is the new voltage gain if 3% negative feedback is introduced?
10. Name two high frequency oscillators.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With necessary diagrams, elucidate the forward and reverse characteristics of PN junction diode. (8)

ii) An a.c. supply of 230 V is applied to a half-wave rectifier circuit through transformer of turns ratio 5:1. Assume that the diode is an ideal one. The load resistance is 300 Ω. Find i) dc output voltage ii) PIV. (8)

(OR)

b) i) Describe the working of center tapped full wave rectifier with neat diagram. (10)

ii) Over what range of input voltage will the zener in a voltage regulator maintain 30 V across 2000 Ω load, assuming that series resistance R = 200 Ω and zener current rating is 25 mA. (6)

12. a) i) Describe the static input and output characteristics of a CB transistor with neat circuit diagram. (8)

ii) In a transistor amplifier using voltage divider bias, the operating point is chosen such that Ic = 2 mA, Vce = 3V. If Rc = 2.2 k, Vcc = 9 V and β = 50. Find the values of bias resistors and Re. Assume: Vbe = 0.3 V and current through the bias resistors is 1mA. (8)

(OR)

b) i) Describe the construction of N channel JFET and also explain the drain and transfer characteristics of the same. (8)

ii) Draw the basic construction and equivalent circuit of a UJT. Briefly explain the device operation. (8)

13. a) Discuss about CE amplifier with neat circuit diagram and derive the expression for gain, input impedance and output impedance of CE amplifier. (16)

(OR)

b) With neat circuit diagram, discuss about common drain MOSFET amplifier and derive the expression for gain, input impedance and output impedance and also draw its small signal equivalent circuit. (16)

14. a) Draw the circuit diagram of an emitter coupled BJT differential amplifier and derive expressions for differential gain, common mode gain, CMRR, input impedance and output impedance. (16)

(OR)

b) Elaborate about RC coupled Class A amplifier and Class C amplifier and derive the expression for efficiency of the same. (16)

15. a) i) Describe the operation of voltage series feedback amplifier with circuit diagram. (8)

ii) Voltage shunt negative feedback amplifier has a voltage gain without feedback of A = 500, input resistances (Ri) = 3 KΩ, output resistance Ro = 20 KΩ, and feedback ratio of β = 0.01. Calculate the voltage gain, input resistance (Rif) and output resistance (Rof) of amplifier with feedback. (8)

(OR)

b) i) With a neat diagram, explain about Colpitt's oscillator and derive the expression for frequency of oscillation. (8)

ii) In Colpitt's oscillator C1 = 1 nf and C2 = 100 nf. If the frequency of oscillation is 100 KHz, find the value of inductor. Also find the minimum gain required for obtaining sustained oscillations. (8)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

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. Define Specific gravity.
2. Write down the unit and dimension of Pressure and Viscosity.
3. Define streamline.
4. How do you determine the velocity of flow through pipe?
5. Distinguish between Laminar flow and Turbulent flow.
6. What are the uses of Moody`s Diagram?
7. Distinguish between Hydraulic Gradient line and Energy gradient line.
8. Write down any two methods of preventing Boundary Layer separation.
9. Define Reynold`s Number.
10. State Buckingham's π theorem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What are the types of fluids? Explain. (8)

ii) A liquid is compressed in a cylinder having a volume of 0.012 m^3 at a pressure of 690 N/cm^2. What should be the new pressure in order to make its volume 0.0119 m^3? Assume Bulk Modulus of Elasticity of the liquid as 6.9×10^4 N/cm^2. (8)

(OR)

b) i) Define: (8)

1) Specific Weight
2) Mass Density
3) Specific Gravity
4) Compressibility.

ii) A 15 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.10 cm. Both cylinders are 25 cm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. If a torque of 12.0 Nm is required to rotate the inner cylinder at 100 rpm determine the viscosity of the fluid. (8)

12. a) i) What are the types of flow through Pipes? Explain. (8)

ii) A cubical tank has sides of 1.5 m. It contains water for the lower 0.60 m depth. The remaining upper part is filled with oil of specific gravity 0.90. Determine for one vertical side of the tank (8)

1) Total Pressure
2) Centre of pressure.

(OR)

b) i) Derive the continuity equation for Three Dimensional flow. (8)

ii) In a two dimensional incompressible flow the fluid velocity components are given by $u = x - 4y$ and $v = -y - 4x$. Show that velocity potential exists. Also determine the velocity potential function and the stream function. (8)

13. a) i) Derive Bernoulli's equation from fundamentals. Also explain the applications of Bernoulli's equation. (8)

ii) The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 lit/sec. Section 1 is 6 m above datum. If the pressure at section 2 is 3 m above the datum and the pressure at section 1 is $39 N/cm^2$, determine the intensity of pressure at section 2. (8)

(OR)

b) i) How do you measure rate of flow through Venturimeter? Explain. (8)

ii) Crude oil of specific gravity 0.92 and viscosity 0.9 Poise is conveyed at a rate of 31 N/s through a 120 mm diameter pipe of length 12 m. Determine the difference of pressure between the two ends of the pipe. (8)

14. a) i) What are the various major and minor losses in Pipe? Explain. (8)

ii) The rate of flow through a horizontal pipe is $0.25 m^3/s$. The diameter of the Pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is $12 N/cm^2$. Determine (8)

1) Loss of head due to sudden enlargement
2) Pressure intensity in large pipe
3) Power lost due to enlargement.

(OR)

b) i) Define: (8)

1) Displacement Thickness
2) Energy thickness
3) Momentum Thickness.

ii) Determine the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by, $u/U = 2(y/\delta) - (y/\delta)^2$ where δ = boundary layer thickness. (8)

15. a) i) What are the applications of Model Study? Explain. (8)

ii) An oil of specific gravity 0.92 and viscosity 0.03 Poise is to be transported at the rate of 2.50 m^3/s through a 1.20 m diameter pipe. Tests were conducted on a 120 mm diameter pipe using water at 20°C. The viscosity of water at 20° C is 1 centipoise. Determine (8)

1) The velocity of flow in the model
2) The rate of flow in the model.

(OR)

b) i) How do you select Repeating Variables in Dimensional Analysis using Buckingham's π theorem? Explain. (8)

ii) Determine an expression for the drag force on smooth sphere of diameter D, moving with a uniform velocity 'V' in a fluid of density 'ρ' and viscosity 'μ'. Use Rayleigh's method. (8)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18CEOE04 - Mechanics of Deformable Bodies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the relation between Modulus of elasticity and Bulk modulus.
2. How thermal stresses are induced in a member?
3. Define Point of contraflexure.
4. Draw the shape of the shear stress distribution across the depth of a T–beam.
5. Write any two assumptions made in Torsion theory.
6. Distinguish between closed coiled and open coiled helical springs.
7. What is residual stress, and how does it differ from applied stress?
8. Distinguish between elastic strain and plastic strain.
9. What are the three stages of fatigue failure?
10. How does the endurance limit differ from the yield strength of a material?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A steel bar ABCD consists of three sections: AB is of 20 mm diameter and 200 mm long, BC is 25 mm square and 300 mm long, and CD is of 12 mm diameter and 200 mm long. The bar is subjected to an axial compressive load which induces a stress of 75 MN/m^2 on the largest cross section. Determine the total decrease in the length of the bar when the load is applied. For steel E=210 GN/m^2. (16)

(OR)

b) A 400 mm long bar has rectangular cross-section 10 mm × 30 mm. This bar is subjected to (16)

1. 15 kN tensile force on 10 mm × 30 mm faces,
2. 80 kN compressive force on 10 mm × 400 mm faces, and
3. 180 kN tensile force on 30 mm × 400 mm faces.

Find the change in volume if $E = 2 \times 10^5$ N/mm² and $\mu = 0.3$.

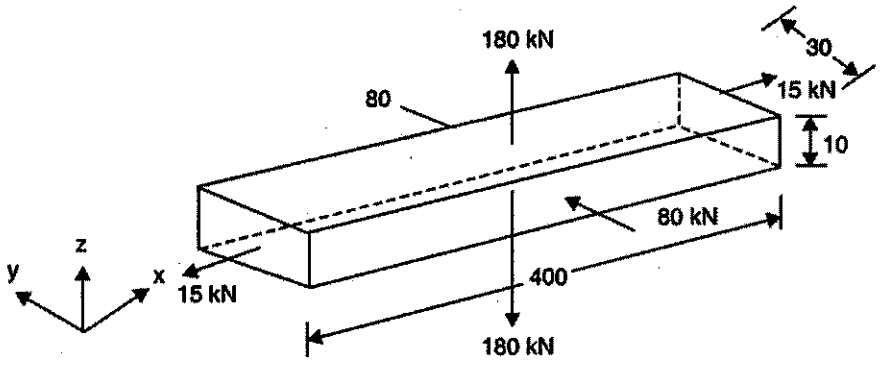

Figure.1

12. a) An overhanging beam ABC is simply supported at A and B over a span of 6 m and BC overhangs by 3m. If the supported span AB carries a centrally concentrated load of 8 kN and overhang span BC carries 3kN/m, draw the shear force and bending moment diagram. (16)

(OR)

b) The unsymmetric I-section shown in Fig. is the cross-section of a beam, which is subjected to a shear force of 80 kN. Draw the shear stress variation diagram across the depth. (16)

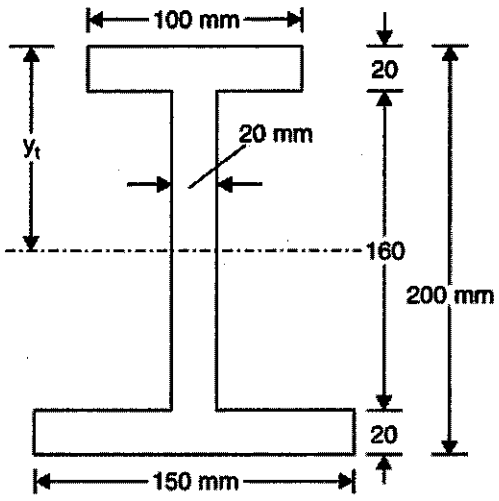

Figure.2

13. a) A hollow shaft is to transmit 300 kW power at 100 r.p.m. If the shear stress is not to exceed 80 N/mm² and the internal diameter is 0.6 times the external diameter, find the external and internal diameters assuming that the maximum torque is 1.4 times the mean. (16)

(OR)

b) A closely coiled helical spring made out of a 10 mm diameter steel bar has 12 complete coils, each of mean diameter of 100 mm. Calculate the stress induced in the section of rod, the deflection under the pull and the amount of energy stored in the spring during the extension. It is subjected to an axial pull of 250 N. Modulus of rigidity is $0.84 \times 10^5 N/mm^2$. (16)

14. a) i) Mild steel and cast iron are tested up to destruction in tension. Compare their fractured surfaces. (8)

ii) Discuss about the techniques used for measuring the residual stress in a material. (8)

(OR)

b) Explain in detail about stress concentration and its effects on the behaviour of a material under loading, Also discuss about the stress concentration mitigating techniques in practice. (16)

15. a) What types of tests are commonly used to study the mechanical behavior of materials under impact loading, and what are some of the key advantages and limitations of these techniques? (16)

(OR)

b) i) Write a short account of the microscopical aspects of fatigue crack initiation and growth. (8)

ii) Explain, briefly, the meaning and importance of the term "stress relaxation" as applied to metallic materials. (8)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC404 – Analog Communication

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the need for modulation.
2. Let a message signal of Bandwidth of 1KHz.What is the bandwidth of the DSB SC and SSB modulated signal.
3. With the block diagram give the relationship between FM and PM.
4. What are the merit and demerit of angle modulation over amplitude modulation?
5. Write the expression for figure of merit in modulation system.
6. Give the expression for thermal noise.
7. What is relationship between the figure of merit of FM and PM?
8. What are the noise in AM receivers?
9. What is the purpose of coding?
10. Show that entropy is measure of uncertainty. When is it at the maximum?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Determine the frequency components in Hz and their amplitudes, and plot the double-sided spectrum of the Amplitude Modulated signal $x(t) = [6 + 2\cos(2\pi 10^3 t) + \cos(4\pi 10^3 t)]\cos(2\pi 10^6 t)$. (6)

ii) Explain the envelope detector circuit for AM demodulation, Along with waveform and signal expressions at each stage. (10)

(OR)

b) i) Sketch the waveform the AM signal $x(t) = [2 + 0.5\cos(2\pi 10^3 t)]\ \cos(2\pi 10^6 t)$ Mark the appropriate amplitude value and time values. (6)

ii) Using Hilbert's transform derive the SSB type Amplitude modulated signal expression in time domain. Also draw the spectrum of for a single tone modulation, when the modulating signal is a sinusoid m(t) = cos $\omega_m t$. (10)

12. a) An angle – modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ is described by the equation (16)

$$\varphi_{EM}(t) = 10\cos\ (\omega_c t + 5\sin 3000\,t\ + 10\sin 2000\,\pi t)$$

i) Find the power of the modulated signal

ii) Find the frequency deviation Δf.

iii) Find the deviation ratio β

iv) Find the phase deviation $\Delta\Phi$

v) Estimate the bandwidth of $\varphi_{EM}(t)$

(OR)

b) Design an Armstrong indirect FM modulator to generate an FM signal with carrier frequency 97.3 MHz and Δf = 10.24 kHz. A NBFM generator of f_{ci} = 20 kHz and Δf = 5 Hz is available. Only frequency doublers can be used as multipliers. Additionally, a local oscillator (LO) with adjustable frequency between 400 and 500 kHz is readily available for frequency mixing. (16)

13. a) Derive the figure of merit in DSB-SC receiver. (16)

(OR)

b) Explain the representation of narrow band noise in terms of envelope and phase components. (16)

14. a) Explain how pre-emphasis and de emphasis using simple PC circuit are used in threshold improvement. (16)

(OR)

b) Explain capture effect and threshold effect in FM receivers. (16)

15. a) A source emits letters from an alphabet A = {$a1$, $a2$, $a3$, $a4$, $a5$} with probability P(a1)=0.15, P(a2)=0.04, P(a3)=0.26, P(a4)=0.05 and P(a5)=0.50 (16)

i) Calculate the entropy of this source

ii) Find a Huffman Code for this source

iii) Find the average length of the code in (b) and its redundancy

(OR)

b) Apply Shannon - Fano coding procedure for the following message ensemble. Use M=2. Calculate the encoded message and efficiency. (16)

X	X1	X2	X3	X4	X5	X6	X7	X8
P	0.25	0.125	0.0625	0.0625	0.0625	0.25	0.0625	0.125

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B.E. Degree Examinations – April/May 2023

V Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE503 - Design of Reinforced Concrete and Masonry Structures

(IS 456, IS 1905 to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Sketch any two types of footing.
2. Define pile cap.
3. What is retaining wall?
4. Mention the forces acting on retaining wall.
5. Classify flat slab.
6. Outline on the characteristics of yield lines.
7. List the types of water tank.
8. What are the types of joints in water tank?
9. Write a note on bond in brick masonry.
10. Define slenderness ratio in brick masonry structures.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Design a rectangular isolated footing of uniform thickness of R.C column bearing a vertical load of 550 kN and having a base size 400 x 600 mm. The safe bearing capacity of soil can be taken as 120 kN/m^2. Use M20 concrete and Fe 415 steel. (16)

(OR)

b) Design a combined trapezoidal footing for two columns A and B, spaced 5 m centre to centre. Column A is 300 x 300 mm in size and transmits a load of 500 kN. Column B is 400 x 400 mm in size and carries a load of 950 kN. The maximum length of footing is restricted to 7 m only. The safe bearing capacity of soil can be taken as 120 kN/m^2. Use M20 concrete and Fe 415 steel. (16)

12. a) Design a T shaped cantilever retaining wall to retain earth embankment 3 m high above ground level. The unit weight of earth is 18 kN/m^2 and its angle of repose is 30^0. The embankment is horizontal at the top. The safe bearing capacity of soil can be taken as 100 kN/m^2 and the coefficient of friction between soil and concrete is 0.5. Use M20 concrete and Fe 415 steel. (16)

(OR)

b) Design a counterfort retaining wall to retain 7m high embankment above ground level. The foundation is to be taken 1m deep where the safe bearing capacity of soil can be taken as 180 kN/m^2. The top of earth retained is horizontal and soil weighs 18 kN/m^3 with angle of internal friction is 30^0 coefficient of friction between soil and concrete is 0.5.Use M20 concrete and Fe 415 steel. (16)

13. a) Design the interior panel of a flat slab 5.6 x 5.6 m in size for a super imposed load of 7 kN/m^2. Provide two way reinforcement. Use M20 concrete and Fe 415 steel. (16)

(OR)

b) A rectangular slab 5 m X 6 m is simply supported and is isotropically reinforced with 10 mm diameter@200 mm c/c both ways at an average depth of 100 mm. The overall depth of slab is 130 mm. Estimate safe permissible load on the slab using yield line theory. Use M20 concrete and Fe415 grade steel. (16)

14. a) A circular water tank has internal diameter 10 m. The maximum depth of water being 4 m. The walls are restrained at base. The tank rests on the ground. Design the tank. Use M20 concrete and Fe 415 steel. (16)

(OR)

b) An open square tank 5 m x 5 m x 3 m deep is supported on brick masonry walls all round. Design the tank. Use M20 concrete and Fe 415 steel. (16)

15. a) Design a brick wall to carry a load of 50 kN/m. The height of wall is 3 m. Strength of brick is 10 N/mm^2. Use cement mortar ratio 1:6. (16)

(OR)

b) Explain the design procedure to design axially and eccentrically loaded brick wall. (16)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

V Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME503 – Automobile Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are three types of axles used in automobiles?
2. What is the difference between unibody and body on frame?
3. Why MPFI was preferred over carburetors?
4. Define "Intermittent injection" in petrol engine.
5. List the types of dry type clutches.
6. Write the functions of torque converters.
7. What type of transmission systems employed in e-vehicles?
8. How ABS enhances the breaking effectiveness?
9. Write any two negative impacts of biodiesel usage in diesel engines.
10. Sketch the layout of a series configured electric vehicle.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the influence of catalytic converters, DPF, EGR and SCR in engine emission control. (16)

(OR)

b) i) Justify: Body on frame structure improves NVH and enhances safety in automobiles. (8)

ii) Draw the layout of an automobile and indicate its various components. (8)

12. a) i) Explain the working principle of electronic fuel injection system. (8)

ii) Draw battery ignition system circuit. Write the routine for maintenance of a Lead acid battery. (8)

(OR)

b) Describe the working of a Common Rail Diesel Injection (CRDI) system with a neat sketch. (16)

13. a) Explain in detail the automatic transmission system. Write in detail about various types of gear selector mechanisms used in automobiles. (16)

(OR)

b) Describe with a line diagram of Synchromesh unit and mention the components (spring with ball type system). (16)

14. a) What is the working principle of antilock braking system? Explain with neat sketch and working method of steering linkage system with suitable sketches. (16)

(OR)

b) Draw the layout of a typical steering system used in a vehicle fitted with rigid suspension configuration and briefly discuss about the function of its constituent members. (16)

15. a) Explain the modification required in CI engines to employ biodiesel to produce on par performance, combustion and emission characteristics of conventional engines. (16)

(OR)

b) i) Explain the construction and working of the PEM fuel cell with a sketch. (8)

ii) Discuss the salient properties of hydrogen as a fuel and write the safety concerns on using hydrogen as fuel in automobiles. (8)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS404 – Software Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the IEEE definition of Software Engineering.
2. Differentiate Product and Process.
3. Explain how the requirements are evaluated?
4. Categorize the problems that are encountered during requirements elicitation.
5. Summarize the three characteristics for the evaluation of a good design.
6. Identify the three key reasons that software architecture is important.
7. Identify the criteria for Completion of Testing.
8. Generalize your opinion about Smoke Testing.
9. What is W^5HH Principle?
10. Define Defect Removal Efficiency.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the umbrella activities in a software engineering process framework. (8)

ii) Explain the seven principles of software engineering practice. (8)

(OR)

b) i) Describe in detail about Personal Software Process and Team Software Process. (8)

ii) Explain in detail about Waterfall Model and Spiral Model. (8)

12. a) i) Explain the steps required to establish the groundwork for an understanding of software requirements. (8)

ii) Explain the elements of the Requirements Model with necessary diagram. (8)

(OR)

	b)	i)	Explain in detail about Scenario based Modeling.	(8)
		ii)	Draw and explain the Activity diagram and Swimlane diagram for Access camera surveillance via the Internet - display camera views function.	(8)
13.	a)	i)	Explain in detail about the design concepts.	(12)
		ii)	Interpret the Software Quality Guidelines and Attributes.	(4)
			(OR)	
	b)	i)	List the design steps to map the data flow diagrams into software architecture and explain.	(12)
		ii)	Design the Architectural context diagram for the Safe Home security function.	(4)
14.	a)		Illustrate in detail about the types of system testing.	(16)
			(OR)	
	b)		Illustrate in detail about the Debugging Process.	(16)
15.	a)	i)	Build the decision tree for a software based system X to support the make/buy decision.	(4)
		ii)	Describe in detail about Software Measurement.	(12)
			(OR)	
	b)	i)	Summarize the steps for estimating the agile projects using decomposition approach.	(4)
		ii)	Explain the Empirical Estimation Model.	(12)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

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. Show the difference between concurrent and non-concurrent force with necessary diagram.
2. A concurrent force vector is acting on a particle, then show the equations of equilibrium for the particle to stay in stable.
3. Draw the diagram for roller support and hinged support carrying a beam of AB.
4. Define varignon's principle.
5. Summarize difference between centroid and centre of gravity.
6. What is radius of gyration?
7. State the difference between co-efficient of friction and angle of friction.
8. Illustrate the term angle of repose.
9. A body is moving with a velocity of 2 m/sec. After 4seconds the velocity of the body becomes 5m/sec. Find the acceleration of the body.
10. What exactly means the term co-efficient of restitution in collision between two elastic bodies.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The forces 20 N, 30 N, 40 N, 50 N and 60 N are acting on one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant force. (16)

(OR)

b) The lines of action of three forces are concurrent at the origin 'O' passes through the points A, B and C having coordinates, (3, 0,-3), (2, -2, 4) and (-1, 2, 4) respectively. If the magnitude of the forces are 10 N, 30 N, and 40 N. Determine the magnitude and direction of their resultant. (16)

12. a) Four forces act on a 700 mm X 375 mm plate as shown in figure.1. (16)

i) Find the resultant of these forces.

ii) Locate the two points where the line of action of the resultant intersects the edge of the plate.

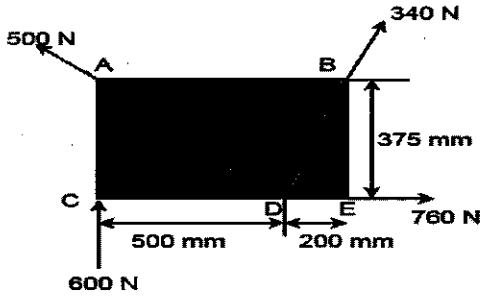

Figure.1.

(OR)

b) Two cylinders A and B rest in horizontal channel as shown in figure 2. (16) The cylinder A has weight of 1000 N and radius of 9 cm. The cylinder B has a weight of 400 N and a radius of 5 cm. The channel is 18 cm wide at the bottom with one side vertical. The other side is incline at an angle 60° with the horizontal. Find the reactions.

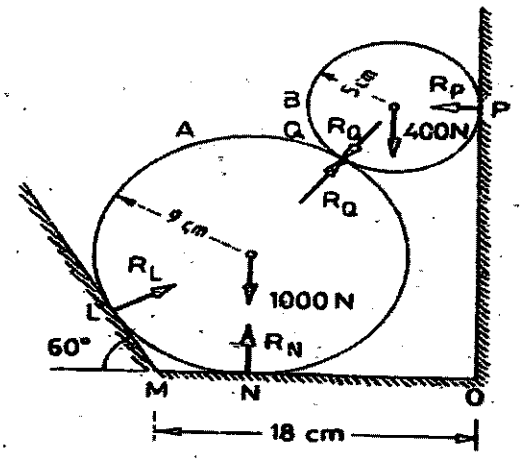

Figure. 2

13. a) Determine the centre of gravity of L-section shown in figure.3. (16)

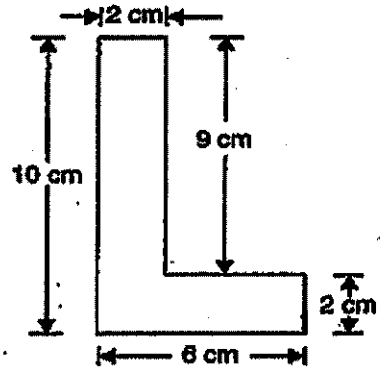

Figure.3.

(OR)

b) Determine the moment of inertia of the area of T-section as shown in figure.3 with respect to the centroidal axis. (16)

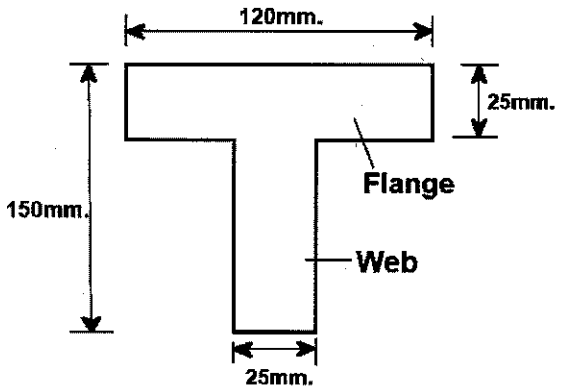

Figure.3.

14. a) A 7 m long ladder rests against a vertical wall, with which it makes an angle 45°, and on a floor. If a man, whose weight is one half of that of the ladder, climbs it, at what distance along the ladder will he be, when the ladder is about to slip? The co-efficients of friction between the ladder and the wall is 1/3 and that between the ladder and floor is 1/2. (16)

(OR)

b) A block over lying a 10° wedge on a horizontal floor and leaning against a vertical wall and weighing 1500 N is to be raised by applying a horizontal force to the wedge. Assuming co-efficient of friction between all the surfaces in construct to be 0.3, determine the minimum horizontal force to be applied to raise the block. (16)

15. a) A burglar's car had a start with an acceleration of 2 m/s^2. A police vigilant party came after 10 seconds and continued to chase the burglar's car with a uniform velocity of 40 m/s. Find the time taken, in which the police van will overtake the car. (16)

(OR)

b) A ball of mass 20 kg moving with a velocity of 5 m/s strikes directly another ball of mass 10 kg moving in the opposite direction with a velocity of 10 m/s. If the co-efficient of restitution is equal to 5/6, then determine the velocity of each ball after impact. (16)

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Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

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. Calculate the percentage of ferrite and pearlite in 0.3%carbon steel.
2. Compare the composition of brass and bronze.
3. Differentiate between annealing and normalizing processes.
4. What is Austempering?
5. What is the use of CVD coatings in metal cutting?
6. List any four defects in ceramics.
7. Differentiate between slip and twinning.
8. Recall the term : Fatigue Failure.
9. What are the advantages of Ultrasonic testing?
10. Define surface engineering.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw an Iron-Carbon phase diagram and explain the three invariant reactions. (16)

(OR)

b) Analyze the composition, microstructure and applications of SG, Malleable, White and Grey cast irons. (16)

12. a) i) Discuss the annealing, normalizing and hardening processes. (8)

ii) Explain the Jominy end quench test of hardenability determination. (8)

(OR)

b) Discuss in detail the following surface hardening processes (16)

i) Carburizing
ii) Nitriding
iii) Flame hardening
iv) Induction hardening

13. a) Discuss in detail the properties and applications of Al_2O_3, SiC and Si_3N_4 Ceramics. (16)

(OR)

b) Elaborate the properties and applications of fibre composites and particulate reinforced composites. (16)

14. a) Analyze the standard tensile properties of mild steel with help of tension test. (16)

(OR)

b) Analyze the testing procedure of Brinell, Vicker's and Rockwell hardness tests. (16)

15. a) Describe the testing procedure, advantages and disadvantages of Liquid Penetrant Inspection. (16)

(OR)

b) Describe the testing procedure, advantages and disadvantages of Magnetic Particle Inspection. (16)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

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. Mention the purpose of providing bed slope in open channels.
2. Obtain the relation between Manning's constant and Chezy's constant.
3. Differentiate subcritical and super critical flow.
4. Classify the hydraulic jump.
5. State jet propulsion.
6. Draw the inlet and outlet velocity triangle for jet striking and leaving on the moving vane in tangential direction.
7. Define specific speed of turbine.
8. Give the comparison between impulse and reaction turbines.
9. What are the advantages of fitting an air vessel in reciprocating pump?
10. Draw an indicator diagram, considering the effect of acceleration and friction in suction and delivery pipes.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Differentiate between pipe flow and open channel flow. (8)

ii) A circular pipe of diameter 1m has to carry a maximum discharge of 0.8 m^3/sec. Calculate the required slope. Use Manning's formula N = 0.0167. (8)

(OR)

b) i) A rectangular channel has a width of 2.5 m and a slope of 1 in 400. Find the depth of flow if the discharge is 10 cumecs. Use Chezy's formula, C= 50. (8)

ii) Derive the most economical side slopes of trapezoidal section. (8)

12. a) i) Derive the dynamic equation of Gradually varied flow. (8)

ii) A river 90 m wide and 3 m deep has stable bed and vertical banks with a bed slope of 1 in 2500. Estimate the length of back water curve produced by an afflux of 2 m. Assume Manning's in N = 0.035. (8)

(OR)

b) i) Derive the application of momentum equation for Rapidly varied flow. (8)

ii) Discuss the graphical integration method in detail for working out water surface profile inan open channel flow. (8)

13. a) A jet of water having a space velocity of 40 m/sec impinges without shock on a series of vanes moving at 12 m/sec. the jet is making an angle of 20° with the direction of motion of the vane. Relative velocity at exit is 0.9 times the relative velocity at entrance and the absolute velocity of water at exit is normal to the direction of the motion of the vanes. Find, the vane angles at entrance and exit, work done on the vanes per N of water and efficiency. (16)

(OR)

b) A wheel having radial blades has the inner and outer radii of 30 cm and 60 cm respectively. The jet enters the blades at the outer tip with a velocity of 40 m/sec at an angle of 30° to the tangent and leaves the blades with a velocity of flow of 8 m/sec. if the angles of the blades at the entrance and exit are respectively 45° and 35°, find the work done per kg of water entering the wheel, the speed of the wheel and its efficiency. (16)

14. a) The internal and external diameters of an inward flow reaction turbine are 0.8 m and 1.2 m respectively. The width of the wheel at inlet and outlet is 150 mm. the head on the turbine is 10m and hydraulic efficiency is 92%. The vane angle at outlet is 20°. Final discharge at outlet is radial at a velocity of 3 m/sec. Find 1) The guide blade angle 2) The runner vane angle at inlet 3) The speed of the turbine 4) The discharge of the turbine 5) The runner power. (16)

(OR)

b) i) Explain the important types of characteristics curves of the turbine. (8)

ii) A pelton wheel has to work under a head of 60m while running at 200 rpm. The turbine is to develop a power of 95.6475 kW. The velocity of buckets is 0.45 times of the velocity of jet. The overall efficiency is 0.80 and coefficient of velocity is 0.98. Design the pelton wheel. (8)

15. a) The centrifugal pump has the following characteristics. Outer diameter of impeller is 800 mm: width of the impeller vane at outlet = 100 mm: angle of the impeller vanes at outlet is 40degree. The impeller runs at 550 rpm and delivers 0.89 m^3/sec under an effective head of 35 m. A 500 kW motor is used to drive the pump. Identify the manometric, mechanical and overall efficiencies of the pump. Assume water enters the impeller vanes radially at inlet. (16)

(OR)

b) A single acting reciprocating pump has a plunger of diameter 150 mm and a stoke 300 mm. the lengths of the suction and delivery pipes are 5 m and 20 m respectively, and their diameter is 75 mm. the suction and delivery heads are 3.5 m and 8 m respectively. Find the pressure head in the cylinder at the beginning, middle and of the suction and delivery stokes. Take f = 0.0075 and speed of the pump=30 rpm. Find also the power required to drive the pump. Take atmospheric pressure head= 10.3 m of water. (16)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE603 – Design and Drawing (Concrete and Steel)

(IS 456:2000, Charts and Tables From SP 16, Steel Tables & IS 800-2007 are to be permitted)

Time : 3 Hours | Maximum Marks : 100

Part - A (Concrete) (60 Marks)

Answer ONE Question from each part

1. a) Design a rectangular water tank open at top resting on ground having a size 3.5 m x 8 m x 3 m high. Adopt M25 grade of concrete and Fe415 steel. Draw reinforcement details in plan and sections. (30)

b) The framing plan of a residential building is shown in Figure 1. The design live load is 3 kN/m² and floor finish load is 1.5 kN/m². All external walls are 230 mm thick and internal walls are 150 mm thick. Floor to floor height is 3.2 m. Grade of concrete is M25 and steel is Fe 415. All columns are 450 mm x 450 mm in size. Design the following and draw neat sketches showing the reinforcement details. (30)

i) Slab S2

ii) Beam ABC

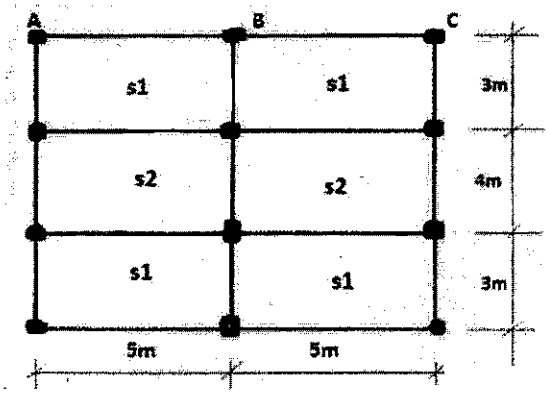

Figure.1.

(OR)

2. a) Design a cantilever retaining wall for the following data: Height of wall above ground is 4 m. SBC of soil at a depth of 1.5 m is 200 kN/m². Angle of internal friction is 30° and unit weight of earth fill is 18 kN/m³. Coefficient of friction between soil and concrete is 0.55. Adopt M25 concrete and Fe415 steel. Draw the reinforcement details. (30)

b) Design a reinforced concrete rectangular combined footing for two columns A and B located 3.6 meters apart. The sizes of the columns are 400 mm × 400 mm and 600 mm × 600 mm and the loads on them are 1000 kN and 1500 kN respectively. The projections of footing beyond the axis of the columns A are limited to 500 mm. Safe Bearing Capacity of the soil is 250 kN/m^2. Use M20 concrete and Fe415 steel. Draw the reinforcement details. (30)

Part – B (Steel) (40 Marks)

3. a) Design a built up double laced column section consist of 2 channel section placed back to back. The factored load on the column is 1800 kN and the length of column is 6 m. It is effectively held in position at both ends and restrained against rotation at one end. Design double lacing system and the bolted connections with 4.6 grade 16 mm diameter bolts. Draw plan and elevation of lacing system designed. (20)

b) Design a welded plate girder of 20 m span to support a uniformly distributed live load of 70 kN/m over the span using the following data. Yield stress of steel is 250 N/mm^2, top flange restrained laterally. Design the cross sectional details of the plate girder to confirm to the specifications of IS 800-2007. Draw cross section and longitudinal section. (20)

(OR)

4. a) Design a steel roof truss to suit the following: Span of truss = 10 m, Type of Truss = Fan-Type. Roof Cover = Galvanized corrugated sheet, Materials = Rolled steel angles, Spacing of roof truss = 4.5 m, Wind Pressure = 1.0 kN/m. Draw the elevation of roof truss and detail the joints. (20)

b) Design a hand operated overhead crane, which is provided in a shed, whose details are: Capacity of crane = 50 kN, Longitudinal spacing of column = 6 m, Center to center distance of gantry girder = 12 m, Wheel spacing = 3 m, Edge distance = 1m, Weight of crane girder = 40 kN, Weight of trolley car = 10 kN. Draw cross section and longitudinal section. (20)

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEEE10 – High Voltage Direct Current Transmission

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Why bipolar line is preferred and more commonly used in HVDC transmission?
2. Define short circuit ratio.
3. Define pulse number.
4. Draw the schematic diagram of three & two valve conduction mode of Converters.
5. Explain the current regulation in inverter side of HVDC System control.
6. Summarize the draw backs of Constant Extinction Angle.
7. Compare SVC and STATCOM.
8. Point out the sources of Reactive Power.
9. Write the different types of AC/DC power flow.
10. Draw the DC system model in power flow analysis.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Compare AC and DC transmission. (6)

ii) Discuss the factors to be considered in planning for HVDC transmission. (10)

(OR)

b) i) Summarize the modern trends in HVDC technology. (10)

ii) Discuss the advantages of VSC based HVDC transmission. (6)

12. a) Analyses a Voltage Source Converter (VSC) Topologies with suitable firing scheme and also obtain the expression. (16)

(OR)

b) Illustrate the circuit diagram analysis of a 12-pulse converter. And also calculate i) Average DC output voltage ii) Current harmonics with suitable expression and wave forms. (16)

13. a) Illustrate the following type of Firing angle control scheme in detail i) Individual Phase Control (IPC) ii) Equidistant Pulse Control (EPC). (16)

(OR)

b) Draw and explain the three level control of the VSC based HVDC. (16)

14. a) What are the filter configurations that are employed for HVDC Converter station? Explain in detail. (16)

(OR)

b) State the various sources of harmonics generated in HVDC-VSC systems and mention the adverse effects caused by these harmonics. (16)

15. a) Create and explain about per unit system for DC quantities. (16)

(OR)

b) Explain the additional constraints needed to include for ac-dc power flow? (16)

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTMEE10 – Entrepreneurship Development

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate Entrepreneur and Intrapreneur.
2. What initiatives will be made to foster entrepreneurship in the educational system at the college level?
3. Define the term self-rating.
4. Mention the possible ways to manage stress in the working environment.
5. What are drawbacks in an ownership structure?
6. Define the techno economic feasibility assessment.
7. Define PERT network analysis.
8. What are the points to be considered to manage working capital?
9. Define the term diversification.
10. What is meant by sickness in small business?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the influence of entrepreneurship in economic growth elaborately. (16)

(OR)

b) What are the elements influencing the expansion of the entrepreneurial sector? Clearly describe. (16)

12. a) Explain the different types of motivation training with necessary examples. (16)

(OR)

b) Give a detailed explanation of the programmes India has to promote entrepreneurship. (16)

13. a) Explain the steps involved in setting up a good business with suitable examples. (16)

(OR)

b) Explain the following in detail. (i) Market survey (ii) Preliminary project report. (16)

14. a) Explain the break-even analysis with suitable sketch. (16)

(OR)

b) Explain in detail about PERT analysis technique. (16)

15. a) Explain the magnitude, causes and consequences of sickness in small businesses. (16)

(OR)

b) Explain the following in detail. (16)

1) Joint Venture
2) Merger
3) Sub Contracting

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

II & III Semester (Full Time)

(2018 Regulations)

EEE, MECHANICAL ENGINEERING & METALLURGICAL ENGINEERING

18MA204 – Fourier Series and Transforms

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the value of a_n in the cosine series expansion of $f(x) = k$ in (0,5).
2. State Parsevals identity for full range expansion of $f(x)$as Fourier series in $(0, 2l)$.
3. An insulated rod has of length 40 cm has its end at A and B maintained at 20°C and 100°C respectively. Find the steady state solution of the rod.
4. List all the possible solutions of the Laplace equation.
5. Find L [$e^{-3t} \cosh 2t$].
6. Find $L^{-1}\left[\frac{s}{s^2 + 4s + 3}\right]$.
7. Write the Fourier transform pair.
8. Find the Fourier sine transform of the function e^{-2x}.
9. Find the Z-transform of 2^n.
10. Define convolution on Z transform.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Obtain the Fourier series for $f(x) = \begin{cases} l - x, & 0 < x \leq l \\ 0, & l \leq x < 2l \end{cases}$ with period $2l$. (16)

(OR)

b) Find the Fourier series expansion up to second term for the function defined in the following table: (16)

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
y	1	1.4	1.9	1.7	1.5	1.2	1.0

12. a) A String is stretched and fastened to two points $x = 0$ and x = l apart. If it is set vibrating giving each point a velocity $\lambda x (l - x)$. Find the displacement at any subsequent time. (16)

(OR)

b) A square plate is bounded by the lines $x = 0, y = 0, x = 10, y = 10$. Its faces are insulated. The temperature along the upper horizontal edge is given by $u(x, 10) = x(10 - x)$ while the other three edges are kept at 0°C. Find the steady state temperature in the plate. (16)

13. a) i) Find the Laplace transform of $f(t) = \begin{cases} t & 0 < t < a \\ 2a - t & a < t < 2a \end{cases}$ with $f(t + 2a) = f(t)$ (8)

ii) Verify the initial and final value theorem on Laplace transform for the function $f(t) = 1 + e^{-t}(\sin t + \cos t)$. (8)

(OR)

b) i) Find $L^{-1}[\frac{s}{(s^2+a^2)^2}]$ using convolution theorem. (8)

ii) Solve $y'' + 4y' + 4y = e^{-t}$ given $y(0) = y'(0) = 0$, using Laplace transform. (8)

14. a) Find the Fourier transform of the function $f(x) = \begin{cases} a - |x| & |x| < a \\ 0 & |x| > a \end{cases}$. Hence show that $\int_0^\infty [\frac{\sin t}{t}]^2 \, dt = \frac{\pi}{2}$. (16)

(OR)

b) i) Find the Fourier cosine transform of the function $f(x) = \begin{cases} x & 0 < x < 1 \\ 2 - x & 1 < x < 2 \\ 0 & x > 2 \end{cases}$ (8)

ii) Evaluate: $\int_0^\infty \frac{x^2}{(x^2+a^2)(x^2+b^2)}$ using Fourier transform. (8)

15. a) i) Find $Z[\frac{2n+3}{(n+1)(n+2)}], n > 0$. (8)

ii) Using partial fraction, find the inverse Z-transform of $\frac{z^2-3z}{(z-5)(z+2)}$. (8)

(OR)

b) Using Z-transform solve difference equation $y(n + 2) - 3y(n + 1) + 2y(n) = 2^n$. Given that $y(0) = 0$ and $y(1) = 0$. (16)

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2016 Regulations)

COMMON TO ALL BRANCHES

16PTMA201 – Mathematics - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Dirichlet's condition for a given function f(x) to be expanded in Fourier series.
2. Find the root mean square value of the function $f(x) = x$ *in* (0,1).
3. Classify the PDE $u_{xx} - 2u_{xy} + u_{yy}$=0.
4. An insulated rod has of length 60 cm has its end at A and B maintained at 20°C and 80°C respectively. Find the steady state solution of the rod.
5. Find L [$e^{4t} + t^4 + 7$].
6. Find $L^{-1}\left[\frac{s+2}{(s+2)^2+9}\right]$.
7. If F [f(x)] =F(s), then prove that $F\{e^{iax}f(x)\} = F(s+a)$.
8. Find the Fourier cosine transform of the function $3e^{-3x}$.
9. Find the Z-transform of a^n.
10. Form the difference equation from $y_n = b\,5^{n+1}$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the Fourier series for $f(x) = x^2$ *in* $-\pi < x < \pi$. (8)

ii) Find the Half-Range cosine series for $f(x) = x(\pi - x)$ in $(0, \pi)$. (8)

(OR)

b) Find the cosine series for $f(x) = x$ in $(0,\pi)$ and then using Parseval's theorem, show that $\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \ldots \infty$. (16)

12. a) A rod 30 cm long has its ends A and B kept at 20°C and 80°C respectively, until steady state condition prevails. The temperature at each end is then suddenly reduced to 0°C and kept so. Find the resulting temperature function $u(x,t)$ taking $x = 0$ at A. (16)

(OR)

b) An infinitely long rectangular plate with insulated surface is 10 cm wide. The two long edges and one short edge are kept at zero temperature, while the other short edge $x = 0$ is kept at temperature given by $u = \begin{cases} 20y & 0 \le y \le 5 \\ 20(10-y) & 5 \le y \le 10 \end{cases}$ (16)

Find the steady state temperature distribution in the plate.

13. a) i) Find the Laplace transform of $f(t) = \begin{cases} \sin \omega t, & 0 < t < \frac{\pi}{\omega} \\ 0 & \frac{\pi}{\omega} < t < \frac{2\pi}{\omega} \end{cases}$ with $f\left(t + \frac{2\pi}{\omega}\right) = f(t)$. (8)

ii) Verify the initial and final value theorem on Laplace transform for the function $f(t) = 1 + 3e^{-2t}$. (8)

(OR)

b) i) Find $L^{-1}\left[\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right]$ using convolution theorem. (8)

ii) Solve $y'' + y = 2e^t$ given $y(0) = 1; y'(0) = 2$, using Laplace transform. (8)

14. a) Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2 & in\ |x| \le 1 \\ 0 & |x| > 1 \end{cases}$. Hence prove that $\int_0^\infty \frac{\sin s - s\cos s}{s^3} . cos\left(\frac{s}{2}\right) ds = \frac{3\pi}{16}$. (16)

(OR)

b) i) Find Fourier cosine transform of $e^{-a^2x^2}$. (8)

ii) Evaluate: $\int_0^\infty \frac{x^2}{(x^2+a^2)(x^2+b^2)}$ using Fourier transform (8)

15. a) i) Find $Z\left[\frac{1}{n(n+1)(n+2)}\right], n > 0$ (8)

ii) Using convolution theorem, find the inverse Z-transform of $\frac{z^2}{(z-4)(z-3)}$. (8)

(OR)

b) Using Z-transform solve difference equation $y(n+2) - 3y(n+1) + 2y(n) = 2^n$. Given that $y(0) = 0$ and $y(1) = 0$. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18CEOE01 – Environmental Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State any two unique characteristics of Environmental problems.
2. Write the classifications of environmental impacts.
3. State the use of material balance in environmental management.
4. How source reduction helps in managing the environment?
5. Why EIA is much needed in a new development project?
6. Write any two objectives of environmental management aspects.
7. Define Environmental Audit.
8. Brife about the significance of Environmental Audit.
9. State the use of Riparian rights.
10. Write any two about the objective of environmental audit.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Enumerate the various Environmental Management Principles and Explain any two. (8)

ii) Explain about any five drivers and barriers for sustainable development. (8)

(OR)

b) i) Explain Abatement of Pollution. List out the major activities under the various schemes on pollution Abatement. (8)

ii) Enumerate the Business charter tools for sustainable production and consumption. (8)

12. a) i) Enumerate the various Environment quality objectives. Briefly explain any two. (8)

ii) Distinguish between (8)

1) Pollution control and pollution prevention

2) Concentration and Mass standards

(OR)

b) i) Explain Environmental Performance evaluation process using PDCA cycle. (8)

ii) Briefly explain about Cleaner production technology and Zero discharge technology. (8)

13. a) i) Write Explanatory notes on the Initial Environmental Review (IER) and Management Review (MR). (8)

ii) Write a note on Environmental aspect and impacts within an organizational setup. (8)

(OR)

b) i) Enumerate the benefits and barriers in implementing ISO 14001 in an organization. (8)

ii) Explain EMS and EMAS. (8)

14. a) i) Write a process flow diagram for the Management of an Audit Programme as per ISO-19011. (8)

ii) Enumerate the contents of Environmental statement. (8)

(OR)

b) i) Write a note on waste minimization planning in an industry. (8)

ii) Explain briefly the roles and qualification of Auditors in an environmental management system. (8)

15. a) i) Briefly discuss the application of EMS and waste Audit. (8)

ii) Explain the concept of Transboundry of Pollutants. (8)

(OR)

b) i) Discuss pollution prevention opportunities in Pulp paper and Sugar mills. (8)

ii) Write a note on Hazardous waste classification and Characteristics. (8)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEPE34 – Ground Improvement Techniques

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Name any four ground improvement techniques.
2. Briefly write the role played by the ground improvement in foundation engineering.
3. Define permeability and seepage.
4. What is electro-osmotic dewatering?
5. What is the principle behind pre compression?
6. Define dynamic compaction.
7. How does the use of a geosynthetic as a filter differ from that of Drainage?
8. What is mean by reinforced soil?
9. Name the different methods of grout injection.
10. Define Suspension grouts and group grouts.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in brief the various methods of ground improvement. (16)

(OR)

b) What are the factors influencing the selection of ground improvement techniques? (16)

12. a) Explain in detail with a neat sketch the method of dewatering using sumps and ditches stating its advantages and disadvantages. (16)

(OR)

b) Explain in detail the well point system of dewatering. (16)

13. a) Write in detail the principle, operation and applications of vibro-compaction method of ground improvement. (16)

(OR)

b) How does a sand compaction pile improve the soil? Write a detailed note on its installation and functioning. (16)

14. a) With neat sketches explain in detail the various applications of reinforced earth for ground improvement. (16)

(OR)

b) Can Geosynthetics used as soil reinforcement? Justify in detail with supporting sketches. (16)

15. a) Describe in detail about the various methods of grouting with neat sketches. (16)

(OR)

b) Describe in detail how chemicals are used in stabilizing the soil with the help of an example. (16)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

V & VI Semester (Full Time)

(2018 Regulations)

ECE/EEE/MECHANICAL ENGINEERING

18CSOE01 – Object Oriented Programming using C++

Time : 3 Hours

Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. State the difference between call by value and call by reference.
2. What are advantages of Object Oriented paradigm over procedural paradigm?
3. Can we have more than one constructor in a class? If yes, explain with example.
4. Distinguish between virtual function and pure virtual function.
5. Explain the use of pointer to objects using 'this' pointer with suitable example.
6. What is the need for virtual base class?
7. What is inline function? Write advantages of inline function over macros.
8. Compare and contrast error and exception.
9. How string is used in C++? How can we create string object?
10. Draw a neat and clean sketch to show the different streams available in C++.

(5 x 16 = 80 Marks)

Part B

Answer ALL Questions

11. a) i) Explain the looping structure in C++ with suitable example. (12)

ii) Write a C++ program using function overloading. (4)

(OR)

b) i) Elaborate on the various object oriented concepts with necessary illustrations. (12)

ii) Write a C++ program to demonstrate function overidding. (4)

12. a) i) Define a class named 'Bank Account' to represent following members: (8)

Data members :-

- Account Number
- Name of Depositor
- Account Type
- Balance Amount

Member functions:

- Initialize members
- Deposit Amount
- Withdraw Amount
- Display Balance

Write a C++ program to test the Bank Account class for 10 customers.

ii) Write a C++ program to find out minimum and average of two integer numbers of two different classes using friend function. (8)

(OR)

b) i) Design a base class Customer (name, phoneNo). Derive a class Depositor (accNo, bal) from Customer. Again derive a class Borrower (loanNo, loan-amt) from Depositor. Write necessary member functions to read and display the details of n Customers. (8)

ii) What is operator overloading? Write a C++ program to print the sum of two matrices using '+' operator overloading? (8)

13. a) i) Write a C++ Program to calculate area of square and circle using abstract and pure virtual function. (8)

ii) Explain public, private and protected access specifiers and show their visibility when they are inherited as public, private and protected with suitable example. (8)

(OR)

b) Explain the various types of inheritance with suitable example. (16)

14. a) i) Create 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)

ii) Write a C++ program to design simple calculator to perform addition, subtraction, multiplication and division using class template. (8)

(OR)

b) i) What is exception? Explain exception handling with example? (try, catch, throw). (8)

ii) 1. Write a C++ program for rethrowing exception handling in function. (4)

2. Write a C++ program for exception handling with multiple catch. (4)

15. a) Write a C++ program involving working with a single file. Use ifstream and ofstream classes to write and read the information to and from a file using operators:- << and >>. Show how a file can be opened and closed. (16)

(OR)

b) i) Write a C++ programs to illustrate the concept of console I/O operations. (8)

ii) What is role of manipulators in C++? Write down different manipulators in C++. (8)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MTOE01 – Foundry and Welding Technology

Time : 3 Hours | Maximum Marks : 100

(10 x 2 = 20 Marks)

Part A

Answer ALL Questions

1. Classify the different allowances in patterns.
2. What is sand reclamation?
3. Differentiate between green sand and dry sand molding.
4. List the advantages of Thixo casting.
5. What are the gas defects in casting?
6. What are the precautions to be taken while melting of Al?
7. List the different types of welding processes.
8. Define the term brazing.
9. Outline the advantages of FSW.
10. Why do we need to go for LBW and EBW?

(5 x 16 = 80 Marks)

Part B

Answer ALL Questions

11. a) Classify and explain with figures and other details about the various sand testing methods. (16)

(OR)

b) Explain the types of patterns, its features and pattern allowances and color codes with neat figures. (16)

12. a) Write short notes on: Die casting process and shell molding (16)

(OR)

b) Discuss in detail about the principle of CO2 process and investment casting process and their salient features (16)

13. a) Discuss in detail about melting practices of Cast Iron and steel. (16)

(OR)

b) Analyze in detail the various casting defect, its appearance, causes and its remedies. (16)

14. a) Compare the electro slag and electro gas welding and their salient features. (16)

(OR)

b) Analyze in detail the about the SAW and gas welding and their salient features. (16)

15. a) Outline the process variables, merits and demerits, applications of EBW and LBW. (16)

(OR)

b) Discuss about the FSW and diffusion welding in detail with figures, its merits and demerits. (16)

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE403 – Structural Analysis - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Betti's theorem.
2. List the applications of Muller Breslau's principle.
3. Write the slope deflection equation for a two span continuous beam.
4. Mention the reasons for possibilities of sway to occur in portal frame.
5. Relate static indeterminacy and kinematic indeterminacy.
6. Define carry over factor.
7. Outline on flexibility coefficient.
8. Write the flexibility matrix for a beam AB hinged at both ends of span L.
9. Sketch orientation diagram for a continuous beam ABC of span 6 m.
10. When do you prefer matrix stiffness method for analysis?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) For a beam fixed at A and hinged at B is of span 9 m, draw Influence line diagrams considering ordinates at suitable intervals. (16)

(OR)

b) Using Muller Breslau's principle, draw influence line for bending moment at D, the middle point of AB of the continuous beam. Supports A, B, C are hinged and spans 20 m. Span AB =10 m and Span BC =10 m, D is in the mid of span AB. (16)

12. a) Analyze the continuous beam by slope deflection method. (16)

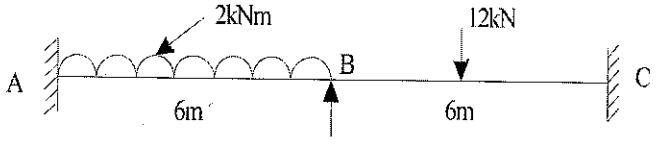

Figure.1.

(OR)

b) Analyze the frame by slope deflection method. (16)

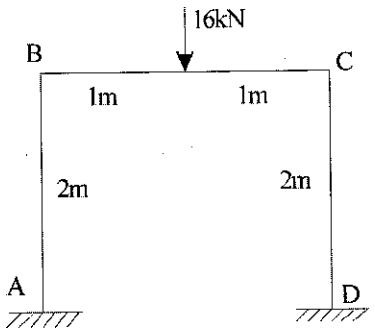

Figure.2.

13. a) Analyze the continuous beam by moment distribution method. (16)

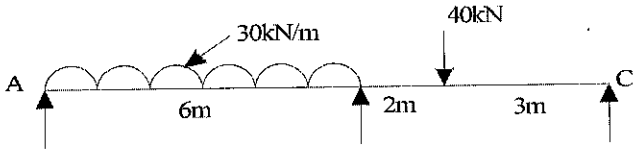

Figure.3.

(OR)

b) Analyze the frame ABCD using moment distribution method with AB = BC = CD = 6 m. Span BC alone carries uniformly distributed load of 15 kN/m. (16)

14. a) Analyze the continuous beam by flexibility method. (16)

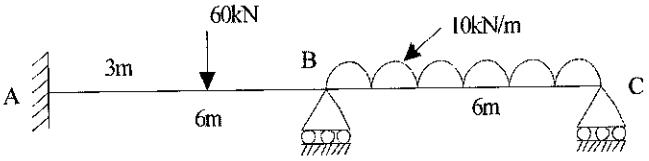

Figure.4.

(OR)

b) Compute the final end moments for the frame by matrix stiffness method. (16)

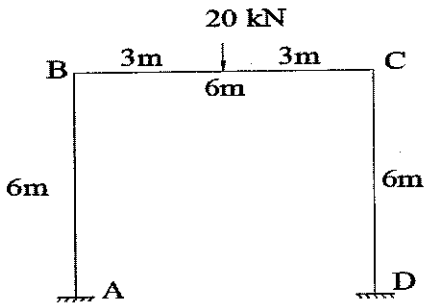

Figure.5.

15. a) A two span continuous beam ABC is placed over simple supports at A and B and is fixed at C such that AB = 12 m and BC = 8 m. It carries a central concentrated load of 20 kN in AB and a uniformly distributed load of 4 kN/m in BC. Assuming same section throughout, analyze the beam by matrix stiffness method and sketch the bending moment diagram. (16)

(OR)

b) Compute the final end moments for the frame by stiffness method. (16)

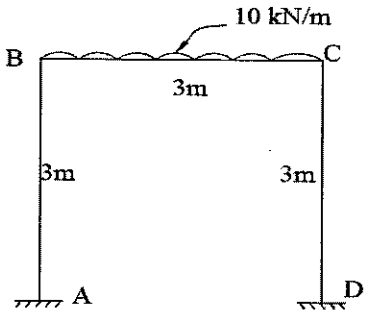

Figure.6.

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC403 – Digital Communication

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare PWM and PPM.
2. What is the need for quantization in PCM?
3. Explain Nquist criterion for distortion less base band binary transmission.
4. A certain low pass band limited signal x(t) is sampled and the spectrum of the sampled version has the first guard band from 1500 Hz to 1900 Hz. How will you determine the sampling frequency and the maximum frequency of the signal?
5. Draw the power spectra of BPSK and QPSK.
6. Compare carrier synchronization and symbol synchronization.
7. List the properties of discrete memory less channels.
8. Compare linear block codes with convolution codes.
9. What is the need for spread spectrum modulation?
10. What is a pseudo noise sequence?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe various elements of digital communication system. (8)

ii) Discuss the advantage of digital communication over analog communication. (8)

(OR)

b) i) Explain pulse code modulation with a neat block diagram. (8)

ii) Given a signal m(t) = 2cos (2π250 t) as the signal input, determine the SNR with 8-bit PCM. (8)

12. a) i) Code the sequence 0010110 using duo binary codes by explain step by step. (8)

ii) Consider binary sequence {bk} = {01101101} applied to input of a precoded modified duo binary filter. Determine receiver output and compare with original {bk}. (8)

(OR)

b) i) A band-limited signal m(t) of 3 kHz bandwidth is sampled at rate of 33⅓ % higher than the Nyquist rate. The maximum allowable error in the sample amplitude (i.e., the maximum quantization error) is 0.5% of the peak amplitude mp. Assume binary encoding. Find the minimum bandwidth of the channel to transmit the encoded binary signal. (8)

ii) Analyse the functioning and properties of matched filter used in detection of digital pulse. (8)

13. a) i) Compare the power spectra and waveforms of BPSK, FSK, QPSK, FSK and MSK schemes. (8)

ii) Explain differential phase shift keying. (8)

(OR)

b) i) Explain in detail M ary modulation techniques. (8)

ii) Compare digital modulation with single carrier. (8)

14. a) i) A convolution encoder has the two-generator sequence each of length 3. The generator sequence are (1, 1, 1) and (1, 0, 1). Determine the encoded sequence for the following message signal (1, 0, 0, 1, 1) using **time domain convolution** approach. (8)

ii) A convolution encoder has the two-generator sequence each of length 3. The generator sequence are (1, 1, 1) and (1, 0, 1). Determine the encoded sequence for the following message signal (1, 0, 0, 1, 1) using **transform domain convolution** approach. (8)

(OR)

b) i) Explain in detail the various steps involved in Trellis Code Modulation method of code generation. (8)

ii) Explain the advantages of multi-dimensional TCM. (8)

15. a) i) Explain **the transmitter** of Direct Sequence Spread Spectrum with neat block diagram. (8)

ii) Explain **the receiver** of Direct Sequence Spread Spectrum with neat block diagram. (8)

(OR)

b) i) Compare direct sequence, frequency hopping and time hopping with their merits and demerits. (8)

ii) Explain with a neat block diagram of a non-coherent frequency-hopping receiver. (8)

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE403 – Digital Logic Circuits

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State De Morgan's theorem.
2. Classify binary codes.
3. Give the design procedure for designing of a combinational circuit.
4. What is look ahead carry adder?
5. Distinguish between multiplexer and demultiplexer.
6. Classify the types of code converters.
7. Differentiate Mealy and Moore Model.
8. State the difference between combinational and sequential circuits.
9. Why is state reduction necessary?
10. Define races. How it can be avoided?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Compare TTL, CMOS and ECL.	(10)
		ii)	List out the advantages and disadvantages in K-map method	(6)
			(OR)	
	b)	i)	Write a note on min terms and max terms with example.	(10)
		ii)	List out the advantages and disadvantages in Quine McCluskey (Tabulation) method.	(6)
12.	a)		Design a Full adder and Full substractor circuit. Also draw its logic diagram.	(16)
			(OR)	
	b)		Develop a combinational logic circuit for BCD adder and magnitude comparator.	(16)

13. a) Design an encoders and decoders. circuit for 3 inputs. Also draw its logic diagram. (16)

(OR)

b) Give a detailed view on ROM, PAL and PLA (16)

14. a) Convert JK flip flop into D flip flop and T flip flop along with truth table and logic diagram. (16)

(OR)

b) Draw and explain the operation of synchronous up and down counter. (16)

15. a) How do you identify and eliminate hazards from an asynchronous sequential circuit? Explain in detail. 16)

(OR)

b) Design an asynchronous circuits with using of SR latches. (16)

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME403 – Design of Transmission Systems

(Approved Design Data Book is Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Under what conditions, chain drives are preferred over V belt drives?
2. Define the term "Crowning of Pulley".
3. State any four advantages of helical gear over a spur gear.
4. What is beam strength of spur gear? What is the effect of module on beam strength of a tooth in a spur gear?
5. Differentiate between external bevel, internal bevel and crown gears.
6. What are the materials used for worm and worm wheel?
7. What are the salient features of ACME thread for power screws?
8. Calculate intermediate speeds for a gear box with minimum speed 30 rpm, maximum speed 600 rpm having 12 steps.
9. List any three properties required for brake lining.
10. What is the advantage of conical clutch over plate clutch? Name any four of Them.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

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

(OR)

b) A motor driven blower is to run at 650 rpm driven by an electric motor of 7.5 kW at 1800 rpm. Design V belt drive. (16)

12. a) Design a pair of spur gears to transmit 20 kW at a pinion speed of 1400 rpm. The transmission ratio is 4. Assume suitable materials and stresses. (16)

(OR)

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

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

(OR)

b) The input to worm gear shaft is 18 kW and 600 rpm. Speed of worm wheel is 30 rpm. The worm is to be of hardened steel and the wheel is made of chilled phosphore bronze. Considering wear and strength, design worm and worm wheel. (16)

14. a) Design a gear box to give 18 speeds for spindle of a milling machine. The drive is from an electric motor of 5 HP, at 1000 rpm. Maximum and minimum speeds of the spindle are to be around 650 rpm and 35 rpm respectively. (16)

(OR)

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

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

(OR)

b) A multi – disk clutch consists of five steel plates and four bronze plates. The inner and outer diameters of friction disks are 75 mm and 150 mm respectively. The coefficient of friction is 0.1 and the intensity of pressure is limited to 0.3 N/mm^2. Assuming the uniform wear theory, calculate i) the required operating force, and ii) power transmitting capacity at 750 rpm. (16)

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III Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS303 – Computer Organization and Architecture

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the reason, Why do buffer registers included with the devices?
2. Differentiate big-endian with little-endian assignment.
3. What is guard bit?
4. How will you detect whether an overflow occur or not in integer arithmetic?
5. What is data path?
6. Assume A=5;
   Instruction 1: A ← 3+A
   Instruction 2: B ← 4*A
   What hazard does the above two instructions create when executed concurrently?
7. What is hit rate and miss penalty?
8. Write the uses of flash memory.
9. How can the processor recognize the device requesting an interrupt?
10. List the components of an input-output Interface.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) With a neat diagram, explain the interconnection between memory and processor. (8)

    ii) Consider, Registers R1 and R2 of a computer contain the decimal values 1200 and 4600. Calculate the effective address of the memory operand in each of the following instruction? And Explain. (8)

    1) Load 20(R1), R5
    2) Move #3000, R5
    3) Store R5, 30(R1,R2)
    4) Add -(R2), R5

(OR)

b) i) Explain indirect addressing and indexed addressing. (8)

ii) Explain instruction and its various types. List the steps needed to execute the machine instructions, Add LOCA, R0 and Add R1, R2, R3. (8)

12. a) i) Multiply the following pairs of signed 2's compliment numbers using the Booth multiplication and n- bit multipliers. Assume that A is multiplicand and B is multiplier. A = 010111 and B = 110110. (8)

ii) Write IEEE standard for floating point numbers. And also Outline the general procedures for performing arithmetic operations on floating point numbers. (8)

(OR)

b) i) Solve 7/3 using non restoring division algorithm. (8)

ii) Draw and explain binary addition-subtraction logic network. (8)

13. a) i) Explain in detail about hardwired control. (8)

ii) Discuss the method used to reduce hazard due to unconditional branch. (8)

(OR)

b) i) Compare hardwired control with micro programmed control. (8)

ii) Explain data hazard in detail. (8)

14. a) i) Discuss the various mapping techniques used in cache memories. (8)

ii) Differentiate static random access memory with dynamic random access memory. (8)

(OR)

b) i) Explain how the logical address is translated into physical address in the virtual memory system with a neat diagram. (8)

ii) Analyze the memory hierarchy in terms of speed, size and cost. (8)

15. a) i) Draw and explain typical block diagram of dynamic memory access. (8)

ii) Compare the features of small computer system interface and peripheral component interconnect interface. (8)

(OR)

b) i) Explain about bus arbitration. (8)

ii) Distinguish the features of universal serial bus with peripheral component interconnect interface. (8)

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III Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC303 – Signals and Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Determine whether $sin\left(\frac{2\pi n}{3}\right) + cos\left(\frac{2\pi n}{5}\right)$ is periodic or not. If periodic, find fundamental period.
2. Check whether the given differential and difference equations are for LTI system.
   a) $4\left(\frac{dy}{dt}\right)^2 + 2y(t) = x(t)$
   b) y(n-1) + y(n) = x(n).
3. State Dirichlet conditions for the existence of Fourier series.
4. Find the frequency response of an LTI system described by the differential equation, $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = x(t)$ using Fourier transform.
5. Verify the initial value theorem for the following function: $x(t) = 3e^{-5t}u(t)$.
6. Find the Laplace transfer of $x(t) = e^{-5t}u(t)$ and also plot the ROC.
7. What is aliasing?
8. Find the Z-transform of x(n) = u(n).
9. List the different types of system realization of continuous time systems.
10. Find the DTFT of $x(n) = \begin{cases} n & -4 \le n \le 4 \\ 0 & \text{othrwise} \end{cases}$

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Check whether, y(n) = nx(n) + x(n+2) + y(n-2) is static, linear, causal, stable and time-invariant. (16)

(OR)

b) Obtain the convolution of the following two functions. (16)

$x(t) = \begin{cases} 1 & \text{for } -3 \le t \le 3 \\ 0 & \text{otherwise} \end{cases}$ and $h(t) = \begin{cases} 2 & \text{for } 0 \le t \le 3 \\ 0 & \text{otherwise} \end{cases}$

12. a) Find the trigonometric Fourier series of x(t). (16)

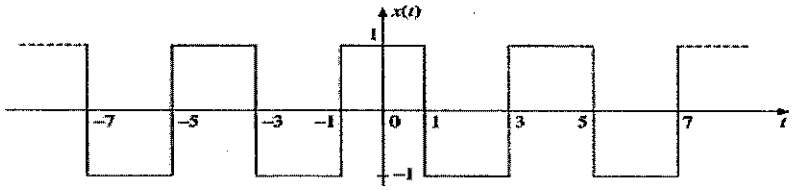

Figure.1.

(OR)

b) Find the frequency response and impulse response of the RC circuit shown in figure.2. Plot the magnitude and phase response for RC = 1. (16)

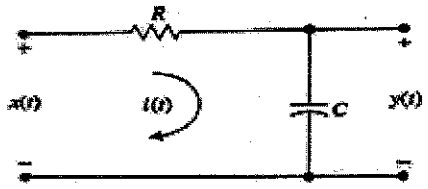

Figure.2.

13. a) Find the Laplace transform of the following signals and also plot their ROCs. (16)

i. $x(t) = e^{-t}u(t) + e^{-4t}u(t)$

ii. $x(t) = e^{-2t}u(t) + e^{3t}u(t)$.

(OR)

b) Find the system transfer function for each of the systems described by the following differential equations using Laplace transform: (16)

i. $\frac{d^2y(t)}{dt^2} + 8\frac{dy(t)}{dt} + 14y(t) = 4\frac{dx(t)}{dt} + 7x(t)$

ii. $\frac{d^3y(t)}{dt^3} + 5\frac{d^2y(t)}{dt^2} + 12\frac{dy(t)}{dt} + 6y(t) = 2\frac{d^2x(t)}{dt^2} + 5\frac{dx(t)}{dt} + 7x(t)$.

14. a) Determine the Nyquist sampling rate and Nyquist sampling interval for, (16)

i) $x(t) = \frac{1}{2}\text{sinc}(100\pi t) + \frac{1}{3}\text{sinc}(50\pi t)$

ii) $x(t) = \text{sinc}(100\pi t) + 3\text{sinc}^2(60\pi t)$.

(OR)

b) State and prove the following properties of Z transform (16)

i) Linearity

ii) Time shifting

iii) Differentiation

iv) Convolution

v) Time reversal

vi) Correlation.

15. a) Obtain the cascade form and parallel form realization of the system, (16)

$$y(n) - \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) = x(n) + 3x(n-1) + 2x(n-2).$$

(OR)

b) i) State and prove any Four properties of CTFS. (10)

ii) How can you determine frequency response of DT LTI System? (6)

Register Number:

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE303 – DC Machines and Transformers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Give the relation between field energy and co-energy for the linear system.
2. Define the term MMF.
3. An 8 pole, lap wound DC generator has 960 conductors, a flux of 40 mWb per pole and is driven at 400 rpm. Find the EMF generated.
4. Sketch the external characteristics of DC compound generator.
5. Mention the significance of back EMF.
6. A 50 HP, 400 V, 4 pole, 1000 rpm, DC motor has flux per pole equal to 0.027 Wb. The armature having 1600 conductors is wave connected. Calculate the gross torque when the motor takes 70 ampere.
7. What are the two components of no load primary current in a transformer?
8. Define voltage regulation of a transformer.
9. What is the condition for attaining maximum efficiency in a DC generator?
10. Define commercial efficiency of a transformer.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the field energy and co-energy expressions for an attracted armature relay. (16)

(OR)

b) Elaborate the operation of magnetic circuits in AC supply system. (16)

12. a) i) A six-pole DC shunt generator supplies full-load current at a terminal voltage of 250 V. The armature and field resistances are 0.04 Ω and 100 Ω, respectively. It runs at a speed of 1,000 rpm and has 700 lap-connected conductors. The voltage across armature resistance is 7.2 V. Find the following: i) the load current, ii) the EMF generated and iii) the flux/pole. Neglect brush contact drop. (8)

ii) Elaborate the internal and external characteristics of DC series generator. (8)

(OR)

b) i) A four-pole DC shunt generator with a wave wound armature having 390 conductors has to supply a load of 500 lamps each of 100 W at 250 V. Allowing 10 V for the voltage drop in the connecting leads between the generator and the load and brush drop of 2 V. Calculate the speed at which the generator should be driven. The flux per pole is 30 mWb and the values of Ra = 0·05 ohm and Rsh = 65 ohm. (8)

ii) With suitable equations, elaborate the internal and external characteristics of DC shunt generator. (8)

13. a) Explain the construction and operation of three point starter. (16)

(OR)

b) Explain the various speed control schemes of DC shunt motor. Discuss the benefits of armature and field control methods. (16)

14. a) i) A 230 V, 50 Hz transformer has 200 primary turns. It draws 5 A at 0.25 p.f lagging at no-load. Determine: a) Maximum value of flux in the core; b) Core loss; c) Magnetising current d) Exciting resistance and reactance of the transformer. Also draw its equivalent circuit. (8)

ii) With suitable equations, construct the equivalent circuit of transformer referred to primary and referred to secondary. (8)

(OR)

b) i) A 30 kVA, 2400/120 V, 50 Hz transformer has a high voltage winding resistance of 0.1 Ω and a leakage reactance of 0.22 Ω. The low voltage winding resistance is 0.035 Ω and the leakage reactance is 0.012 Ω. Find the equivalent winding resistance, reactance, and impedance referred to the a) high voltage side and b) low voltage side. (8)

ii) Explain the operation of practical transformer on load condition. Construct the phasor diagram of the same considering winding resistances and leakage reactances for resistive load. (8)

15. a) Consider a 4 kVA, 200/400 V single phase transformer supplying full load current at 0.8 lagging power factor. The open circuit test and short circuit test results are as follows. (16)

OC Test: 200 V, 0.8 A, 70 W (LV Side)

SC Test: 20 V, 10 A, 60 W (HV Side)

Calculate efficiency, secondary voltage and primary current at the above load. Calculate the load at unity power factor corresponding to maximum efficiency.

(OR)

b) The Hopkinson's test on two shunt machines gave the following results for full load. Line voltage = 250 V; Current taken from supply system excluding field currents =50 A; Motor armature current = 380 A; field currents 5 A and 4.2 A. Calculate the efficiency of the machine working as a generator. Armature resistance of each machine is 0.2 Ω. (16)

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18ES205 – Mechanics of Solids

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define polar moment of inertia.
2. Express the radius of gyration of the body.
3. Give the relationship between Bulk modulus and Young's modulus.
4. Define proof resilience & modulus of resilience.
5. Give the relationship between B.M. and S.F. and rate of loading in a beam.
6. A cantilever beam of span 4m is subjected to an udl of 2 kN/m over its entire length. Sketch the bending moment diagram for the beam.
7. State the theory of simple bending and also assumptions made in the theory on bending.
8. Find an expression for section modulus for rectangular, circular & hollow circular sections.
9. Write the expression for power transmitted by the shaft.
10. State the significance of principal plain and principal stresses.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) State and prove perpendicular axis theorem. (8)

ii) Find the centroid of an equal angle section 100 mm x 80 mm x 20 mm. (8)

(OR)

b) Determine the moment of inertia on horizontal and vertical axis as shown in figure.1 about centroidal axis. (16)

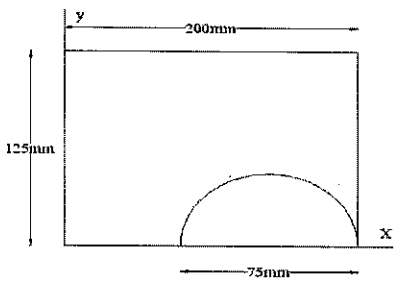

Figure.1.

12. a) i) A tapered circular bar tapers uniformly from a diameter d at its small end to D at the big end. The length of the bar is L. Derive the expression for the elongation of the bar due to an axial tensile force P. (8)

ii) Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of a diameter 25 mm and length 1.6 m. if the longitudinal strain in a bar during tensile stress is four times the lateral strain. Determine the change in volume, when the bar is subjected to a hydraulic pressure of 100 N/mm^2. Take E = $1x10^5$ N/mm^2. (8)

(OR)

b) i) Derive an expression for strain energy stored in a body when the load is applied suddenly. (8)

ii) A steel tube 30 mm external diameter and 25 mm internal diameter encloses a gun metal rod 20 mm diameter to which it is rigidly joined at each end. The temperature of the whole assembly is raised to 150°c. Find the intensity of the stress in the rod when the common temperature has fallen to 20°c. the value of the young's modulus for steel and the gun metal are 2.1 x $10^5 N/mm^2$ and $1x10^5$ N/mm^2 respectively. The co-efficient of liner expansion for steel is 12 x 10^{-6}/o c and for gun metal is 20 x 10^{-6}/o c. (8)

13. a) A beam 8m long is simply supported at the ends and carries a uniformly distributed load of 1500 N/m and three concentrated loads of 1000 N, 2000 N and 4000 N acting respectively at the left quarter point, entre point and right quarter point. Draw SFD and BMD. (16)

(OR)

b) A beam 6 m long rests on supports 5 m apart, the right-hand end is overhanging by 1 m. The beam carries a UDL of 20 KN/m over the entire length of the beam. Draw SFD and BMD indicating the maximum BM and the point of contra flexure. (16)

14. a) i) A rectangular timber beam of span 6m and cross-sectional dimension 200 x 400 mm is freely supported at the ends.it carries a UDL of 10KN/m run the entire span and a concentrated load of 12 KN at the centre. Find the maximum bending stress and draw the bending stress diagram. (8)

ii) A round bar 80 mm diameter is to be used as a beam. Find the maximum allowable bending moment, if the stress due to bending is limited to 140 N/mm^2. Calculate also the radius of curvature at the point of maximum bending moment if E = 210 KN/mm^2. (8)

(OR)

b) i) A I section beam 350 mm x 200 mm has a web thick ness of 12.5 mm and a flange thickness of 25 mm. it carries a shearing force of 20 tones at a section. Sketch the shear stress distribution across the section. (8)

ii) Two beams are simply supported over the same flexural strength. Compare the weights of these two beams, if one of them is solid and the other is hollow circular with internal diameter half of the external diameter. (8)

15. a) i) Derive the torsion equation for a circular shaft of diameter 'd' subjected to torque 'T'. (8)

ii) A shaft has to transmit 110 kW at 160 rpm. If the shear stress is not to exceed 65N/mm^2 and the twist in a length of 3.5 m must not exceed 1°, find a suitable diameter. Take C = 8 x 10^4 N/mm^2. (8)

(OR)

b) i) A body is subjected to direct stresses in two mutually perpendicular directions. Draw the Mohr's circle of stresses and explain how you will obtain the principal stresses and principal planes. (8)

ii) The normal stresses acting on two perpendicular planes at a point in a strained material are 70 MN/m^2 tensile, 35 MN/m^2 compressive. In addition, shear stress of 40 N/mm^2 act on these planes. Calculate the following: (8)

1) The magnitude of the principal stresses
2) The direction of the principal planes
3) The magnitude of the maximum shear stress.

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME303 – Thermodynamics

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. What is a quasi-static process?
2. Compare reversible process and irreversible process.
3. Summarize the corollaries of Carnot's theorem.
4. List the alternative methods by which the efficiency of a Carnot cycle can be increased.
5. What is saturation temperature and saturation pressure?
6. Explain Rankine cycle.
7. State the Vander Waal's equation of states.
8. Distinguish ideal gas and real gas.
9. List the industrial and commercial application of refrigeration.
10. Compare DBT and WBT.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Define a thermodynamic system. Differentiate between open system, closed system and an isolated system. (8)

ii) 1 kg of ethane (perfect) gas is compressed from 1.1 bar, 27°C according to a law $pV^{1.3}$ = constant, until the pressure is 6.6 bar. Calculate the heat flow to or from the cylinder walls. (8)

Molecular weight of ethane = 30

Cp = 1.75 kJ/kg K.

(OR)

b) i) A turbine, operating under steady-flow conditions, receives 4500 kg of steam per hour. The steam enters the turbine at a velocity of 2800 m/min, an elevation of 5.5 m and a specific enthalpy of 2800 kJ/kg. It leaves the turbine at a velocity of 5600 m/min, an elevation of 1.5 m and a specific enthalpy of 2300 kJ/kg. Heat losses from the turbine to the surroundings amount to 16000 kJ/h. Determine the power output of the turbine. (8)

ii) Define Zeroth Law of Thermodynamics, Define First Law of Thermodynamics, List the limitations of First Law of Thermodynamics. (8)

12. a) An iron cube at a temperature of 500°C is dropped into an insulated bath containing 12 kg water at 25°C. The water finally reaches a temperature of 50°C at steady state. Given that the specific heat of water is equal to 4186 J/kg K. Find the entropy changes for the iron cube and the water. Is the process reversible? If so why? (16)

(OR)

b) i) A domestic food refrigerator maintains a temperature of – 12°C. The ambient air temperature is 35°C. If heat leaks into the freezer at the continuous rate of 2 kJ/s determine the least power necessary to pump this heat out continuously. (8)

ii) Define availability function and find the relationship between availability function and change in availability. (8)

13. a) In a single-heater regenerative cycle the steam enters the turbine at 30 bar, 400°C and the exhaust pressure is 0.10 bar. The feed water heater is a direct contact type which operates at 5 bar. Find :
i) The efficiency and the steam rate of the cycle.
ii) The increase in mean temperature of heat addition, efficiency and steam rate as compared to the Rankine cycle (without regeneration).
Pump work may be neglected. (16)

(OR)

b) i) List the advantages and disadvantages of reheating. Why reheat cycle is not used for low boiler pressure? (8)

ii) Distinguish flow process and non flow process. Give examples for flow process and non flow process. (8)

14. a) i) Derive the Clausius - Clapeyron equation. (8)

ii) A gas mixture consists of 10 kg of methaNE, 6 kg of nitrogen and 2 kg of oxygen. Deterrmine the molecular mass and gas constant of the mixture. If the total pressure if 100 kPa, calculate their partial pressures. (8)

(OR)

b) i) Define Compressibility factor. Explain the physical significance of compressibility factor Z. (8)

ii) Derive any two Maxwell's relation. (8)

15. a) i) The dry and the wet bulb temperature of atmospheric air at 1atm (101.325 kPa) pressure are measured with a sling psychrometer and determined to be 25°C and 15°C respectively. Determine (12)

1) The specific humidity
2) The relative humidity
3) The enthalpy of air using thermodynamic relations.

ii) What is wet bulb depression and where is it equal to zero? (4)

(OR)

b) One kg of air at 35°C DBT and 60% R.H. is mixed with 2 kg of air at 20°C DBT and 13°C dew point temperature. Calculate the specific humidity of the mixture. (16)

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT303 – Metallurgical Thermodynamics and Kinetics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What do you meant by thermodynamic equilibrium?
2. State Hess's law and its applications in thermodynamics.
3. Give Clausius statement of second law of thermodynamics.
4. List the applications of Gibbs-Helmholtz equation.
5. Define the terms fugacity and activity.
6. Give the application of Le-chatelier's principle.
7. State Sievert's law.
8. What are ideal solutions?
9. What do you mean by order of a reaction and how is it determined?
10. Name the methods used to determine the order of a reaction.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the following terms with examples (8)
    1. Isolated system
    2. Path and state properties.

    ii) Illustrate the Reversible and Irreversible process with examples. (8)

(OR)

b) i) Calculate the standard heat of formation of solid WO_3 from solid W and O_2 gas at 25°C (298 K) and 1 atm pressure from the following data at 25°C (298 K) and 1 atm pressure: (8)

$<W> + (O_2) = <WO_2>$; $\Delta H°_{298}$ = -134 kcal (-560.66 kJ).

$3<WO_2> + (O_2) = <W_3O_8>$; $\Delta H°_{298}$ = -131.5 kcal (-550.20 kJ).

$<W_3O_8> + 1/2(O_2) = 3<WO_3>$; $\Delta H°_{298}$ = -66.5 kcal (-278.24 kJ).

ii) Write the Kirchoff's equation and explain it in detail. (8)

12. a) i) Derive the Maxwell's relations. Explain how it is useful in thermodynamic analysis? (8)

ii) The heat capacity of solid magnesium at 1 atm pressure in the temperature range from 0°C to 560°C is given by the expression. $C_p = 0.20 + 1.33 \times 10^{-3} T + 0.78 \times 10^4 T^{-2}$ cal/deg/mole. Determine the increase of entropy per mole for an increase of temperature form 27°C to 527°C at 1 atm pressure. (8)

(OR)

b) i) Define entropy. Quantify it for irreversibility. (8)

ii) The initial state of one mole of a monatomic ideal gas is p = 10 atm and T = 300 K. Calculate the change in the entropy of the gas for a) an isothermal decrease in the pressure to 5 atm, b) a reversible adiabatic expansion to a pressure of 5 atm, c) a constant-volume decrease in the pressure to 5 atm. (8)

13. a) i) Derive Clausius Clapeyron equation. (8)

ii) State the importance of Clausius Clapeyron equation. Also discuss the applicability of Clausius – Clapeyron equation to certain phase changes like fusion, vaporization, sublimation, allotropic transformation, etc. (8)

(OR)

b) i) Derive expression for the term fugacity and activity. (8)

ii) Draw the phase diagram for H_2O system and briefly explain the terms. (8)

14. a) i) Show that for binary solution, if solute obeys Henry law, solvent will obey Raoult's law. (8)

ii) State and Explain Raoult's law and its applications. (8)

(OR)

b) i) Derive Gibb's-Duhem equation and explain its significance. (8)

ii) Explain the composition of solutions in terms of partial molar quantities. (8)

15. a) i) Explain electrochemical and electrolytic cells in detail. (6)

ii) Explain the theory of absolute reaction rates and its applications. (10)

(OR)

b) i) Write the Arrhenius equation of reaction rate. What do you mean by activation energy? (6)

ii) The EMF of the galvanic cell where all of the components are present as pure solids in contact with an HCl electrolyte is 0.490 volts at 25°C and at that temperature, the temperature co-efficient of the EMF is -1.84×10^{-4} volts/degree. Write the cell reaction and calculate the Gibbs free energy change and the change in entropy for the cell reaction at 298 K. (10)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

I Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME101 – Engineering Thermodynamics

(Steam tables & Chart to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is quasi-static process?
2. State the limitations of I law of thermodynamics.
3. What are Kelvin's and Clausius statements?
4. What is principle of increase of entropy?
5. What do you understand by triple point?
6. What are the basic components of steam power plant?
7. What is Avogadro's law?
8. Define Dalton's law of partial pressure.
9. Define dew point temperature.
10. What is sensible heating?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Show that work is a path function, and not a property. (6)

ii) A stationary mass of a gas is compressed without friction from an initial state of 0.3 m^3 an 0.105 MPa to a final state of of 0.15 m^3 and 0.105 MPa, the pressure remains constants during the process. There is a transfer of 40 kJ of heat from the gas during the process. How much does the internal energy of the gas change? (10)

(OR)

b) i) Which property of the system increases when heat is transferred: a) at constant volume b) at constant pressure? (4)

ii) A blower handles 1 kg/s of air at 20°C and consumes a power of 15 kW. The inlet and outlet velocities of the air are 100 m/s and 150 m/s respectively. Find the exit air temperature assuming adiabatic conditions. Take c_p of the air is 1.005 kJ/kgK. (12)

12. a) i) What is the qualitative difference between the heat and work? Why is heat and work not completely interchangeable form of energy? (8)

ii) A domestic food freezer maintains the temperature of -15°C. The air temperature is 30°C. If heat leaks into the freezer at the continuous rate of 1.75 kJ/s. What is the least power necessary to pump this heat out continuously? (8)

(OR)

b) i) Show that entropy is a property of the system. (6)

ii) A fluid undergoes a reversible adiabatic compression process from 0.5 MPa, 0.2 m^3 to 0.05 m^3 according the the law $Pv^{1.3}$ = Constant. Determine the change in enthalpy, internal energy, entropy and heat transfer during the process. (10)

13. a) i) What is critical state? Explain in terms of critical pressure, critical temperature and critical volume of water. (8)

ii) A vessel of volume 0.04 m^3 contain a mixture of saturated water and saturated steam at a temperature of 250°C. the mass of liquid present is 9 kg. Find the pressure, the mass, the specific volume, the enthalpy, the entropy and the internal energy. (8)

(OR)

b) i) When is reheating of steam is recommended in a steam power plant? How does the reheat pressure get optimized? (8)

ii) Steam at 20 bar, 350°C is expanded in a steam turbine to 0.08 bar. It then enter a condenser, where it is condensed to saturated liquid water. The pump feeds back the water into the boiler. Assuming ideal processes find per kg of steam the network and the efficiency of the cycle. (8)

14. a) i) Derive the equations used for computing the entropy change of an ideal gas. (8)

ii) A constant volume chamber of 0.3 m^3 capacity contains 2 kg of this gas at 5°C. Heat is transferred to the gas until the temperature is 100°C. Find the work done, the heat transferred and the change the internal energy, enthalpy and entropy. Take C_p= 1.968 kJ/kgK and c_v = 1.507 kJ/kgK also find its molecular weight and gas constants. (8)

(OR)

b) i) Derive the Maxwell equations. (8)

ii) Determine the maximum Joule – Thomson inversion temperature in terms of the critical temperature T_c predicted by the a) Vander Waals equations b) Redlich- Kwong equations. (8)

15. a) i) Explain the process of cooling and dehumidification. (8)

ii) Atmospheric air at 1 bar has a dbt of 32°C and a wbt of 26°C. Compute (8)

1) the partial pressure of water vapour
2) the specific humidity
3) the dew point temperature
4) the relative humidity
5) degree of saturation
6) Density of the air in the mixture
7) the density of the vapour in the mixture.

(OR)

b) i) What do you understand by sensible heat load and latent heat load (8)

ii) Saturated air at 2°C is required to be supplied to a room where the temperature must be held at 20°C with a relative humidity of 50%. The is heated and then at 10°C is sprayed in to give the require humidity. Determine the temperature to which the air must be heated an the mass of spray water required per m^3 of air at room conditions. Assume that the total pressure is constant at 1.0132 bar and neglect the fan power. (8)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE404 – Water Supply Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the objectives of public water supply system.
2. Define impounding reservoir.
3. List out the functions of intake structures.
4. Mention the factors to be considered while selecting the pump.
5. Name the coagulants used for water treatment.
6. Define pulsator clarifier.
7. What are the methods of demineralization?
8. How do you remove iron and manganese from water?
9. Classify distribution reservoir.
10. What is a stand pipe?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Summarize the population forecasting methods.	(16)
		(OR)	
	b)	Enumerate sources of water with their physico-chemical characteristics of water.	(16)
12.	a)	Describe the various materials and joints used in pipeline construction.	(16)
		(OR)	
	b)	Illustrate the pipe appurtenances used in water conveyance system.	(16)
13.	a)	Elaborate the principle and process of sedimentation tank.	(16)
		(OR)	
	b)	Categorize the types of chlorination in detail.	(16)
14.	a)	Demonstrate the water softening methods to remove temporary and permanent hardness.	(16)
		(OR)	
	b)	Examine defluoridation techniques.	(16)

15. a) Elucidate the different layouts of distribution network. (16)

(OR)

b) i) Discuss pipe fittings used for water distribution system. (8)

ii) Analyze important aspects associated with house service connection. (8)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS403 – Object Oriented Programming using C++

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Give any two examples that show that C++ is better than C.
2. Why is printf() more risky to use than cout() in C++?
3. What is typecasting? State its need.
4. Differentiate friend function and member function of a class.
5. What are the uses of an abstract class?
6. What is a reference variable in C++?
7. Bring out the use of virtual functions.
8. Can you rethrow an exception?
9. What are manipulators? Give example.
10. List various file modes.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What is Object Oriented Programming? How is it different from Structured Programming? (8)

ii) Bring out the features of Object Oriented Programming. (8)

(OR)

b) i) Why are constructors and destructors included in a C++ Class? (6)

ii) Write a C++ program to create a class called Student, with appropriate data members and member functions and constructor. (10)

12. a) i) Write a C++ program to overload the + operator to concatenate two strings. (12)

ii) Give the list of operators that cannot be overloaded. (4)

(OR)

b) State the advantages of polymorphism. Give examples for the two types of polymorphism supported in C++. (16)

13. a) With a suitable example, explain how runtime polymorphism is achieved using virtual functions. (16)

(OR)

b) i) Are pointers the same as reference variables? Explain with examples. (8)

ii) Illustrate multilevel inheritance with a suitable example. (8)

14. a) i) Illustrate the exception handling mechanism of C++. (10)

ii) Bring out the need for exception handling in a programming language. (6)

(OR)

b) i) What is a generic function? What are its applications? Give examples of generic functions. (8)

ii) Elaborate on Class templates and Function templates. Give an example for function template with multiple parameters. (8)

15. a) Write a program in C++ to copy the contents of a user specified file into another file. The program should work fine for both text files and binary files. (16)

(OR)

b) i) Discuss container classes with examples. (8)

ii) Elucidate the hierarchy of stream classes in C++ library. (8)

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Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC403 – Microprocessors and Microcontrollers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the function of the pins HOLD and HOLDA in 8085 microprocessor?
2. Write the two modes of operations present in 8086.
3. Elaborate on any four string instructions.
4. List the output terminals in USART 8251.
5. Distinguish between Microprocessor and Microcontroller.
6. Difference between the Von-Neumann and Harvard architecture.
7. Identify the features of 8051 serial port in Mode 0.
8. What are the types of sensors used for interfacing?
9. Highlight the significance of working register in PIC microcontroller.
10. Add the given two eight-bit binary numbers b1 = 0011 1000 and b2 = 0011 1000 and report its influence on the digit carry bit.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw the block diagram of 8085 microprocessor and explain how the various units of 8085 work in executing an instruction. (12)

ii) Illustrate the timing diagram for LXI H, 4200 H. (4)

(OR)

b) i) Describe in detail with necessary illustrations, the internal Architecture of Intel 8086 Microprocessor. (12)

ii) How many operands do each of the following instructions of 8086 have? (4)

1. ADD
2. ADC
3. INC
4. ROR

Write examples for each instruction.

12. a) i) Outline the use of the following assembler directives: DD, ASSUME, EQU. (6)

ii) Examine the various addressing modes available in 8086. (10)

(OR)

b) i) Explain the function of unsigned multiplication and Division instructions in 8086 with suitable examples. (10)

ii) With neat block diagram, explain the description and function of 8279. (6)

13. a) i) Summarize the features of 16 bit Microcontrollers. (4)

ii) Illustrate in detail about the Architecture of 8051 Microcontroller with neat diagram. (12)

(OR)

b) i) Write short notes on I/O ports and their functions of 8051 Microcontroller. (4)

ii) Discuss in brief the various registers and memory organization of 8051 Microcontroller. (12)

14. a) i) Demonstrate in detail about arithmetic and control instruction set in 8051. (10)

ii) Analyze how to interface a 16 X 2 LCD display using 8051 Microcontroller. (6)

(OR)

b) i) Describe about Interrupt programming with respect to 8051 microcontroller with neat diagram. (10)

ii) Give short notes on ADC interfacing. (6)

15. a) i) Explain in detail with a neat block diagram the architecture of PIC 16C7X. (12)

ii) Write a code to decrement a 16-bit variable and test the result for zero, branching to HALT if the result is zero. (4)

(OR)

b) i) Discuss in detail the register file structure and addressing modes of PIC 16C6x/7x. (12)

ii) Assume that a 16-bit accumulator made up of RAM bytes namely ACC16H, ACC16L. Write the instructions to a add a 16-bit number NUM16H, NUM16L to the contents of the accumulator, leaving the result in the accumulator and setting the C and Z bits appropriately. Minimize program words. (4)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE404 – Analog and Digital Integrated Circuits

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List out the ideal characteristics of an OP-AMP.
2. Draw the circuit diagram of an integrator.
3. What is sample and hold circuit?
4. What are the different types of Linear Voltage regulators?
5. Given F=B'+A'B+A'C': Identify the redundant term using K- map.
6. Write the truth table for 4 to 2 priority encoder.
7. Convert T Flip Flop to D Flip Flop.
8. Compare combination logic and sequential logic circuits.
9. What is latch?
10. State the difference between synchronous and asynchronous circuit.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss in detail about the DC and AC characteristics of op amp. (16)

(OR)

b) i) Draw the inverting amplifier circuit and non- inverting amplifier circuit of an op-amp in closed loop configuration. Obtain the expression for the closed loop gain for both amplifiers. (10)

ii) Sketch an instrumentation amplifier using 3 Op- Amp. (6)

12. a) i) What is a comparator? With neat circuit diagram Explain its characteristics. (8)

ii) Describe the second order high pass filter with its frequency response and design the circuit with the cut- off frequency of 5 KHz. (8)

(OR)

b) i) Design a monostable multivibrator with pulse duration of 1ms using 555 timers IC. (8)

ii) Briefly explain the difference between the two operating modes of 555 timer. (8)

13. a) Simplify the following Boolean expression using K map (16)

i) f (x, y, z) = x y'z' + xyz + xyz' + x y' z + xyz'

ii) f(A, B, C, D) = $\sum(1, 3, 4, 5, 9, 10, 11)+\sum(6, 8)$.

(OR)

b) Implement the following Boolean function using 8:1 Mux: (16)
F(A, B, C, D) = $\sum m(0, 1, 3, 4, 8, 9, 15)$.

14. a) Draw the logic diagram of T flip-flop, and explain the operation, state diagram and characteristics table of a T flip flop. (16)

(OR)

b) Design a 4-bit synchronous counter. Explain the operation of the counter using the timing diagram. (16)

15. a) i) How do you get output specifications from a flow table in asynchronous sequential circuit operating in fundamental mode? (8)

ii) Explain the operation of clocked SR latch. (8)

(OR)

b) Describe the procedure to design of asynchronous sequential circuit in detail with an example. (16)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME404 – Strength of Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define bulk modulus.
2. Define principal plane and principal stresses.
3. Write the assumptions made in the theory of simple bending.
4. What do you mean by point of contraflexure?
5. Write Maxwell's reciprocal theorem.
6. What is equivalent length of a column?
7. What is hoop stress?
8. A spherical shell of internal diameter 0.9 m and of thickness 10 mm is subjected to an internal pressure of 1.4 N/mm^2. Determine the increase in diameter.
9. Define Torsion.
10. Differentiate close coiled and open coiled helical spring.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A steel rod of 16 mm diameter and 3 m length passes through a copper tube of 50 mm external and 40 mm internal diameter and of the same length. The tube is closed at each end with the help of 30 mm thick steel plates which are tightened by nuts till the length of the copper tube is reduced by 0.6 mm. The temperature of the whole assembly is then raised by 56°C. Determine the stresses in the steel and copper before and after the rise of temperature. Assume that the thickness of the steel plates at the ends do not change during tightening of the nuts. (16)

(OR)

b) The stresses on two perpendicular planes through a point in a body are 30 MPa and 15 MPa both tensile along with shear stress of 25 MPa. Find (16)

i) the magnitude and direction of principal stresses

ii) the planes of maximum shear stress

iii) the normal and shear stresses on the planes of maximum shearing stress by Mohr's stress circle.

12. a) Draw the shear force and bending moment diagram for the overhanging beam carrying uniformly distributed load of 1kN/m over the entire length and a point load of 3 kN as shown in figure.1. Locate the point of contraflexure. (16)

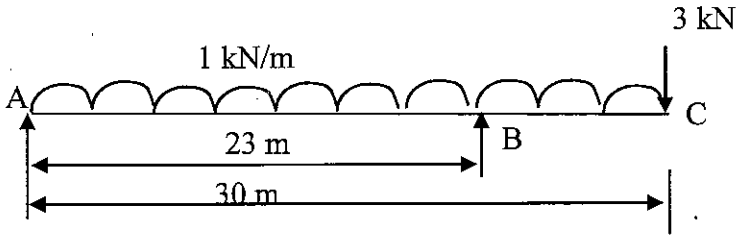

Figure.1.

(OR)

b) A timber beam is freely supported on supports 6m apart. It carries a uniformly distributed load of 12 kN/m run and a point load of 9 kN at 3.5 m from the right support. Design a suitable section of the beam making depth twice the width, if the stress in timber is not to exceed 8 N/mm^2. (16)

13. a) A simply supported beam of 8m length carries two point loads of 64 kN and 48 kN at 1m and 4m respectively from the left hand end. Find the deflection under each load and the maximum deflection. E = 210 GPa and I = 180 x 10^6 mm^4. (16)

(OR)

b) A 2 m long column has a circular cross section of 6 cm diameter. One of the ends of the column is fixed in direction and position and other end is free. Taking factor of safety as 3, calculate the safe load using (16)

i) Rankine's formula take yield stress f_c = 550 N/mm^2 and α = 1/1600 for pinned ends,

ii) Euler's formula, young's modulus for C.I = 1.3 x 10^5 N/mm^2.

14. a) Calculate i) the change in diameter, ii) change in length and iii) change in volume of a thin cylindrical shell 100 cm diameter, 1 cm thick and 5 m long when subjected to internal pressure of 3 N/mm^2. Take E= 2 x 10^5 N/mm^2 and Poisson's ratio 0.3. (16)

(OR)

b) Drive the expression for the radial pressure and hoop stress for a thick cylindrical shell. (16)

15. a) Determine the diameter of a solid steel shaft which will transmit 90 kW at 160 r.p.m. Also determine the length of the shaft if the twist must not exceed 1° over the entire length. The maximum shear stress is limited to 60 N/mm^2. Take the value of modulus of rigidity = 8 x 10^4 N/mm^2. (16)

(OR)

b) A closed coiled helical spring is to carry a load of 1kN. Its mean coil diameter is to be 10 times that of wire diameter. Calculate these diameters if the maximum shear stress in the material of the spring is to be 90 N/mm^2. If the stiffness of the spring is 20 N/mm deflection and modulus of rigidity = 8.4 x 10^4 N/mm^2, find the number of coils in the closely coiled helical spring. (16)

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B.E. Degree Examinations – April/May 2023

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 is called scientific management?
2. What do you understand by span of control?
3. What is the need for quality circles?
4. Compare joint sector, co-operative sector and public sector.
5. What is PERT? Mention its significance.
6. Give a basic idea on construction of network.
7. What are direct and indirect taxes?
8. Give a short note on National income.
9. List the role and functions of NABARD.
10. What is meant by privatization?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)		Give a detailed view on Organizational structure – Line and Functional relationship.	(16)
			(OR)	
	b)		Discuss in detail about management by objectives.	(16)
12.	a)	i)	Compare conciliation, arbitration with adjudication procedures.	(10)
		ii)	List down the causes of strike and explain its types.	(6)
			(OR)	
	b)	i)	List the objectives and functions of personnel management.	(6)
		ii)	How is the recruitment, selection and training made for the workers?	(10)
13.	a)	i)	Elaborate on Batch and Mass production.	(8)
		ii)	Discuss on channels of distribution.	(8)
			(OR)	

	b)	i)	Write notes on EOQ.	(8)
		ii)	Elaborate On Marketing management.	(8)
14.	a)	i)	Write the factors involved with price mechanism.	(8)
		ii)	Elaborate on theory of demand and supply.	(8)
			(OR)	
	b)	i)	Discuss the impact of Black money.	(8)
		ii)	Explain the causes and consequences of inflation.	(8)
15.	a)	i)	Write notes on multinational corporation.	(8)
		ii)	Discuss the impact of MNC on Indian economy.	(8)
			(OR)	
	b)	i)	Compare and give your view on Indian capital market and stock market.	(8)
		ii)	Elaborate on UTI, Insurance companies.	(8)

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B.E. Degree Examinations – April/May 2023

V Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18CSOE10 – Artificial Intelligence and Machine Learning

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How can recognize an intractable problem?
2. Illustrate the Agents interact with environments through sensors and actuators.
3. Compare goal formulation with problem formulation.
4. Define minimax algorithm.
5. What is Lifting lemma?
6. Mention the major characteristics of general-purpose ontologies distinguish them from collections of special-purpose ontologies.
7. Differentiate between supervised and unsupervised learning.
8. List the advantages of Heuristic space search.
9. Depict Perceptron.
10. What is uniform crossover?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Examine the AI literature to discover whether the following tasks can currently be solved by computers: (16)
    i) Buying a week's worth of groceries on the Web.
    ii) Discovering and proving new mathematical theorems.
    iii) Giving competent legal advice in a specialized area of law.
    iv) Translating spoken English into spoken Tamil in real time.

(OR)

b) Discuss in detail about the model based reflex agents and utility based agents with pseudocode programs. (16)

12. a) The traveling salesperson problem (TSP) can be solved with the minimum-spanning-tree (MST) heuristic, which estimates the cost of completing a tour, given that a partial tour has already been constructed. The MST cost of a set of cities is the smallest sum of the link costs of any tree that connects all the cities. (16)

i) Show how this heuristic can be derived from a relaxed version of the TSP.

ii) Show that the MST heuristic dominates straight-line distance.

iii) Write a problem generator for instances of the TSP where cities are represented by random points in the unit square.

iv) Find an efficient algorithm in the literature for constructing the MST, and use it with A* graph search to solve instances of the TSP.

(OR)

b) Consider the chess game playing and discuss with the imperfect real-time decisions in detail. (16)

13. a) Briefly explain about the syntax and semantics of first order logic. (16)

(OR)

b) Explain the mental events and mental objects. (16)

14. a) Discuss in detail about the version spaces and candidate elimination. (16)

(OR)

b) Describe the representation, the hypothesis space and show how to learn a good hypothesis of decision tree induction. (16)

15. a) i) Explain the derivation of the Back propagation weight-tuning rule. (10)

ii) Explain the representational power of Feed forward networks. (6)

(OR)

b) i) Describe in detail about the specific instantiation of the Genetic algorithm in GABIL system. (10)

ii) Explain Lamarckian evolution and Baldwin effect. (6)

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Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

VI & VII Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATIONS ENGINEERING

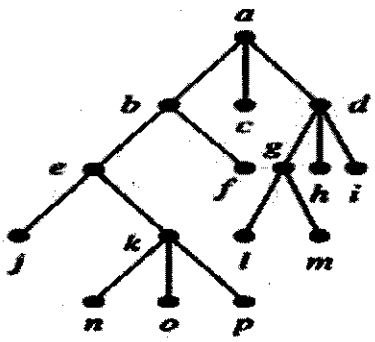
18CSOE07 – Data Structures using C++

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between a constructor and a destructor.
2. What is Dynamic memory allocation? Give an example.
3. State the differentiation between function overloading and function overriding.
4. Distinguish between virtual function and pure virtual function.
5. How to evaluate the postfix expression : 6 5 2 3 + 8 * + 3 + *.
6. Convert the following expression to prefix:
   a) ((c-b/d-((e+f)*g)
   b) 24/6-3*7-6+10/2
7. For the following tree, give the (i) Preorder, (ii) Inorder and (iii) postorder traversal.



8. What are the ways in which graphs are represented?
9. Sort 20, 35, 40, 100, 3, 10, 15 using insertion algorithm.
10. What is meant by internal and external sorting? Give examples.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write a C++ program to add two complex numbers using operator overloaded by a friend function. (8)

    ii) Write a C++ Program to demonstrate the functioning of a friend class and friend function. (8)

(OR)

b) i) Write a C++ program to overload area () function to calculate area of shapes like triangle, square, circle. (8)

ii) Discuss the types of constructor with the help of an example in C++. (8)

12. a) What does inheritance means in C++? What are different forms of inheritance? Explain any three types with suitable example of each. (16)

(OR)

b) i) Write a C++ program demonstrating use of the pure virtual function with the use of base and derived classes. (8)

ii) Write a C++ program to invoke derived class member through base class pointer (use Virtual function concept). (8)

13. a) i) Explain the implementation of Queue operations using Linked list. (8)

ii) Write a C++ Program to evaluate a postfix expression. (8)

(OR)

b) Explain the implementation of Singly Linked List with the basic operations. (16)

14. a) i) Write a C++ program to implement the operations of Binary Search Tree (BST). (8)

ii) State the Heap tree property .Discuss the operations on MaxHeap and MinHeap with suitable example for each type. (8)

(OR)

b) Define Graph. Discuss the ways in which graphs are represented? Explain in detail about graph traversal. (16)

15. a) i) Trace the quick sort algorithm for the following numbers 90, 77, 60, 99, 55, 88, 66. (8)

ii) Explain with an example the working of merge sort. (8)

(OR)

b) Explain in detail about algorithm for Linear and Binary Search. (16)

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B.E. Degree Examinations – April/May 2023

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. Differentiate load curve and load duration curve.
2. Mention four sources of non-conventional energy.
3. State the laws of illumination.
4. List the requirements of a good lighting scheme.
5. Write the advantages and applications of dielectric heating.
6. Draw the electric circuit for resistance welding.
7. Draw the speed-torque characteristics of 3-phase Induction Motor.
8. Mention a few advantages of electric traction.
9. Classify the various types of loads.
10. List the various methods for determining the size and rating of electric motor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Calculate the diversity factor and the annual load factor of a generating station supplies loads to various consumers as follows: Industrial consumer = 1,500 kW, Establishment = 7,500 kW, Domestic power = 100 kW, and Domestic light = 400 kW. Assume the maximum demand on the station is 2,500 kW and the number of units produced per year is 40 *10^5. (8)

ii) Explain briefly any four types of Tariffs with examples. (8)

(OR)

b) i) Explain briefly the method of generating geothermal power (6)

ii) Explain the electrical energy conservation methods. (10)

12. a) i) With neat circuit, explain the working principle of Sodium Vapor lamp. (8)

ii) Explain the various types of lighting schemes with examples. (8)

(OR)

b) i) With neat circuit, explain the working of fluorescent lamp. (8)

ii) Write short notes on "Energy efficient lamps". (8)

13. a) i) Explain the design of heating element for Ribbon-type element. (8)

ii) Compare the resistance welding and arc welding. (8)

(OR)

b) i) A 40-kW, 3-phase, and 400-V resistance oven is to employ Ni-Cr strip of 0.3 mm thickness. The heating elements are star commuted. If the temperature of the wire is to be 1,200°C and that of the charge is 700°C. Determine the length and width of the wire. Take the radiation efficiency as 0.5 and the emissivity as 0.9. Take the specific resistance of Ni-Cr = 1.03×10^{-6} Ω-m. (8)

ii) Explain any two types of resistance welding. (8)

14. a) i) Draw the Trapezoidal speed-time characteristics and explain the traction motor control. (8)

ii) Write short notes on various traction electrification systems. (8)

(OR)

b) i) Explain the mechanism of train movement. (8)

ii) List the various types of electric braking applied to the traction vehicle. Also explain any one of the braking methods. (8)

15. a) i) Explain in detail, the field control method of speed control of DC shunt motor for DC drive applications. (8)

ii) List the various factors for the choice of electric motors. (8)

(OR)

b) i) With neat diagram, explain the functions of various blocks of Electric drive. (8)

ii) Explain the types of electric drives with examples. (8)

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B.E. Degree Examinations – April/May 2023

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. Compare appraisal and failure costs.
2. What are the dimensions of quality?
3. Compare Reward and Recognition.
4. Classify the types of motivation.
5. Give the seven tools of quality.
6. Enumerate the importance of process capability.
7. What are the types of benchmarking?
8. List the benefits of FMEA.
9. Define ISO. What is the need for ISO?
10. Compare QS 9000 with TS 16949 quality system.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain the general duties of a quality council.	(8)
		ii)	Categorize the different TQM Framework with diagram.	(8)
			(OR)	
	b)	i)	Compare the dimensions of product quality and service quality with example.	(8)
		ii)	Discuss the Obstacles associated with TQM Implementation.	(8)
12.	a)	i)	Explain the common team problems.	(8)
		ii)	Summarize the activities to be done using customer complaints.	(8)
			(OR)	
	b)	i)	Explain why and now we should retain the customer using an established model.	(8)
		ii)	Summarize conditions for the selection and evaluation of suppliers.	(8)

13. a) i) What are control charts? What are various types of control charts used in industries? (8)

ii) Explain the concept of six sigma. (8)

(OR)

b) i) In what way, matrix data analysis differs from all other management tools? (8)

ii) What are scatter diagrams? Explain the various patterns of it. (8)

14. a) i) Analyze the two main types of benchmarking. In what circumstances would each type be more appropriate? (8)

ii) Analyse the stages involved in developing TPM. (8)

(OR)

b) i) Explain the four stages of FMEA. (8)

ii) Discuss the elements of House of Quality. (8)

15. a) i) What are the steps to be followed in implementing quality system ISO 9001:2000? (8)

ii) Elaborate on quality auditing. (8)

(OR)

b) i) Discuss about the four important documents to be prepared for ISO 9000 certification. (8)

ii) Discuss about ISO 9000:2000 Quality Systems. (8)

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B.E. Degree Examinations – April/May 2023

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. Distinguish between value and wealth.
2. Define law of demand.
3. Illustrate balance sheet.
4. What is meant by monetary policy?
5. Define co-operative organization.
6. What is the necessity of partnership in business?
7. List the Various types of management.
8. What are the Various motivational theories available?
9. Write Short Note on Break even Analysis.
10. What are the application of Break even analysis in economics?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	How does managerial economics differ from economics?	(6)
		ii)	Discuss the scope of managerial economics.	(10)
			(OR)	
	b)	i)	Discuss the types and degrees of elasticity of demand with examples.	(10)
		ii)	Briefly write about law of diminishing.	(6)
12.	a)		Summarize the sources of financing for industries in detail.	(16)
			(OR)	
	b)		Explain the procedure to be followed in balance sheet, profit and loss account and fund flow statement.	(16)
13.	a)		Describe in detail about proprietorship and partnership with their merits and demerits.	(16)
			(OR)	

b) Write short notes on: (16)

i) Mixed economy

ii) Monopoly and

iii) Joint stock company.

14. a) Discuss in detail about human resources planning and motivational theories. (16)

(OR)

b) Explain how communication plays an vital role in any industry and also describe budgetary control techniques. (16)

15. a) i) Enumerate the various classification of costing. (8)

ii) Explain the concept of fixed cost, variable cost and marginal cost. (8)

(OR)

b) i) Describe the step by step procedure in plotting the break-even chart. (8)

ii) Write the various assumptions in break even analysis. (8)

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B.E. Degree Examinations – April/May 2023

V, VI & VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING, COMPUTER SCIENCE AND ENGINEERING &
ELECTRICAL AND ELECTRONICS ENGINEERING

18MEOE03 – Total Quality Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the functions of quality council?
2. Compare appraisal and failure costs.
3. How is Customer retention focused in TQM?
4. How employee involvement can be improved in an organization?
5. Differentiate between control charts for variables and attributes.
6. Write the features of Activity network diagram.
7. Make a distinction between failure mode and failure effects?
8. Recall the significance of Taguchi's QLF.
9. What is the purpose of TS 16949:2002 quality system?
10. Write the significance of Quality Auditing.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Examine evolution and potential benefits of TQM. (10)

ii) Evaluate Quality statements of manufacturing company with an example. (6)

(OR)

b) i) Classify the various types of Quality costs and given examples. (10)

ii) Explain the role of senior level management in TQM implementation. (6)

12. a) i) How would you show your understanding on the essentials PDCA Cycle? (10)

ii) Explain the common customer feedback collection tools. (6)

(OR)

b) i) How would you describe kaizen model and list their merits? (10)

ii) Enumerate types of team and the characteristics of a successful team. (6)

13. a) i) Describe any five traditional tools of quality. (10)

ii) How would you show your understanding of properties of normal curve? (6)

(OR)

b) i) Describe any five new management tools. (10)

ii) Elaborate the stages of six sigma in process improvement. (6)

14. a) i) Discuss the Pillars of TPM. (10)

ii) Describe the four phases of QFD. (6)

(OR)

b) i) With an application example explain the preparation of FMEA work sheet. (10)

ii) Analyze the three main types of benchmarking. In what circumstances would each type be more appropriate? (6)

15. a) Discuss about the documents to be prepared for ISO 9000 certification. (16)

(OR)

b) What are the types of quality audit? Explain with application examples. (16)

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Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

I & II Semester (Full Time)

(2018 Regulations)

COMMON TO ALL BRANCHES

18CS101 – Fundamentals of Problem Solving and C Programming

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How are the computers classified? List its types.
2. Write the pseudo code to find the given number is divisible by 5 or not?
3. State the C program structure.
4. List the advantages of Symbolic constant.
5. What is meant by preprocessor? Give the example.
6. Mention the storage classes in C.
7. List any four built-in functions in C.
8. What is meant by function prototyping? Give example.
9. State the difference between structure and union.
10. Write the syntax of nested structure.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Draw and explain the basic organization of a computer.	(10)
		ii)	Describe the computer generations.	(6)
			(OR)	
	b)	i)	Draw the flowchart to find the given number is prime or not	(8)
		ii)	Write the algorithm to find the sum and average of N numbers	(8)
12.	a)		Illustrate the different types of operators in c with suitable examples.	(16)
			(OR)	
	b)		Explain the decision-making statements (branching and looping) with suitable example program.	(16)
13.	a)	i)	Illustrate the array declaration, initialization and accessing with suitable example program.	(8)
		ii)	Write the program to find the minimum and maximum of N numbers stored in an array.	(8)

(OR)

b) i) Explain string handling functions with example. (8)

ii) Write a program to search an element in an array. (8)

14. a) i) Explain call by value and call by reference with suitable program. (8)

ii) Write a recursive function to find the factorial of N (8)

(OR)

b) i) How will you declare, initialize, and access the pointer? Give example. (8)

ii) Write a program to sort the array elements in ascending order using pointer. (8)

15. a) i) Illustrate pointer to structure with suitable example. (8)

ii) Describe the different file opening mode in C. (8)

(OR)

b) i) Define a structure for student with register number, name, date of birth and percentage of the marks. Write a program to store n students and display the student details using array of structure. (16)

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B.E. Degree Examinations – April/May 2023

VI & VII Semester (Full Time)

(2018 Regulations)

METALLURGICAL 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 is service learning?
2. Brief on spirituality.
3. Differentiate Micro ethics and Macro ethics.
4. Explain Gilligan's theory.
5. How does a code support engineers?
6. Demonstrate balanced outlook on Law?
7. Classify the collective bargaining.
8. Define occupational crime.
9. State few advantages of Multinational Corporations.
10. What are the moral dimensions of an Engineer-manager?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Identify the meaning of integrity and importance in Ethics.	(8)
		ii)	Explain in detail about on Honesty.	(8)
			(OR)	
	b)	i)	Examine the significance of valuing time.	(8)
		ii)	Write short note on self-confidence and its importance.	(8)
12.	a)	i)	Explain in detail about the senses of Engineering ethics.	(8)
		ii)	Discuss in detail about the concept of moral dilemmas.	(8)
			(OR)	
	b)	i)	Describe briefly about consensus and controversy.	(8)
		ii)	Analyze in detail the uses and limitations of ethical theories.	(8)
13.	a)		Engineering as experimentation plays a vital role in the design process - Discuss with suitable example.	(16)
			(OR)	
	b)		Discuss in detail the importance of code of ethics.	(16)

14. a) Explain the risk benefit analysis and conceptual problems associated with it. (16)

(OR)

b) i) Discuss in detail the conflicts of interests and the different ways to avoid conflicts of interests? (8)

ii) Explain in detail about the employee rights and its role in the organization. (8)

15. a) i) Discuss in detail the corporate responsibility. (8)

ii) Identify and organize the ethical issues related to computer ethics. (8)

(OR)

b) i) Illustrate the role of engineers as consulting engineers. (8)

ii) Explain the IEEE code of ethics. (8)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE403 - Engineering Geology

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What do you understand by weathering? Define spheroidal weathering.
2. Name any four core and allied branches of geology.
3. Show the differences between muscovite and biotite.
4. Distinguish between mineral colour and mineral streak.
5. What do you understand by clastic and non-clastic rocks?
6. Identify the types of metamorphism.
7. Classify the types of dips.
8. Assess the influence of joints on the strength of rocks.
9. Outline the term parallax in aerial photograph.
10. Identify any four methods to prevent landslides.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the concept of plate tectonics and describe how earthquakes occur. Write notes on seismic zones in India. (16)

(OR)

b) Describe the geology of ground water and its importance in civil engineering. (16)

12. a) Identify the physical properties and chemical composition of clay minerals. Also discuss engineering considerations of clay minerals. (16)

(OR)

b) Illustrate in detail about the crystallographic system. (16)

13. a) Compare the composition, texture, occurrence, engineering properties and uses of i) Limestone, ii) Granite, iii) Slate and iv) Marble. (16)

(OR)

b) Distinguish igneous rock, metamorphic rock and sedimentary rock on the basis of structure & texture? (16)

14. a) What do you understand by geological map? Explain the importance of geological maps in civil engineering. (16)

(OR)

b) Illustrate with neat sketches on the folding processes and their civil engineering significance. (16)

15. a) Examine the geological conditions necessary for construction of tunnels. (16)

(OR)

b) Explain in detail the seismic and electrical methods in civil engineering investigations. (16)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE403 – Measurements and Instrumentation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How do you define the terms Accuracy and Precision?
2. List out the different types of damping used in an instruments.
3. Draw the circuit to measure power in DC circuits. Mention the expression for power in DC circuit
4. What is called creeping in energy meters? Why it occurs?
5. Write the different types of test that are used for testing of magnetic materials?
6. Show the relation between iron loss with frequency and indicate the hysteresis and eddy current loss variations.
7. Write the two conditions to be satisfied for balancing AC bridges.
8. List out any four applications of DC potentiometer in the field of electrical measurements?
9. Classify the different types of transducers.
10. Name the devices used measurement of angular velocity.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw the functional block diagram of an Instrumentation system showing the main elements and explain their functions. (10)

ii) Identify the different effects used in producing deflecting torque in an analog instrument and cite an example for each case. (6)

(OR)

b) i) Describe the construction and working of permanent magnet moving coil (PMMC) instrument. Also derive the expression for deflection if the instrument is spring controlled. (10)

ii) Develop the method used for extension the range of Moving Iron type instruments used for voltage and current measurements with suitable expressions. (6)

12. a) Explain the working of a three phase double element wattmeter. Draw a neat sketch of the wattmeter and also its connections. Describe how the mutual effects between the two elements of the wattmeter are eliminated. (16)

(OR)

b) Describe the constructional details of single phase induction type energy meter. Explain why the phase of shunt flux is made exactly in quadrature with that of applied voltage so as to produce a deflecting torque exactly proportional to power. (16)

13. a) i) Describe the method for determination of hysteresis loop of a magnetic material using (12)

i) Method of reversals and

ii) Step by step method.

ii) Draw the circuit diagram for magnetic potentiometer and mention its uses. (4)

(OR)

b) i) Describe the Lloyd Fisher Square for measurement of iron losses in a specimen of laminations. How is the true value of flux density in the laminations determined? (12)

ii) Draw the circuit diagram for Illiovici Permeameter and mention its uses. (4)

14. a) i) Explain the principle of working a Kelvin's double bridge and explain how the effect of contact resistance and resistance of leads is eliminated. (10)

ii) A coil has 10mH inductance with quality factor of 100. Choose the type of AC bridge used for measurement of the coil inductance. Draw its circuit diagram and indicate the mathematical expression for unknown inductance. (6)

(OR)

b) i) Draw the circuit for Drysdale polar potentiometer and explain its working. How it is standardized? (10)

ii) Draw the circuit for Duo-range type potentiometer and mention its advantages. (6)

15. a) i) Explain the construction and working principle of linear voltage differential transformer (LVDT). Explain how the magnitude and direction of the displacement detected in a LVDT? (12)

ii) List out the factors to be considered for selection of transducers. (4)

(OR)

b) i) Explain the operation of Electromagnetic type flow meter used for measurement of fluid flow. Compare the operation of Electromagnetic type flow meter when it is excited by AC and DC. (12)

ii) Write short notes on Thermistor used for temperature measurement. (4)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT403 – Iron Making

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Give the condition for iron making process.
2. Can we do iron making without coke? Justify.
3. What is direct and in-direct reduction in iron making?
4. Blast furnace produces pig iron of composition Fe 94%, Si 2%, Mn 0.5%, and C 3.5% by reduction smelting of iron ore, coke, and limestone. The analysis is as follows: Iron Ore: Fe_2O_3 78%, SiO_2 8%, Al_2O_3 5%, MnO 2%, H_20 7%. Find the amount of Iron ore.
   (Given Fe Atm.Wt. = 56 & O_2 Atm.Wt. = 16).
5. Why pre-heating of air blast is necessary in blast furnace?
6. Give the principle of dust catcher.
7. Define schaffolding and give a remedy to avoid it.
8. Expand RAFT and MBF.
9. What is HBI?
10. Why there is a need for an alternative route for iron making.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the classification of iron ores with its chemical names and discuss the problems associated with Indian raw materials. (16)

(OR)

b) Discuss the theory and practice of pelletisation explaining the green ball formation with figure and graphs. (16)

12. a) Explain the C–O, Fe–C-O & Fe–H–O equilibria in detail with respective reactions and neat graphs. (16)

(OR)

b) Discuss the reaction of iron making at tuyere zone and hearth zone with chemical reactions and neat sketches. (16)

13. a) Draw the layout of iron making process and explain the bell-less top charging system with neat labeled figure. (16)

(OR)

b) Explain the principle, construction and working of gas cleaning equipments with neat sketches. (16)

14. a) Discuss in detail the different irregularities in blast furnace with their remedies. (16)

(OR)

b) What is desulphurization of hot metal? Discuss the modern trends in blast furnace practice. (16)

15. a) Explain the following iron making route: (16)

1. Low shaft furnace
2. Charcoal furnace
3. Electro-thermal furnace

(OR)

b) Discuss any two types of gas based process for sponge iron production. (16)

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B.E. Degree Examinations – April/May 2023

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. Define reluctance torque with reference to a synchronous reluctance motor.
2. Summarize the factors to be considered while designing a vernier motor.
3. A four stack variable reluctance stepper motor has a step angle of 1.8 degree. Find the number of its stator and rotor teeth.
4. Sketch the block diagram for closed loop control of stepper motor?
5. Draw the speed-torque characteristics of switched reluctance motor.
6. State the advantages of microprocessor based control of switched reluctance motor.
7. Name the position sensors that are used for brushless permanent magnet DC motor.
8. What is the necessity of using brushless permanent magnet DC motors in industries?
9. Write the important features of Permanent Magnet Synchronous Motor.
10. List any two comparisons between permanent magnet excitation and electromagnet excitation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the operation of axial type synchronous reluctance motor. (8)

ii) Discuss briefly about i) Torque-angle characteristic, and ii) Torque - speed characteristic for a synchronous reluctance motor. (8)

(OR)

b) i) Develop the phasor diagram of synchronous reluctance motor. (8)

ii) State few advantages, disadvantages, and applications of synchronous reluctance motor. (8)

12. a) i) With neat cross-section diagram, explain the principle of operation of hybrid stepper motor. (8)

ii) Describe the linear analysis of stepper motor. (8)

(OR)

b) i) Discuss the concept of torque production in stepper motor. (8)

ii) Draw and explain the typical static characteristics of stepper motor. (8)

13. a) i) With neat cross sectional view of switched reluctance motor, explain its principle of operation. (8)

ii) A switched reluctance motor with six stator poles and four rotor poles has a stator pole arc of 30° and a rotor pole arc of 32°. The aligned inductance is 10.7 mH and unaligned inductance is 1.5 mH. Saturation can be neglected. Calculate the instantaneous torque when the rotor is 30° before the aligned position and the phase current is 7 A. Neglect fringing. (8)

(OR)

b) i) Draw and explain any one converter topology for a 3-phase Switched Reluctance Motor. (8)

ii) Draw and explain the schematic arrangement of the voltage PWM type current regulator for one phase of SRM. (8)

14. a) i) Explain the magnetic circuit analysis of permanent magnet brushless DC motor on open-circuit. (10)

ii) Derive the EMF equation of permanent magnet brushless DC motor. (6)

(OR)

b) i) Discuss briefly the operation of electronic commutator for a PM brushless DC motor. (6)

ii) Illustrate the structure of controller for permanent magnet brushless DC motor and explain the functions of various blocks with different modes of operation. (10)

15. a) i) With necessary phasor diagram and circle diagram, describe torque-speed characteristics of surface magnet PMSM. (10)

ii) Discuss briefly about the converter volt-ampere requirement of permanent magnet synchronous motor. (6)

(OR)

b) i) Explain briefly the principle of operation of permanent magnet synchronous motor. (6)

ii) Discuss the operation of closed loop speed control of load commutated inverter fed synchronous motor drive. (10)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE602 – Water Resource Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the types of precipitation?
2. Distinguish between interception and depression storage.
3. State any two names of reservoirs in Tamil Nadu.
4. What is flood routing?
5. Differentiate between aquifer and aquiclude.
6. Define kachha well.
7. State the use of wood's table.
8. What do you mean by dowla?
9. How rivers are classified?
10. State any two GIS applications in river training works.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the methods of estimation of average rainfall over a basin. (8)

ii) How infiltration indices are used to estimate surface run-off? (8)

(OR)

b) i) Describe about the Hydrological cycle in detail. (8)

ii) Explain the components of storm hydrograph with suitable sketch. (8)

12. a) i) Explain the various purposes of storage work. (8)

ii) Describe the zones of storage in a reservoir with sketch. (8)

(OR)

b) i) How will you determine the storage capacity of a reservoir? (8)

ii) Describe the investigation required for reservoir planning. (8)

13. a) i) Distinguish between confined and unconfined aquifers. (6)

ii) An artesian tube well has a diameter of 20 cm. The thickness of aquifer is 30 m and its permeability is 38 m/day. Find its yield under a drawdown of 4 m at the well face. Use radius of influence as 245 m. (10)

(OR)

b) i) How will you a select the site for a tube well? (6)

ii) During a recuperation test, the water in an open well was depressed, by pumping, by 2.1 m and it recuperated 1.6 m in 90 minutes. Find the diameter of well to yield 10 litres/sec. under a depression head of 2 m. (10)

14. a) i) Discuss the classifications of canal based on alignment. (6)

ii) Design an irrigation channel by Lacey's theory for 40 cumecs capacity. The side slopes may be assumed to be 1:1. The average size of the bed material may be taken as 0.8 mm. (10)

(OR)

b) i) Explain the GIS application in distribution system. (6)

ii) Using Kennedy's theory, design a channel section for the following data: (10)

Discharge Q = 14 cumecs, Kutter's N = 0.0225, Critical velocity ratio m = 1, Side slopes = ½:1, Bed slope = 1/5000.

15. a) i) Discuss the causes of water logging. (8)

ii) Brief about Guide bank system. (8)

(OR)

b) i) Draw the layout of tile drainage system. (8)

ii) Discuss about the Groynes in river training works. (8)

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME201 – Thermal Engineering

(Use of Steam Tables and Mollier Chart are permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Show the P-V and T-S diagram of Dual cycle.
2. For same maximum pressure and temperature, show that $\eta_{Diesel} > \eta_{Dual} > \eta_{Otto}$.
3. Classify the engines based on the method of cooling.
4. Differentiate air injection and airless injection.
5. Summarize the effects of super saturation in a steam nozzle.
6. What are the different methods of governing steam turbines?
7. Define volumetric efficiency of a reciprocating air compressor.
8. Give the condition for minimum work input in case of two stage air compressor.
9. Explain the function of analyzer in Vapour absorption refrigeration system.
10. Propose a suitable air-conditioning system for an office building.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) The minimum pressure and temperature in an Otto cycle are 100 kPa and 27°C. The amount of heat added to the air per cycle is 1500 kJ/kg. i) Determine the pressures and temperatures at all points of the air standard Otto cycle. ii) Also calculate the specific work and thermal efficiency of the cycle for a compression ratio of 8 : 1. Take for air : $c_v = 0.72$ kJ/kg K, and $\gamma = 1.4$. (16)

(OR)

b) Derive an expression for air standard efficiency of Diesel cycle. (16)

12. a) Explain with suitable sketches the working of four stroke Diesel engine. (16)

(OR)

b) Discuss with suitable sketches the following ignition systems used in petrol engines : i) Coil or battery-ignition system ii) Magneto-ignition system. (16)

13. a) Dry saturated steam enters a steam nozzle at a pressure of 15 bar and is discharged at a pressure of 2.0 bar. If the dryness fraction of discharge steam is 0.96, what will be the final velocity of steam? Neglect initial velocity of steam. If 10% of heat drop is lost in friction, find the percentage reduction in the final velocity. (16)

(OR)

b) Explain with diagrams, the working of i) Velocity compounding ii) Pressure-velocity compounding of turbines. (16)

14. a) i) State at least six uses of compressed air. How is volumetric efficiency affected by i) speed of the compressor; ii) delivery pressure; and iii) throttling across the valves. (8)

ii) A multi-stage air compressor is to be designed to elevate the pressure from 1 bar to 125 bar such that stage pressure ratio will not exceed 4. Determine: i) Number of stages ii) Exact stage-pressure ratios (8)

(OR)

b) A single-acting two-stage reciprocating air compressor with complete intercooling delivers 10.5 kg/min of air at 16 bar. The suction occurs at 1 bar and 27°C. The compression and expansion processes are reversible, polytropic index n = 1.3. Calculate: i) The power required to drive the compressor ii) The isothermal efficiency iii) The free air delivery iv) The heat transferred in intercooler The compressor runs at 440 r.p.m. v) If the clearance ratios for L.P. and H.P. cylinders are 0.04 and 0.06 respectively, calculate the swept and clearance volumes for each cylinder. (16)

15. a) i) Compare and contrast the merits and demerits of the vapour compression refrigeration system over vapour absorption refrigeration system. (8)

ii) How are air-conditioning equipment classified? In what ways package units differ from central units? (8)

(OR)

b) i) Draw the p-h and T-s diagram of vapour compression refrigeration system with the refrigerant entering the compressor as superheated. Obtain an expression for COP of the above system. (8)

ii) Design an air conditioning system for a shopping mall. List the important factors to be considered for the design. (8)

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B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE202 – Synchronous and Induction Machines

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term voltage regulation of Alternator.
2. Write the equation for frequency of emf induced in an alternator.
3. What is meant by hunting or swinging of synchronous motor?
4. Write the applications of synchronous motor.
5. How the direction of rotation of a three phase induction motor can be reversed?
6. State the condition at which the starting torque developed in a slip-ring induction motor is maximum.
7. List the methods of speed control from rotor side of induction motor.
8. Mention types of slip power recovery schemes.
9. What is a hysteresis motor?
10. What is the function of centrifugal switch in a single phase induction motor?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Define armature reaction and explain the effect of armature reaction on different power factor loads of synchronous generators. (8)

ii) Describe how the direct and quadrature-axis reactances of a salient-pole synchronous machine can be estimated by means of slip test. (8)

(OR)

b) i) Enumerate the parallel operation of three phase alternators with help of a neat diagram. (8)

ii) Describe the Potier method of determining the regulation of an alternator. (8)

12. a) i) With neat diagram, explain briefly the features and principle of operation of synchronous motor. (8)

ii) Explain in detail the V curve and inverted V curve of a synchronous motor. (8)

(OR)

b) i) Examine in detail the effect of varying excitation on armature current and power factor of synchronous motor. (8)

ii) With phasor diagram illustrate how synchronous motor can be used as a synchronous condenser. (8)

13. a) i) Develop the approximate equivalent circuit of a 3-phase induction motor. (8)

ii) Deliberate the different power stages of an induction motor with losses. (8)

(OR)

b) i) Sketch and Explain the torque slip characteristics of a 3-phase cage and slip-ring induction motors. (8)

ii) Derive the expression for torque under running condition of a 3-phase induction motor and obtain the condition for maximum torque. (8)

14. a) i) Describe why starters are necessary for starting 3-phase induction motors? Name the different types of starters and explain DOL Starter. (8)

ii) A 400 V induction motor runs at a speed of 1440 rpm when supplied from a 50 Hz source. Find its speed at 30 Hz when the load torque is constant. The frequency is varied while maintaining the ratio (V/f). (8)

(OR)

b) i) Explain in detail the Scherbius system of speed control. (8)

ii) Constant Illustrate the phenomena of Cogging and Crawling in Induction Motor. (8)

15. a) i) Elucidate the operation of shaded pole induction motor with diagram. (8)

ii) Using double field revolving theory, explain why single phase induction motor is not self-starting. (8)

(OR)

b) i) A 220 V, 6-pole, 50 Hz, single-winding single-phase induction motor has the following equivalent circuit parameters as referred to the stator. R_{lm} = 3.0 Ω, X_{lm} = 5.0 Ω, R_2 = 1.5 Ω, X_2 = 2.0 Ω. Neglect the magnetizing current. When the motor runs at 97% of the synchronous speed, compute the following: (8)

i) The ration E_{mf}/E_{mb}.

ii) The ratio T_f/T_b.

iii) The gross total torque.

ii) Describe the constructional features and principle of operation of repulsion motor. (8)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME403 – Fluid Mechanics and Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define " Archimedes Principle".
2. Find the surface tension in a soap bubble of 40 mm diameter when the inside pressure is 2.5 N/m^2 above the atmospheric pressure.
3. Classify fluid flows.
4. What is model analysis?
5. What is boundary layer? Draw the boundary layer region over a flat plate.
6. Find the head loss due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using Chezy's formulae which C=60.
7. Distinguish between impulse and reaction turbines.
8. What is the specific speed of the turbine?
9. What is meant by cavitation in centrifugal pump?
10. Differentiate between Reciprocating and Rotary Pumps.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) The space between two square flat parallel plates is filled with oil. Each side of the plate is 60 cm. The thickness of the oil film is 12.5 mm. The upper plate, which moves at 2.5 m/sec, requires a force of 98.1 N to maintain the speed. Determine 1) The dynamic viscosity of oil and 2) Kinematic viscosity of oil, if the specific gravity of oil is 0.95. (8)

ii) An open tank contains water up to a depth of 2 m and above it an oil of specific gravity of 0.9 for a depth of 1m. Find the pressure intensity 1) at the interface of the two liquids 2) at the bottom of the tank. (8)

(OR)

b) i) A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40 cm and height of fluid in the left from the center of pipe is 15 cm below. (8)

ii) Find the volume of the water displaced and position of center of buoyancy for a wooden block 2.5 m and depth of 1.5 m, when it floats horizontally in water. The density of the wooden block is 650 kg/ m^3 and its length is 6 m. (8)

12. a) Derive an expression for Bernoulli's theorem. (16)

(OR)

b) Derive on the basis of dimensional analysis suitable parameters to present the thrust developed by a propeller. Assume that the thrust P depends up on the angular velocity ω, Speed diameter D, dynamic viscosity μ , mass density ρ , elasticity of the fluid medium which can be denoted by the speed of sound in the medium C. (16)

13. a) Derive Hagen – Poiseuille formulae. (16)

(OR)

b) A pipe line of length 2000 m is used for power transmission. If 110 kW of power is to be transmitted through the pipe in which water having pressure of 490 N/cm^2 at inlet is flowing. Find the diameter of the pipe and efficiency of transmission, if the pressure drop over the length of the pipe is 98.1 N/cm^2. Take f=0.0065. (16)

14. a) A pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 700 Liters/ sec under a head of 30 m. The buckets deflect the jet through an angle of 160°. Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume coefficient of velocity as 0.98. (16)

(OR)

b) A Kaplan turbine working under a head of 20 m develops 11772 kW shaft power. The outer diameter of the runner is 3.5 m and hub diameter is 1.75 m. The guide blade angle at extreme edge of the runner is 35°. The hydraulic and overall efficiencies of the turbines 88% and 84% respectively. If the velocity of whirl is zero at outlet, determine i) Runner vane angles at inlet and outlet at the extreme edge of the runner ii) Speed of the turbine. (16)

15. a) The outer diameter of an impeller of a centrifugal pump is 400 mm and outlet width is 50 mm. The pump is running at 800 rpm and working against total head of 15m. The vane angle at outlet is 40° and manometric efficiency 75%. Determine i) velocity of flow at outlet ii) Velocity of water leaving the vane iii) angle made by the absolute velocity at outlet with the direction of motion at outlet iv) Discharge. (16)

(OR)

b) i) With a neat sketch explain the principle and working of vane pumps. (8)

ii) Write short notes on "Air vessels" and Indicator diagram. (8)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

II Semester (Part Time)

(2016 Regulations)

Civil Engineering

16PTCE201 – Basic Structural Steel Design

(Use of 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. Write short note on allowable stress design.
2. Draw the neat sketch of stress strain curve of mild-steel and mark its salient points.
3. Differentiate between pitch and gauge.
4. Write the advantages of welded connections.
5. Infer the modes of failures in tension members.
6. In what situation lug angles are used?
7. Define Slenderness ratio.
8. What are the Various types of Compression members in Steel Structures?
9. How do you make the beam laterally supported?
10. Define web buckling.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Write notes on partial safety factors for loads with respect to strength and serviceability and partial safety factors for materials in limit state method. (16)

(OR)

b) Explain the different types of loads on structures and load combinations with respect to code of practice. (16)

12. a) A single-bolted double cover butt joint is used to connect two plates 10 mm thick. Assume the 20 mm diameter bolts are used with a pitch of 50 mm, calculate the efficiency of the joint. Use 4.6 grade bolts. (16)

(OR)

b) Design a suitable fillet weld to connect lap joint of size 200 x 10 mm with 120 x 10 mm, to transmit a pull equal to the full strength of the small plate. Use Fe 410 grade steel. Assume the welding is done at shop. (16)

13. a) A single equal angle ISA 90 x 90 x 6 mm is connected to a 10 mm thick gusset plate at the ends with 4 numbers of 20 mm diameter 4.6 grade bolts to transfer tension. Determine the design tensile strength of the angle. (16)

(OR)

b) Design a double angle tension member connected on either side of 10 mm thick gusset plate to carry an axial factored tensile load of 250 kN. Use 4Nos. of 18 mm diameter of 4.6 grade bolts for connection. (16)

14. a) Calculate the strength of a discontionuous strut of length 3.5 m. The strut consists of two equal angles of 100 x 100 x 8 mm, placed on the opposite side of a gusset plate. The strut is tack bolted and is connected to a 10 mm thick gusset plate. (16)

(OR)

b) A built-up column of effective length 4m is made of two ISMC 350 channels placed face to face, separated by a distance of 250 mm (between web ends) and carries a factored load of 800 kN. Design a suitable lacing system with connections. (16)

15. a) A beam simply supported over an effective span of 6m, carries an uniformly distributed load of 40 kN/m inclusive of its own weight. The depth of the beam is restricted to 450 mm. design the beam, assuming that the compression flange of the beam is laterally supported by a floor construction. Take fy = 250 N/mm^2 and E = $2X10^5$ N/mm^2. Assuming width of the support is 230 mm. (16)

(OR)

b) A simply supported beam ISMB 400@ 61.6 kg/m has an effective span of 5 m Find i) the design bending strength of the beam ii) the design shear strength of the beam iii) the intensity of UDL that the beam may carry under service condition iv) maximum deflection. Assume that the beam is laterally supported. The grade of steel is Fe250. (16)

Register Number:

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC402 – Analog Circuits

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State the Barkhausen criterion for an oscillator.
2. Analyze the advantages and disadvantages of Wein bridge oscillator.
3. Illustrate the applications of tuned amplifiers.
4. Compare Astable, Monostable and Bistable multivibrators.
5. Mention the importance of current mirror circuit used in Differential amplifier stages.
6. A Differential amplifier has a differential voltage gain of 2000 and common mode gain of 0.2. Determine CMRR.
7. Draw the inverting & non- inverting amplifier using operational amplifier.
8. Summarize the frequency expressions for LPF, HPF and BPF.
9. Compare the advantages and drawbacks of a dual-slop ADC.
10. Draw the functional block diagram of IC 723 regulator.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Identify the working principle of RC phase shift oscillator circuit diagram also derive the expression for frequency of oscillation and condition for sustained oscillation. (16)

(OR)

b) Estimate the frequency of oscillation and the condition for sustained oscillation of Colpitts oscillator with neat circuit diagram. (16)

12. a) Evaluate the circuit diagram and equivalent circuit of a capacitor coupled single tuned amplifier and derive the expression for the bandwidth. Sketch also the frequency response of the amplifier. (16)

(OR)

b) i) Illustrate the operation of collector coupled Astable multivibrator with neat diagrams and waveforms. (8)

ii) Device the expression for Pulse width of an Astable multivibrator. (8)

13. a) i) Draw the circuit of basic current mirror and explain its operation. (8)

ii) With a neat diagram derive the AC performance close loop characteristics of Op-amp to discuss on the circuit Bandwidth, Frequency response and slew rate. (8)

(OR)

b) State and explain about CMRR, Ad, Ac and suggest a method to improve CMRR. (16)

14. a) i) With neat sketch explain the working of Full wave Precision Rectifier in detail. (10)

ii) Sketch the Integrator circuit and explain the working principle in detail. (6)

(OR)

b) i) With neat diagram explain the operation of Schmitt trigger. (8)

ii) Design an OP-AMP based first order active low pass filter. (8)

15. a) Discuss in detail about the following Converters. (16)

i) Successive approximation ADC

ii) Weighted Resistor DAC.

(OR)

b) Briefly explain the working of linear voltage regulator using IC 723. (16)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS402 – Design and Analysis of Algorithms

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Determine the largest value n of a problem that can be solved in 1 hour assuming that the algorithm to solve the problem takes n^2 microseconds.
2. Derive the tight asymptotic bounds for $T(n) = 2T\left(\frac{n}{2}\right) + n^3$. Assume $T(n)$ is constant for $n \leq 2$.
3. How many comparisons are required to find the maximum and minimum elements in a set of elements using a single procedure?
4. Apply Job sequencing with deadlines greedy approach to solve $n = 7, (p_1, p_2, \ldots, p_7) = (3, 5, 20, 18, 1, 6, 30)$ and $(d_1, d_2, \ldots, d_7) = (1, 3, 4, 3, 2, 1, 2)$.
5. What is an optimal binary search tree?
6. Derive the optimization criteria for flow shop scheduling.
7. What is the order of magnitude of the worst-case computing time for backtracking procedure to find all hamiltonian cycles in a graph with n vertices?
8. Compute any two solutions to 4-Queen problem.
9. When do you say a graph is biconnected?
10. Define P and NP.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Consider sorting n numbers stored in array $A[1..n]$ by first finding the smallest element of A and exchanging it with the element $A[1]$. Then find the second smallest element of A and exchange it with $A[2]$. Continue in this manner for the first $n-1$ elements of A. Write pseudo code for this algorithm, which is known as selection sort. Derive the best case and worst case running time of selection sort in Θ-notation. (16)

(OR)

b) Use recursion tree to determine the asymptotic bound on the recurrence $T(n) = 4T(\lfloor n/2 \rfloor) + cn$ where C is a constant. Verify the bound using substitution method. (16)

12. a) Choose an appropriate design strategy to sort a set of n elements using quick sort. Assume the last element of the set serves as pivot element. Device an algorithm for quick sort and analyze its time complexity. (16)

(OR)

b) Device a solution to Knapsack problem using greedy approach. Explain the operation of the solution and find an optimal solution to the knapsack instance $n = 7$, $m = 15, (p_1, p_2, \ldots, p_7) = (10, 5, 15, 7, 6, 18, 3)$ and $(w_1, w_2, \ldots, w_7) = (2, 3, 5, 7, 1, 4, 1)$.What is the complexity of the algorithm? (16)

13. a) Demonstrate the use of multistage graph to allocate n resources to r projects to obtain maximum profit with an example. (16)

(OR)

b) Apply Bellman and Ford algorithm to compute the shortest path from node 1 to every other node for the graph (16)

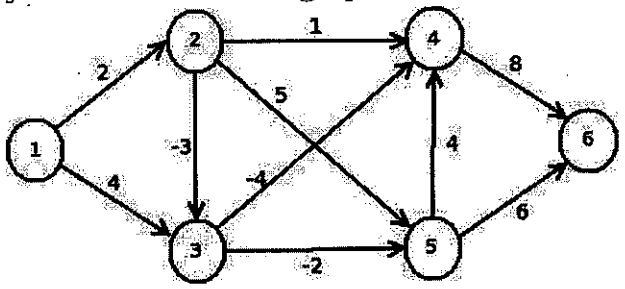

Figure.1.

Explain the procedure with a pseudo code and identify the design strategy.

14. a) Discuss the procedure to solve subset sum using backtracking approach. What is the complexity of the devised procedure? Explain its operation with an example. (16)

(OR)

b) Explain graph coloring problem with pseudo code and example in detail. Derive its complexity. (16)

15. a) Describe the least cost and FIFO solutions to 0/1 Knapsack problem using branch and bound with examples. (16)

(OR)

b) Show that the travelling salesman decision problem is NP-hard. (16)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT301 – Elements of Physical Metallurgy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare between metallic bond and covalent bond with examples.
2. Draw a (110) and a (111) plane inside a cubic unit cell.
3. What is octahedral site? Give example for it.
4. Compare the difference between slip and twinning.
5. State any two industrial applications of diffusion process.
6. What is meant by directional solidification?
7. Compare the difference between Gibb's phase rule and condensed phase rule.
8. What is eutectic reaction? Give its importance.
9. What are the important characteristics of pearlite?
10. Calculate the percentage of ferrite and pearlite in 0.45 wt % carbon steel at room temperature.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Sketch unit cell and atom position of 1) BCC, 2) FCC and 3) HCP crystals. (8)

ii) Drive relationship between lattice parameter and atomic radius for all cubic unit cells. (8)

(OR)

b) A metal has an atomic weight of 55.85 g/mol., a density of 7.89 g/cc and a lattice parameter of 2.861 Å. What is the crystal structure of the metal? Sketch the (100) plane and [100] direction for this metal and calculate its planar density and linear density. (16)

12. a) Explain in detail all types of point defects with neat sketches. (16)

(OR)

b) Discuss in detail the types of dislocations with sketches. (16)

13. a) Explain in detail the Kirkendall effect as well as mechanisms of diffusion. (16)

(OR)

b) State Fick's laws of diffusion. Briefly discuss the factors affecting diffusion. (16)

14. a) The following data to the binary system of A and B: melting points of pure A and pure B are 1050°C and 1900°C respectively. At 1250°C, the alpha solid solution (containing 50% of B), the beta solid solution (containing 80% of B) and liquid (containing 30 of B) are in the phase equilibrium. At room temperature, the maximum solubility of B in the alpha phase is 30% and the maximum solubility of A in the beta phase is 10%. Construct the phase diagram of A and B, showing the phases and invariant reaction in each area of the diagram. (16)

(OR)

b) i) Discuss about coring and its effects. (8)

ii) Describe the types of solid solution with examples. (8)

15. a) Draw the Fe-Fe_3C phase diagram and discuss its features in detail. (16)

(OR)

b) Discuss in detail the structure, properties and applications of four types of cast iron. (16)

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME301 – Manufacturing Processes

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is chaplet?
2. Compare true centrifugal casting with semi centrifugal casting.
3. Describe about 'welding decay'.
4. What is plasma?
5. List out the operations performed in lathe.
6. Explain the working principle of Electro chemical machining.
7. What are the types of plastics?
8. What is parison?
9. Distinguish hot working from cold working.
10. Write the types of rolling mill.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the function of blind riser. Why the blind risers are smaller in size than open-top-risers? (4)

ii) Explain squeeze casting and sand slinger process with neat sketch. Why machine moulded parts have better dimensional accuracy than expendable moulded parts? (12)

(OR)

b) Describe the step-by-step procedure to make investment casting. (16)

12. a) i) Explain flash butt welding and percussion welding with neat sketch. (10)

ii) Explain the types of gas welding flames and their applications. (6)

(OR)

b) Brief the working principle of Thermit welding process. list out the benefits, drawbacks and applications of thermit welding process. (16)

13. a) i) Explain the various operations performed in milling machine. (10)

ii) How the Capstan lathe differs from Turret lathe? (6)

(OR)

b) Describe the construction and working of Electric discharge machining (EDM) with neat sketch. List out its advantages, limitations and applications. (16)

14. a) i) Sketch and explain transfer moulding process. (12)

ii) Discuss about properties and limitations of plastics (4)

(OR)

b) Identify and explain the appropriate manufacturing process for making petrol tanks. (16)

15. a) Discuss about impact extrusion and hydrostatic extrusion process with a neat sketch. (16)

(OR)

b) Elaborate the various steps in powder metallurgy process. (16)

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B.E.Degree Examinations –April/May 2023

III Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGIENERING

18EE301 – Electric Circuit Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Ohm's Law. Mention the limitations of Ohm's Law.
2. Define power and power factor.
3. Three resistors R_{ab}, R_{bc} and R_{ca} are connected in delta. Write the expression for resistors R_1, R_2 and R_3 in equivalent star connection.
4. State Millman's theorem.
5. Compare the properties of series and parallel resonant circuits.
6. What is meant by tuned circuits? List some applications of tuned circuits.
7. Write the 'time constant' formulae for RL & RC circuit.
8. Develop an equivalent circuit for inductor and capacitor at $t=0^+$ when there is no initial energy.
9. Distinguish between star and delta connected system.
10. Sketch the phasor diagram of voltages derived from a 3phase source.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) FInd the Loop currents I_1, I_2 and I_3 by Mesh Current analysis as shown in Figure.1 (12)

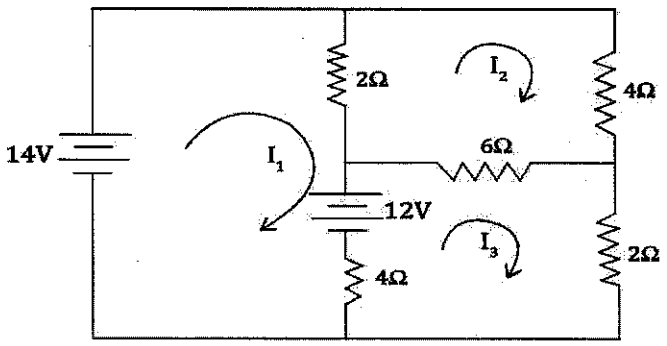

Figure.1.

ii) Distinguish between series and parallel circuits. (4)

(OR)

b) i) Obtain the mathematical expression for impedance, phase angle, power, power factor, apparent power, active and reactive power for RLC series circuit connected across the sinusoidal AC source and also draw the power triangle diagram. (12)

ii) Define form factor. Derive the expression for form factor for sinusoidal signal. (4)

12. a) i) In the circuit Shown in figure.2 six resistors are connected to form delta and a star. Formulate the effective resistance between A and B. (10)

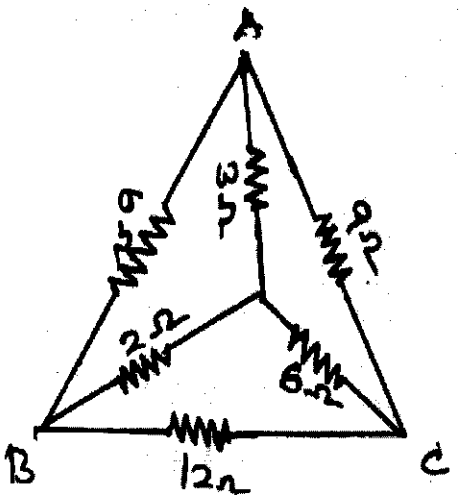

Figure.2.

ii) Justify and derive the formulae for voltage division rule. For the given circuit figure.3 apply voltage division rule and find the valuesof V_1 and V_2. (6)

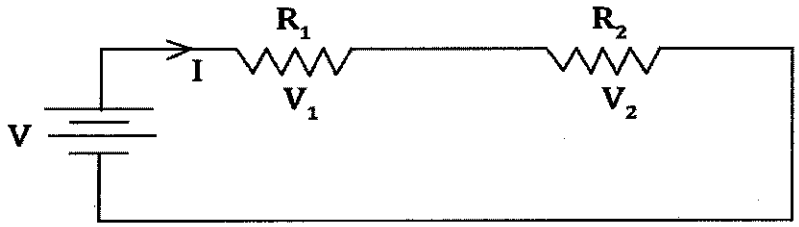

Figure.3.

(OR)

b) i) Using Thevenin's theorem, evaluate the current through R_L=10 Ohm as shown in Figure.4 and find power developed by load. (10)

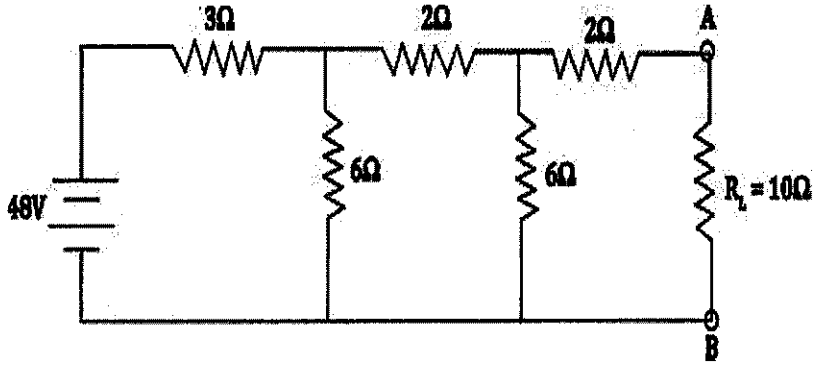

Figure.4.

ii) Find the magnitude and direction of current flow through 6 Ohm resistor by Superposition Theorem as shown in Figure.5. (6)

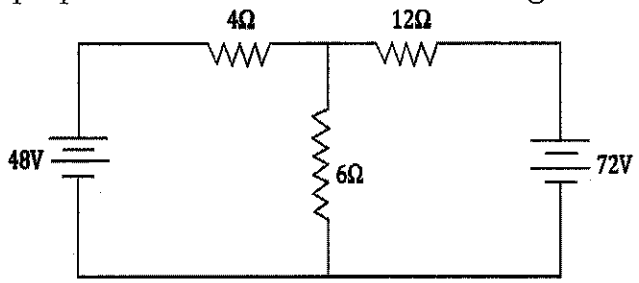

Figure.5.

13. a) i) Obtain the expression for resonant frequency and bandwidth for a series RLC resonant circuit. (10)

ii) Determine the quality factor of a coil for the values R=10Ω; L=0.1 H and C= 10μF. (6)

(OR)

b) i) Derive the expression for coefficient of coupling in terms of mutual and self-inductances of the coils. (10)

ii) Two identical coupled coils in series has an equivalent inductance of 0.08 H and 0.0354 H when connected in series aiding and series opposing. Find the values of the inductance, mutual inductance and the co-efficient of coupling. (6)

14. a) Develop the expression for transient response of RLC series circuit excited by DC voltage. (16)

(OR)

b) Analyze the expression for current transient when series RL circuit is excited by a sinusoidal source $V=V_m(\sin \omega t)$ at t=0. (16)

15. a) i) Determine the line current, power factor and total power when a 3- phase 400V supply is given to a balanced load of impedance (8+j6) Ω in each branch connected in star. (8)

ii) A symmetrical three phase three wire 440 V supply is applied to a star connected load. The impedance in each branch are 2+j3Ω, 1-j2Ω and 3+j4Ω. Find its equivalent delta connected load. (8)

(OR)

b) i) Formulate the expression for measurement of power in 3 phase circuit using one wattmeter method. (8)

ii) Two watt meters in three phase three wire system with an effective line voltage of 120 volts reads 1500 watts and 500 watts. Find the impedance of the balanced delta connected load. (8)

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B.E. Degree Examinations – April/May 2023

III Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS301 – Digital Principles and System Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Convert the gray code 101011 to binary number.
2. Construct the circuit for AND function with only NOR gates.
3. Derive the logic to detect overflow in a binary adder-subtractor.
4. Determine the configuration of binary adders needed to design a decimal adder to add 6-digit decimal numbers. Justify your answer.
5. Realize the Boolean function xy + y'z using a decoder.
6. Draw the function table and logic circuit of SR latch.
7. Design a 2-bit Johnson counter and draw its function table.
8. Design a read-only memory for storing the function $f(x) = x^2$ where x can take any one of the values, 0, 1, 2 or 3.
9. Compare an asynchronous sequential circuit with synchronous sequential circuit.
10. What is a primitive flow table? Give example.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Simplify the Boolean function
$F(A, B, C, D, E) = \Sigma m(0, 4, 8, 10, 13, 15, 16, 18, 20, 23, 24, 26) + d(2, 27)$ (16)
using K-map and express the simplified expression in Sum of Product(SOP) and Product of Sum(POS).

(OR)

b) Simplify the Boolean function (16)
$F(W, X, Y, Z) = \sum m(0, 3, 5, 6, 7, 10, 12, 13) + d(2, 8, 15)$
using Quine-Mc-cluskey method.

12. a) Design an 8-bit carry look-ahead adder and determine the time to observe the results after applying the inputs assuming uniform time-delay for all gates. (16)

(OR)

b) Design a 8-bit magnitude comparator and derive the output of all relational operators considering only magnitude of its operands. (16)

13. a) Design the circuit to implement the Boolean function F(A, B, C, D) = AB'D + A'C'D + B'CD' + AC'D using 8 x 1 MUX. Repeat the procedure to implement the same function using 4 x 1 MUX. (16)

(OR)

b) Design a sequential circuit with JK flip-flops and an input x. When x is zero, the circuit goes through the sequence 000, 010, 110, 000 and repeats. When x is one, the circuit goes through the sequence 001, 101, 111, 001 and repeats. (16)

14. a) Determine if the message 10101001111010101101 received from a sender is error free or not. Correct the error if any if possible. (16)

(OR)

b) Design a programmable array logic to implement the following functions: (16)

w(A, B, C, D) = Σ m (1, 2, 12, 13)

x(A, B, C, D) = Σ m (1, 3, 4, 5, 13, 14, 15)

y(A, B, C, D) = Σ m (0, 2, 4, 5, 6, 7, 8, 11, 13)

z(A, B, C, D) = Σ m (3, 6, 7, 9, 12, 13, 15).

15. a) What is a hazard? What are its types? Explain the procedure to eliminate hazards from the circuit with examples. (16)

(OR)

b) What is a race in asynchronous sequential logic? Give example. Explain the procedure to eliminate race condition from flow table with three rows and four rows using shared-row method. (16)

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME602 – Finite Element Analysis

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is a structural and non-structural problem?
2. What is meant by degrees of freedom?
3. Define shape function.
4. What are the properties of stiffness matrix?
5. Write a strain-displacement matrix for CST element.
6. What is meant by CST element?
7. What is mean by isoparametric element?
8. Write down the Gaussian quadrature expression for numerical integration.
9. Write down the expression for one dimensional heat conduction with free end convection.
10. Write down the shape function for two-dimensional heat transfer.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Write down general steps of the finite element analysis. (6)

ii) What are the points to be considered while analyzing the discretization process? (10)

(OR)

b) The differential equation of a physical phenomenon is given by, (16)

$$d^2y/dx^2 + 500\,x^2 = 0,\ 0 \le x \le 1$$

Trail function is , $y = a_1 (x - x^4)$

Boundary conditions are, $y(0) = 0$, $y(1) = 0$

Calculate the value of the parameter a_1 by the following methods:

1. Point collocation,
2. subdomain collocation,
3. Least squares,
4. Galerkin approach.

12. a) A thin steel plate of uniform thickness 25 mm is subjected to a point load of 420 N at mid depth as shown in figure.1. The plate is also subjected to self-weight. If Young's modulus, E = $2x10^5$ N/mm^2 and unit weight density, ρ = 0.8 x 10^{-4} N/mm^3, Calculate the following: i) Displacement at each nodal point. ii) Stresses in each element. (16)

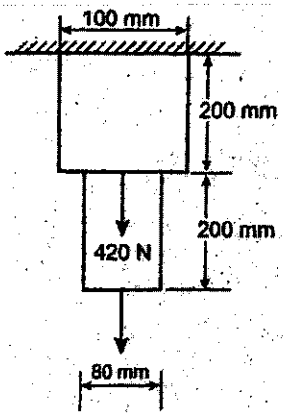

Figure.1.

(OR)

b) For the two bar truss shown in figure.2. Determine the displacements of node 1 and the stress in element 1-3. (16)

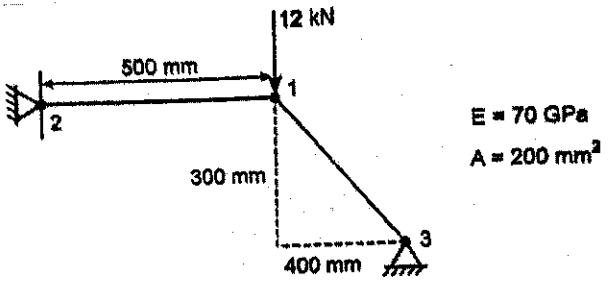

Figure.2.

13. a) Derive the shape function for 2-dimensional constant strain triangular element (CST). (16)

(OR)

b) Determine the stiffness matrix for the CST element shown in figure.3. The coordinates are given in mm. Assume plane strain conditions E = 210 Gpa, poisons ratio = 0.25 and t = 10 mm. (16)

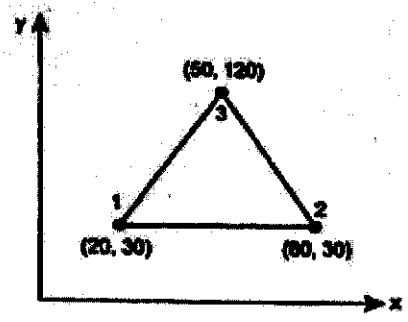

Figure.3.

14. a) Establish the strain-displacement matrix for the linear quadrilateral element as shown in figure.4 at gauss point r = 0.57735 and s = -0.57735. (16)

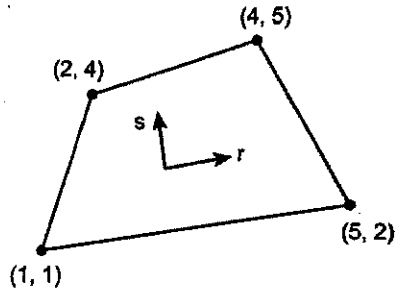

Figure.4.

(OR)

b) Evaluate the integral I = $\int_{-1}^{1}(2+x+x^2)dx$ by Gaussian quadrature and compare with exact solution. (16)

15. a) A wall of 0.6 m thickness having thermal conductivity of 1.2 W/mK. The wall is to be insulated with a material of thickness 0.06 m having an average thermal conductivity of 0.3 W/mK. The inner surface temperature is 1000 °C and outside of the insulation is exposed to atmospheric air at 30 °C with heat transfer co-efficient of 35 W/m²K. Calculate the nodal temperatures. (16)

(OR)

b) Compute the element matrix and vectors for the element shown in Figure.5. When the edges 1-2 and 2-3 experience convection heat loss. (16)

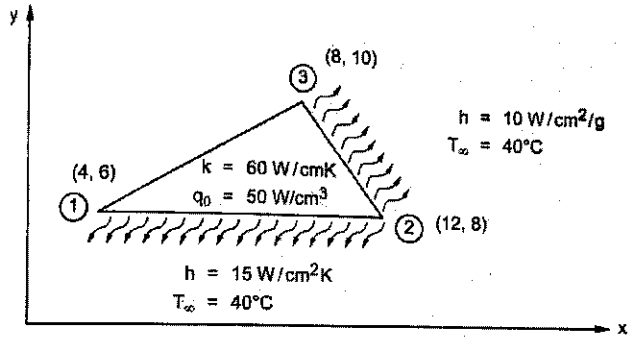

Figure.5.

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

VI & VIII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE61 – Cryogenic Engineering

(T – S chart of cryogenic fluids may be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Explain the various properties of Helium IV.
2. What is Type I and Type II superconductors?
3. Define FOM for the Refrigerator.
4. Compare Isenthalpic and Isentropic expansion.
5. What is Precooled Linde Hampson system?
6. Name any two liquefaction systems used for Neon and Helium?
7. What is vapour shielding in cryogenic vessels?
8. What are the advantages of opaurifier powder insulation technique over evacuated power insulation technique?
9. Why do you need instrumentation in cryogenic systems?
10. List out various sensors available to measure pressure in cryogenic systems?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain how the ductility and yield strength of engineering materials change with cryogenic temperature. (8)

ii) Summarize the historical development of cryogenics. (8)

(OR)

b) i) Explain superfluid fountain and rollin film effect of helium II. (8)

ii) Draw P-T diagram for He-4. Indicate Lamda point, Lamda line and critical point. (8)

12. a) i) Drive general relation for Isentropic coefficient and obtain a relation for an Ideal gas. (10)

ii) Draw layout of LN_2 plant. (6)

(OR)

b) i) With a neat sketch and T-s diagram explain the working of Simon helium liquefaction system. (6)

ii) With a neat sketch T-P diagram, explain joule thomson effect of a real gas. (10)

13. a) i) With a neat sketch and T-s diagram, explain the working of Linde Hampson liquefaction system. (8)

ii) With a neat sketch and T-s diagram, explain the working of a Claude liquefaction system. (8)

(OR)

b) i) Explain the working of ideal Stirling cycle of crycoolers and derive an expression for schmidts analysis. (8)

ii) With a suitable sketch and T-s diagram, explain the working of philips refrigerator. (8)

14. a) i) Discuss functions of the different components of a typical Dewar vessel with neat sketches. (8)

ii) Classify the different types of insulations used in cryogenic equipments. Discuss multilayer insulation technique with neat sketches. (8)

(OR)

b) i) Explain the thermal conductivity of various cryogenic insulation materials and its temperature dependence. (8)

ii) Explain the various features of cryogenic fluid transfer systems. (8)

15. a) i) Explain the working principle of cryopumping with a neat sketch. (8)

ii) Explain the working principle of Turbine flow meter with a neat sketch. (8)

(OR)

b) i) Discuss the working principle of Resistance dependence thermometer with neat sketches. (8)

ii) Discuss the following techniques used to measure liquid level in cryogenics (8)

1) Electric resistance gauge
2) Thermodynamic liquid gauge

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE402 – Transmission and Distribution

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Enumerate different voltage levels used in transmission of power in India.
2. Give the reason why transmission line are three phase three wire circuits and distribution lines are three phase four wire circuits.
3. How inductance and capacitance of a transmission line are affected by the spacing between the conductors?
4. A three phase transmission line has its conductor at the corners of an equilateral triangle with side 3m. The diameter of each conductor is 1.63cm. Find the inductance per km per phase of the line.
5. State the Significance of surge impedance loading.
6. Under what circumstances, the receiving end voltage may be higher than that of the sending end?
7. Write the properties of insulating materials.
8. Mention the factors to be considered while selecting a cable for a particular service.
9. State the various types of substation according to its service requirements.
10. Distinguish between a feeder and a distributor.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Illustrate about the structure of electric power systems with typical voltage levels in detail. (16)

(OR)

b) i) Describe the different types of HVDC links used in HVDC transmission. (8)

ii) Compare the HVDC transmission with HVAC transmission in the following aspects, if bulk power is transmitted over a long distance. (8)

i) Economics of power transmission

ii) Technical Performance.

12. a) Derive the expression for inductance of three phase symmetrical and unsymmetrical spaced transmission line. (16)

(OR)

b) i) Derive for expression for the capacitance of symmetrically spaced three phase overhead line. (8)

ii) Discuss about Skin and proximity effects. (8)

13. a) Derive the expression for efficiency and regulation of long transmission line using rigorous method. (16)

(OR)

b) A three phase, 50 Hz, 100 km line has the following constants. Resistance/ph/km = 0.153 ohm, Inductance/ph/km = 1.21 m, Capacitance/ph/km = 0.00958 μF. If the line supplies a load of 20 MW at 0.9 pf lagging at 100 KV at the receiving end calculate the sending end current, sending end power factor, regulation and transmission efficiency using nominal T method. (16)

14. a) i) Obtain the expression for string efficiency of suspension insulator string. (8)

ii) An insulator string for 66 KV lines has 4 discs. The shunt capacitance between each joint and metal work is 10% of the capacitance of each disc. Find the voltage across the different disc and string efficiency. (8)

(OR)

b) i) With neat diagram, explain about construction of HT cables. (8)

ii) Illustrate about the various methods of grading of cables with necessary diagrams. (8)

15. a) i) Summarize in detail about the different methods of neutral grounding with neat diagram. (10)

ii) Draw the circuit arrangement and explain the various elements of the single bus-bar arrangements. (6)

(OR)

b) i) Write short notes on Ring main distribution system. (8)

ii) A two wire dc ring main distributor ABCDEA is fed at point A with 230V supply. The resistances of go and return conductors of each section AB, BC, CD, DE, EA are 0.1 ohm. The main supplies the loads of 10 A at B, 20 A at C, 10 A at D, 30 A at E. Find the voltage at each load point. (8)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE402 – Mechanics of Soils

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Void Ratio.
2. Draw the phase diagram for completely dry and fully saturated soil mass.
3. Write the mode of occurrence of water in soil.
4. State the Boussinesq's formula for vertical stress distribution in soil under a point load.
5. List the condition for occurrence of Quick Sand Condition.
6. State the Darcy's Law of Permeability of soil.
7. Write any four Field compaction methods.
8. Define Compression index.
9. What are the Merits of Triaxial Compression Test?
10. What are the factors affecting shear strength of cohesive soils?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A soil sample has a porosity of 40 per cent The specific gravity of soil is 2.70, Calculate voids ratio, dry density, unit weight if the soil is 50% saturated and unit weight if the soil is completely saturated. Take unit weight of water as 9.81kN/m^3. (16)

(OR)

b) Explain the method for determination of Liquid limit and Plastic limit of soil in the laboratory (16)

12. a) The Water Table in a deposit of sand 8 m thick is at the depth of 3 m below the ground surface. Above the water table the sand is saturated with capillary water. The bulk density if sand is 19.62 kN/m^3. Calculate the effective stress at 1 m, 3 m and 8 m below the ground surface. Also plot the variation of Total Pressure, Neutral Pressure and Effective pressure over the depth of 8m.Take unit weight of water as 9.81 kN/m^3. (16)

(OR)

b) A concentrated point load of 200 kN acts at the ground surface. Find the intensity of vertical pressure at a depth of 10 m below the ground surface and situated on the axis of the loading. What will be the vertical pressure at a point at a depth of 5 m and at a radial distance of 2 m from the axis of loading? Use Boussinesq analysis. (16)

13. a) In a falling head permeameter test the initial head is 40 cm. The head drops by 5 cm in 10 minutes. Calculate the time required to run the test for the final head to be at 20 cm. If the sample is 6 cm height and 50cm^2 cross sectional area. Estimate the coefficient of permeability, take area of Stand pipe is 0.5 cm^2. (16)

(OR)

b) What is Flow net? Explain in detail about the various Properties and Applications of the Flow Net. (16)

14. a) Derive the equation for Terzaghi's theory of one dimensional consolidation with a neat sketch. (16)

(OR)

b) A clay layer of 8 m thick with single drainage settles by 120 mm in 2 years. The co-efficient of consolidation for this clay was found to be 6×10^{-3} cm^2/sec. Calculate the likely ultimate consolidation settlement and find out how long it will take to undergo 90 % of this ultimate settlement. (16)

15. a) An unconfined compression test was carried out on a sample of clay had a diameter of 38 mm and a length of 76 mm. The load at failure measured by the proving ring was 45 N and the axial deformation of the sample at failure was 15 mm. Estimate the unconfined compressive strength, undrained shear strength and undrained cohesion of the clay sample. (16)

(OR)

b) Explain the Direct shear test. Mention its advantages and disadvantages. (16)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

I Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION/MECHANICAL ENGINEERING

16PTCY101 – Environmental Science and Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the environmental impact of soil erosion.
2. Distinguish between deforestation and forest degradation.
3. What do you mean by hotspots of biodiversity?
4. Differentiate food chain from food web.
5. Write the names of any two organic pollutants and their sources.
6. When does a sound become noise?
7. Define photochemical smog.
8. Compare incineration and pyrolysis.
9. Recall the term 'sustainable development'.
10. Differentiate exponential growth from logistic growth of population.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Describe the environmental impacts of mining in detail.	(8)
		ii)	Discuss the causes and effects of deforestation briefly.	(8)
			(OR)	
	b)	i)	Analyze the impacts of using synthetic fertilizers in agriculture to the environment.	(8)
		ii)	Suggest some conservational methods to avoid soil erosion.	(8)
12.	a)	i)	Explain the structure and functions of an ecosystem.	(8)
		ii)	Discuss the any four values of biodiversity and their significances.	(8)
			(OR)	
	b)	i)	Analyze the threats to biodiversity briefly.	(8)
		ii)	Identify and explain the methods of in situ conservation of biodiversity.	(8)

13. a) i) Explain the environmental effects of air pollution. (8)

ii) Describe the sources of water pollution and their effects briefly. (8)

(OR)

b) i) Demonstrate the experimental method of determination of BOD. (8)

ii) Suggest and explain any one suitable method to treat industrial waste water briefly. (8)

14. a) i) Discuss the various processes of solid waste management briefly. (8)

ii) Describe the mechanism of ozone layer depletion. (8)

(OR)

b) i) Analyze the various methods adopted for the safe disposal of e-waste. (8)

ii) Create and explain your own ideas to manage the destructive damages of cyclones. (8)

15. a) i) Discuss the method of rain water harvesting with a neat diagram. (8)

ii) Describe the causes and health effects of AIDS briefly. (8)

(OR)

b) i) Analyze the ways of achieving sustainable development. (8)

ii) Compare the environmental and social impact of population explosion thoroughly. (8)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME402 – Mechatronics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the key elements of mechatronics system?
2. Define response time and time constant based on sensors.
3. Compare mechanical and electrical systems in mechatronics.
4. List down the applications of hydro-mechanical systems.
5. Identify the applications of stepper and servo motors.
6. Choose the contribution of AI in mechatronics.
7. Examine the criteria for the selection of a PLC.
8. Categorize the ladder diagram to represent a latch circuit.
9. Compare traditional and mechatronic system design.
10. Choose the sensors used in engine management system.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Recall in detail about the emerging areas in Mechatronics. (16)

(OR)

b) Explain the construction and working of the following sensors: (16)
   i) Potentiometer
   ii) Eddy current proximity sensor.

12. a) i) Explain the functions of a bimetallic strip with neat sketch. (8)

ii) Illustrate the functions of a thermocouple with neat sketch. (8)

(OR)

b) i) Explain the function of a LVDT with neat sketch. (8)

ii) Illustrate the Hall Effect sensor with neat sketch. (8)

13. a) Explain the construction and working principle of stepper and servo motor. (16)

(OR)

b) Construct the functions of Neural networks and fuzzy systems in mechatronics system design. (16)

14. a) Infer the architecture of a PLC and explain its elements. (16)

(OR)

b) Categorize PLC on the following : (16)
   i) Data movement
   ii) Data comparison

15. a) Analyze the roles of car engine management system? Explain with a block diagram. (16)

(OR)

b) Examine a robot to pick and place an object also explain the elements involved in that. (16)

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B.E. Degree Examinations – April/May 2023

I & II Semester (Full Time)

(2018 Regulations)

COMMON TO ALL BRANCHES

18CY101 – Chemistry

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is Huckel Rule?
2. Define Spectrochemical Series?
3. State Aufbau Principle.
4. Elaborate buffer solution? Give an example.
5. Discuss about optical activity? How is it measured?
6. Recal Markovnikov rule?
7. Summarize the Zeroth law of thermodynamics?
8. What is a single electrode potential?
9. Analyze lambert's law.
10. What are the Chromophores. Give the example.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Discuss briefly on the Molecular Orbital theory?	(8)
		ii)	Contract the MO design of N_2 molecules.	(8)
			(OR)	
	b)	i)	Write the postulates of Crystal field theory?	(8)
		ii)	How can you explain Crystal Field Stabilization Energy (CFSE) and its calculation for octahedral complexes?	(8)
12.	a)	i)	Explain effective nuclear charge & Shielding effects of different types of orbitals taking potasium as example.	(8)
		ii)	Discuss the periodic properties of Ionization energy and Electronegativity?	(8)
			(OR)	
	b)	i)	Briefly explain acid base concept given by HSAB Principle?	(8)
		ii)	Derive the Henderson-Hasselbalch Equation.	(8)

13. a) i) Differentiate between Enantiomers and diastereomers? (8)

ii) Describe the conformational isomers of butane. (8)

(OR)

b) i) Illustrate in details on aliphatic Nucleophilic substitution reaction with example. (8)

ii) Describe details on electrophilic substitution reaction in benzene with example. (8)

14. a) i) Write note on partial molar properties? (8)

ii) Describe the variation of chemical potential with temperature? (8)

(OR)

b) i) What is electrochemical series? Write its significance? (8)

ii) Derive the Nernst equation? (8)

15. a) i) Describe the principle, working and instrumentation of UV Visible spectroscopy? (8)

ii) Explain the principle, working and instrumentation of IR spectroscopy? (8)

(OR)

b) i) How can you estimate sodium by Flame photometer? (8)

ii) Write detail note on the estimation of Nickel by atomic adsorption spectroscopy. (8)

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Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC402 – Digital Signal Processing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the applications of FFT algorithms?
2. List out the properties of DFT.
3. List out the advantage of direct form-II realization when compared to direct form I realization.
4. What is the relation between digital and analog frequencies in bilinear transformation?
5. What are the necessary and sufficient conditions for the linear phase FIR filter?
6. When and under what condition a continuous time system is not physically realizable?
7. List the merits and demerits of the three types of fixed-point arithmetic.
8. Define the "dead band" of digital filter.
9. What is the advantage of TMS320C54X processor?
10. What is multirate signal processing?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Compute the 8 point DFT of the given sequence $x(n) = \{1,2,1,2,1,3,1,3\}$ using DIF - FFT algorithm. (10)

ii) Calculate the percentage saving in calculations in a 512-point radix-2 FFT, when compared to direct DFT. (6)

(OR)

b) Determine 8 point DFT using DIT – FFT algorithm (16)
x(n) = {1, 2, 3, 4, 4, 3, 2, 1}.

12. a) Design a Butterworth filter for the following specification using Impulse Invariant method (16)

$$0.8 \le |H(e^{j\omega})| \le 1 \quad 0 \le \omega \le 0.2\pi$$
$$|H(e^{j\omega})| \le 0.2 \quad 0.6\pi \le \omega \le \pi$$

(OR)

b) i) Realize the given difference equation in direct form-I and direct form – II system structure (10)

$$y[n] = -0.1y[n-1] + 0.72y[n-2] + 0.7x[n] - 0.252x[n-2]$$

ii) Convert the analog filter into digital IIR filter by means of the impulse invariant method with system transfer function (6)

$$H_a(s) = \frac{s+0.1}{(s+0.1)^2+9}.$$

13. a) Design a filter using hamming window with N=5 of a frequency response (16)

$$H_d(e^{j\omega}) = e^{-j2\omega} \quad for \quad \frac{-\pi}{4} \le |\omega| \le \frac{\pi}{4}$$

$$0 \quad for \quad \frac{\pi}{4} < |\omega| \le \pi$$

(OR)

b) Design a linear phase FIR filter of length M=11 has a symmetric unit sample response and a frequency response that satisfies the condition (16)

$$H\left(\frac{2\pi k}{11}\right) = 1 \quad k = 0,1,2$$

$$= 0.5 \quad k = 3$$

$$= 0 \quad k = 4,5$$

14. a) i) Explain the characteristics of a limit cycle oscillation with respect to the system described by the equation y(n)= 0.82y(n-1)+x(n) When the product is quantized to 4-bita by rounding. The system is excited by an input x(n) =0.875 for n=0 and x(n) =0 for n≠ 0. Also determine the dead band of the filter. (10)

ii) Explain the fraction 7/8 and -7/8 in sign magnitude, 2's complement and 1's complement. (6)

(OR)

b) i) Find the output noise power of the digital filter whose system function is $H(Z) = \frac{1}{1-0.999z^{-1}}$. (8)

ii) Compute the effect of coefficient quantization on pole location of given second order IIR system, when it is realized in direct form I and in cascade form $H(z) = \frac{1}{(1-0.95z^{-1}+0.225z^{-2})}$. (8)

Assume a word length of 3 bits through truncation.

15. a) i) Explain sampling rate reduction by an integer factor D. Determine input and output frequency spectrum relation. (10)

ii) Consider the discrete time signal x(n) = { 2, 4, 6, 8, 10, 12, 14, 16}. Determine the down sampled version of the signal for the sampling rate reduction factor. D = 2 and D = 3. (6)

(OR)

b) i) Explain the architecture of barrel shifter of TMS320C54X processor with neat block diagram. (8)

ii) Explain von Neumann and Harvard architectures with simple sketches. (8)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE43 – Automation in Manufacturing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the four functions included within the scope of manufacturing support systems?
2. Mention any four reasons why companies automate their operations.
3. What does buffer storage mean?
4. Define work-in-process.
5. What are the three functions of adaptive control?
6. Name the three types of discrete variables.
7. Infer the advantages of using servomotor over stepper motor.
8. What is meant by open loop system?
9. How is tool offset measured in the machine?
10. Distinguish between G-functions and M-functions.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain ten strategies for automation and production systems. (10)

ii) Companies undertake projects in automation and computer-integrated manufacturing for good reason. Justify the sentence. (6)

(OR)

b) i) Explain the three phases of a typical automation migration strategy in detail. (10)

ii) Differentiate programmable, fixed and flexible automation in brief. (6)

12. a) i) Explain with suitable sketches about for machining operations. (8)

ii) A 20-station transfer line is divided into two stages of 10 stations each. The ideal cycle time of each stage is Tc = 1.2 min. All of the stations in the line have the same probability of stopping, p = 0.005. The downtime is assumed constant when a breakdown occurs, Td = 8.0 min. Compute the line efficiency for the following buffer capacities: a) b = 0, b) b = ∞, c) b = 10, and d) b = 100. (8)

(OR)

b) i) A 17-station in-line transfer machine has an ideal cycle time of 1.35 min. Station break-downs occur with a probability of 0.01. Average downtime is 8.0 min per line stop. The starting work part is a casting that costs $3.20. Operating cost of the transfer line is $108/ hr, and tooling cost is $0.07 per piece per station. Determine a) ideal production rate, b) frequency of line stops, c) average actual production rate, d) line efficiency, and e) cost per completed part. (8)

ii) For the same 20-station transfer line considered in the previous examples, compare line efficiencies and production rates for the following cases, assuming an infinite buffer capacity: a) no storage buffer, b) one buffer, c) three buffers, and d) 19 buffers. Base the comparison on constant repair times. Assume in cases b) and c) that the buffers are located in the line so as to equalize the downtime frequencies, that is, all Fi are equal. (8)

13. a) i) Summarize the difference between a continuous control system and a discrete control system. (8)

ii) Explain the Supervisory Control and Data Acquisition system with a block diagram. (8)

(OR)

b) i) What are Human Machine Interfaces? Why are they becoming more important? (8)

ii) Explain the process industries and Discrete Manufacturing industries in detail. (8)

14. a) i) Describe the axis representation system used for CNC Milling and turning machines. (8)

ii) Discuss the various interpolation methods used in NC machines. (8)

(OR)

b) i) Explain the basic elements and functions of DNC system with neat sketch. (8)

ii) Discuss with neat sketch about the basic elements and constructional features of CNC machining center. (8)

15. a) i) Write a CNC part program for the part shown in figure.1. Assume suitable spindle speed and feed. Use standard ISO G and M codes (12)

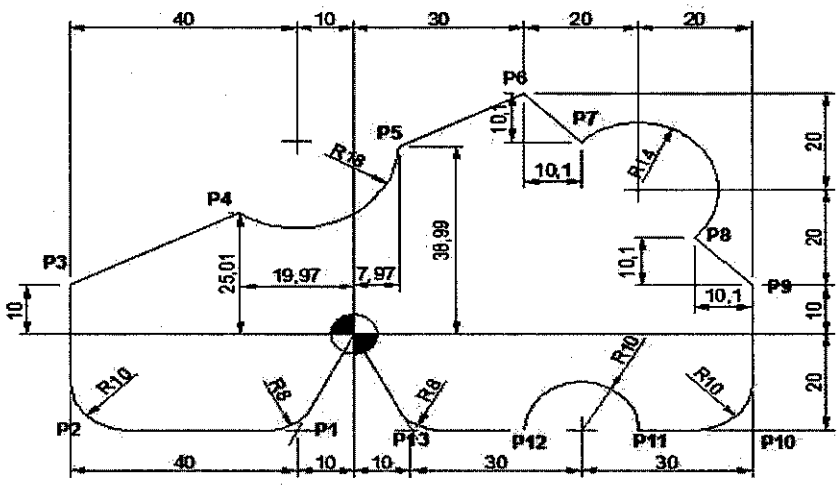

Figure.1.

ii) Explain G28, G04, G40 and G41 code in part programming. (4)

(OR)

b) i) Write a manual par program for turning a raw bar of 60 mm diameter and 52 mm long as per the drawing shown in figure.2 using canned cycles. (12)

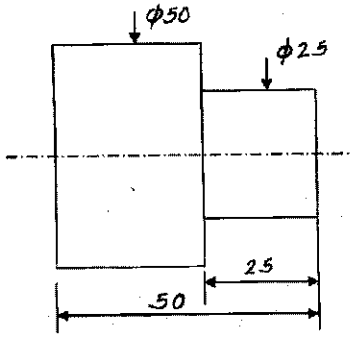

Figure.2.
All dimensions are in mm

ii) Explain the canned cycle for drilling and boring. (4)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

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CIVIL ENGINEERING

18CEPE31 – Ferrocement Technology

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define ferrocement.
2. Show any four similarities in the applications of ferrocement and reinforced concrete.
3. Simplify the multiple cracking behaviour of ferrocement.
4. Identify the advantages of ferrocement.
5. Recommend the maximum crack width for ferrocement.
6. What is the minimum volume fraction of reinforcement in ferrocement?
7. Summarize the integral mould method.
8. List down the properties of ferrocement.
9. Classify the types of storage tanks.
10. Define foot bridge.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Recall the historical background of ferrocement. (6)

ii) What are the constituent materials of ferrocement and explain briefly? (10)

(OR)

b) i) Classify the casting methods of ferrocement and explain briefly. (6)

ii) Compare the tension behaviour of ferrocement and reinforced concrete with neat sketch. (10)

12. a) Explain the behaviour of ferrocement in bending with neat sketch. (16)

(OR)

b) Explain the following properties of ferrocement: (16)

i) Impact Strength
ii) Leakage
iii) Fire resistance and
iv) Durability

13. a) List the various practical design parameters for ferrocement. (16)

(OR)

b) Identify the guidelines for good construction of ferrocement structures, allowable stresses under max service load and deflection limitation in ferrocement. (16)

14. a) Classify the various construction methods of ferrocement and explain briefly with neat sketches. (16)

(OR)

b) Write short notes on ferrocement precast walls and roofing units. (16)

15. a) Construct the method of fabrication and casting of ferrocement water retaining structures. (16)

(OR)

b) List the salient features of ferrocement counterfort retaining wall. (16)

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(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECPE707 – High Speed Networks

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Write the importance of AAL layer.
2. List out the applications of wireless LAN.
3. What are the types of queuing models?
4. Compare packet switching and circuit switching.
5. What is the need for window management?
6. What are the features of GFR traffic?
7. List the limitations of WFQ queuing discipline.
8. What are the features of differentiated services?
9. What are the goals of RSVP?
10. Define label stacking.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the features of ATM and which aspects of the ATM network architecture depend on the fixed length nature of ATM cells? What happens if ATM cells are allowed to be variable in length? (16)

(OR)

b) Discuss the main features of fast Ethernet and compare it with other types of high speed LAN. (16)

12. a) i) Describe the single server queuing models in detail. (8)

ii) Discuss about the effects of congestion in detail. (8)

(OR)

b) i) Explain about traffic management in packet switching networks. (8)

ii) List and explain the frame relay congestion control techniques. (8)

13. a) i) Discuss the various algorithms to improve the timer management mechanism of TCP. (8)

ii) Illustrate the performance of TCP over ATM. (8)

(OR)

b) i) Discuss the traffic control in ATM networks. (8)

ii) Illustrate in detail the traffic management framework. (8)

14. a) Explain with neat diagram, the significance, components, services and the architecture of Integrated services. (16)

(OR)

b) Explain the various queuing discipline and its limitations. (16)

15. a) Elucidate the characteristics, operation and protocol mechanism of RSVP. (16)

(OR)

b) Distinguish Multiprotocol label switching and RTP protocol in detail. (16)

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VI Semester (Full Time)

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ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP09 – Power Quality

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term Power Quality.
2. Write the primary types of waveform distortion.
3. Write the formula to estimate sag severity during Induction Motor starting with full voltage.
4. Identity the devices used for voltage regulation in utility electrical network.
5. What is called ferroresonance?
6. Identify the suitable software tools used for transient analysis in power system.
7. Why harmonic current flow from load to source takes place in power system network?
8. Write the IEEE standard 519-1992 for harmonic current distortion limit.
9. Mention the factors that should be considered for selecting the instrument for power quality survey.
10. What is called Distributed Generation? Mention its advantages.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Define and explain the following power quality terms (16)
    a) Transients
    b) Voltage Imbalance
    c) Voltage Sag
    d) Voltage Swell

(OR)

b) Draw the CBEMA curve and explain the significance of power quality terms involved in the curve. (16)

12. a) Elaborate how voltage sag performances are evaluated in the electric supply system. (16)

(OR)

b) What is called flicker? Discuss sources for flicker and mitigation techniques used for flicker protection. (16)

13. a) Elaborate how capacitor switching and lightning creates transient over voltages with neat diagram. (16)

(OR)

b) List out the devices used for mitigation of overvoltage problems. Explain any two devices in detail. (16)

14. a) i) Identify the major harmonic sources from commercial loads connected to distribution system. (8)

ii) What is called harmonic phase sequence and explain its impact in industrial loads. (8)

(OR)

b) i) How power system characteristics are modified due to harmonics in power system network. (8)

ii) Explain the principle of harmonic control and any one device used for harmonic reduction. (8)

15. a) i) List out the types of instruments used for power quality measurement. (6)

ii) Explain the operation of power quality instrument used for measurement of harmonics. (10)

(OR)

b) i) Explain any two power quality issues developed from Distributed Generation. (6)

ii) List out the available Distributed Generation technologies. Explain any one DG technology. (10)

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VI Semester (Full Time)

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ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP11 – Electrical Energy Conservation and Auditing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the importance of Energy conservation?
2. Specify few of the energy sector reforms.
3. Compare specific heat and latent heat.
4. How are two part and three part tariffs framed?
5. Define energy management. What is the objective of energy management?
6. Distinguish between 'preliminary energy audit' and 'detailed energy audit'.
7. Mention the benefits of power factor Improvement.
8. Specify the factors affecting motor performance.
9. What are soft starters. Also mention its advantages.
10. Define are occupancy sensors.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Elaborate the power of central Govt and State Govt to facilitate and enforce efficient use of Energy and its conservation as per Energy Conservation Act-2001. (16)

(OR)

b) The usage of energy resources in industry leads to environmental damages by polluting the atmosphere. "Justify the statement connected to Energy and Environment. (16)

12. a) i) What are the three modes of heat transfer? Explain with examples. (10)

ii) Write short notes on thermal energy contents of fuel. (6)

(OR)

b) i) Describe the Load management. (10)

ii) Describe in detail about the functions of Maximum demand controller. (6)

13.	a)	i)	Explain the methodology for detailed Energy Audit Process.	(12)
		ii)	List the steps involved in pre-audit phase.	(4)
			(OR)	
	b)	i)	Discuss the Benchmarking and Energy Performance.	(12)
		ii)	List the various energy audit instruments.	(4)
14.	a)	i)	Elaborate the power factor improvement and its benefit with a case study.	(12)
		ii)	How is the performance assessment of PF capacitors made?	(4)
			(OR)	
	b)	i)	Specify the energy saving opportunities with energy efficient motors.	(12)
		ii)	Discuss in briefly about rewinding and motor replacement issues.	(4)
15.	a)	i)	Elaborate the energy efficient technology used in motors.	(12)
		ii)	Compare the difference between maximum demand controllers and automatic power factor controllers.	(4)
			(OR)	
	b)	i)	Discuss the energy efficient technology used in transformers.	(12)
		ii)	How are electronic ballast helpful in energy saving?	(4)

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VI Semester (Full Time)

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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. Define Reciprocity theorem.
2. Calculate the maximum effective aperture of a microwave antenna which has a directivity of 900.
3. List the design considerations and the applications of an aperture antenna.
4. At 2.7 GHz, the increase in antenna temperature from Cygnus A with a 20 m dish antenna is 51k. Compute the aperture efficiency of the antenna.
5. Draw the field patterns of broad side and end fire antenna arrays.
6. Differentiate FNBW and HPBW?
7. Generalize the most commonly preferred substrate material for Microstrip antenna. Mention their features.
8. An array of four $\lambda/2$ patches with spacing 'd' connected by microstrip lines to a 50 Ω source has a total HPBW of 26° . Calculate its directivity.
9. Why antenna measurements are necessary?
10. Outline the features of an anechoic chamber and mention its uses.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Derive the radiation resistance of Loop antenna. (8)

ii) Calculate the radiation pattern of two point sources when both amplitude is same and in-phase. (8)

(OR)

b) i) Examine the performance of Balanced to Unbalanced Transformer in wave propagation (8)

ii) Compute the radiation resistance, the power radiated and efficiency of an antenna having total resistance of 50 Ω, an effective height of 60.96 m and an effective current of 50 A at 480 KHz. (8)

12. a) i) Derive an expression for input impedance of a slot antenna. (8)

ii) Distinguish horn antenna from parabolic reflector. Bring out the design details of pyramidal horn antenna. (8)

(OR)

b) i) What is reflector antenna? Explain with design procedure. (8)

ii) A rectangular aperture with a constant field distribution with a = 3 λ and b = 2 λ is mounted on infinite ground plane. Compute, E-plane, HPBW and BWFN. (8)

13. a) i) Express Dolph-Chebyshev distribution for linear array. (8)

ii) Verify that the value and utility of an antenna array determine the received or transmitted power as a function of the arrival angle. Enumerate the performance of a phased array antenna. (8)

(OR)

b) i) Compare plannar array and circular array. (8)

ii) Evaluate the performance of Analog and Digital beam forming in the construction of phased array with neat diagram. (8)

14. a) i) Interpret the input impedance of a rectangular patch antenna with appropriate expression. (8)

ii) Analyze a microstrip patch antenna operating at the frequency of 2.4 GHz for wireless application. (8)

(OR)

b) i) Why microstrip antennas are preferred for space applications? (8)

ii) Examine the radiation mechanism from microstrip antenna and also discuss about its excitation techniques. (8)

15. a) i) Explain gain and impedance measurement of an antenna. (8)

ii) Point out the construction and working of Log periodic dipole antenna with a neat diagram. Derive an expression for spacing factor. (8)

(OR)

b) i) Discuss the issues related to EMC in detail, also explain the concept of EMC measuring antenna. (8)

ii) With neat diagrams, explain how transmitter and receiver antenna factors are measured. (8)

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VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE15 – Metal Cutting & Tool Design

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate orthogonal cutting and oblique cutting.
2. What is Built-Up-Edge?
3. List the causes of chip notching failure.
4. Write the advantages of Coated tool.
5. How does rake angle affect cutting edge quality?
6. Classify the form tools.
7. What is the influence of land width margin of Drill bit on Drilling?
8. Write short notes on material selection for milling cutter.
9. Classify the Broach based on its function.
10. What is thread rolling process?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)		Analyze the Heat production in metal cutting operation, temperature distribution and the factors influencing the quantum of heat.	(16)
			(OR)	
	b)		Construct the Merchants circle for orthogonal cutting and derive the equations for various force components involved.	(16)
12.	a)	i)	Discuss the various types of Tool wear.	(10)
		ii)	Explain the procedure of Tool wear measurement using Tool makers microscope.	(6)
			(OR)	
	b)	i)	Explain about Tool Life characteristics curve.	(10)
		ii)	Determine percentage change in cutting speed required to give 50% reduction in tool life. Take n = 0.2.	(6)

13. a) i) With neat sketch explain Nomenclature of Single point cutting tool. (8)

ii) Design the single point cutting tool in the view of its strength and rigidity. (8)

(OR)

b) i) Explain the design procedure for circular form tool. (8)

ii) Briefly explain the Griding method for Flat form tool. (8)

14. a) i) With neat sketch explain the elements of twist drill. (8)

ii) Design the Drill bit in HSS of 10 mm diameter. (8)

(OR)

b) i) Explain the tool signature of plain milling cutter. (8)

ii) Explain the design procedure for Profile sharpened milling cutter. (8)

15. a) i) Explain Broach tool nomenclature with neat sketch. (8)

ii) Explain the design procedure for Broach. (8)

(OR)

b) i) Explain the design procedure for Reamer. (8)

ii) Explain the design procedure for Thread cutting taps. (8)

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VI & VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE46 – Total Quality Management

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Why quality is needed in business organizations?
2. Define quality policy statements.
3. Define Kaizen.
4. Why strategic planning is important in TQM?
5. What are the different ways of bench marking?
6. Enumerate the importance of process capability.
7. What is house of quality?
8. Define quality auditing.
9. Why organizations require quality management system?
10. Classify quality auditing.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)		Discuss the need and basic concepts of TQM.	(16)
			(OR)	
	b)		Explain in detail about Deming Philosophy.	(16)
12.	a)	i)	Enumerate the duties of quality council.	(8)
		ii)	Explain McGregor's theory X and theory Y.	(8)
			(OR)	
	b)		What is PDCA (PDSA) cycle? Illustrate PDSA cycle as an effective tool for continuous improvement with an example.	(16)
13.	a)		List out the seven new management tools. Explain them briefly.	(16)
			(OR)	
	b)	i)	Compare six sigma and TQM concepts.	(10)
		ii)	What benefits have been achieved by the organizations that have successfully completed their benchmarking programs? Name any four selected best practiced companies.	(6)

14. a) Explain the stages and types of FMEA. (16)

(OR)

b) Explain the process of TPM with Business Organization of your choice. (16)

15. a) Describe the steps involved in implementing ISO 9001 quality management system in any organizations. (16)

(OR)

b) Discuss the various elements of ISO 9001: 2008 quality system. (16)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE402 - Design of Steel Structural Elements

(IS 800-2007, IS 875 Part 1, 2, 3 and Is 1893 to be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is use of partial safety factors? How they are different from the factor of safety used in working stress method?
2. What are the advantages of HSFG bolts over Black bolts?
3. Write down the Weld symbols of fillet and butt weld.
4. Write the any two load combinations for structural steel design as per IS 800-2007.
5. What is meant by lug angle?
6. Give examples for tension members.
7. Why are four different buckling curves prescribed to evaluate column strength?
8. Why a separate provision for the design of a single angle strut has been proposed by IS: 800 code?
9. Differentiate between the bending and buckling of a beam.
10. Define web crippling.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain in detail about the Design Philosophies of Working Stress method and Limit State method. (16)

(OR)

b) i) Explain the Classification of Cross section as per IS 800-2007 based on yied and plastic moment & rotational properties. (8)

ii) Explain the 8 features of Structural Steel. (8)

12. a) Design a connection of a truss joint as shown in Figure.1, using M16 black bolts of property class 4.6 and grade 410 steel. Assume that the members' shown are capable of resisting the loads. (16)

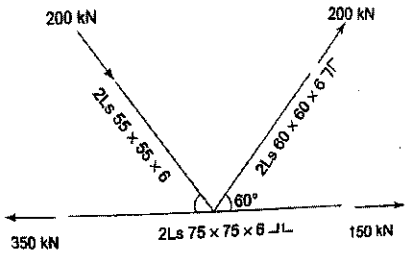

Figure.1.

(OR)

b) i) Design a butt joint to connect two plates 200 x 8 mm (Fe410 grade) using M16 bolts. Arrange the bolts to give maximum efficiency. (8)

ii) A tie member of a truss consisting of an angle section ISA 65X65X6 of Fe 410 grade is welded to an 8 mm gusset plate. Design a weld to transmit a load equal to the full strength of the member. Assume shop welding. (8)

13. a) Design a bridge diagonal subjected to factored tensile load of 310 kN. The length of the diagonal is 3.1 m. The tension member is connected to gusset plate 16 mm thick with one line of 20 mm diameter bolts of grade 8.8. (16)

(OR)

b) A tension member 1.50 m long is to resist a service dead load of 25 kN and a service live load of 75 kN. Design a rectangular bar of standard structural steel of grade Fe 415. Assume that the member is connected by one line of 16 mm diameter bolts of grade 4.6. (16)

14. a) Design a built-up column with four angles. The column is 11 m long and supports a factored axial compressive load of 750 kN. The ends of the column are held in position and restrained against rotation. Design a suitable connecting system. Use steel of grade Fe 410. (16)

(OR)

b) A discontinuous strut of 3.5 m length between the intersection consists of two angles 100 x 75 x 8 mm. The angles are placed back to back on the opposite side of a 12 mm thick gusset plate with long legs connected. Calculate the percentage change in the design compressive strength if the two angles are placed the same side of the gusset plate with short legs connected. (16)

15. a) Design a laterally unsupported beam of span 4.5 m. The beam is subjected to a factored bending moment of 600 kNm and factored shear force of 250 kN. (16)

(OR)

b) A simply supported steel joist of 4.0 m effective span is laterally supported throughout. It carries a total uniformly distributed load of 50 kN/m (inclusive of self-weight).Design an appropriate section using steel of grade Fe 410. (16)

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IV Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CS401 – Computer Networks

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Topology. Draw a hybrid topology with a star backbone and three ring networks.
2. Performance is inversely related to delay. When you use the Internet, which of the following applications are more sensitive to delay? Justify.
   a) Sending an e-mail
   b) Copying a file
   c) Surfing the Internet
3. How does a single-bit error differ from a burst error? Give example.
4. Differentiate Go-Back-N and Selective Repeat ARQ.
5. Classify the ranges of Classful Addressing. Identify 14.23.120.8 belongs to which class?
6. What is the difference between connectionless and connection-oriented services? Which type of service is provided by IPv4 and IPv6?
7. Compare the TCP and UDP header. List the fields in the TCP header that are missing from UDP header. Give the reason for their absence.
8. What is the difference between open-loop and closed-loop congestion control?
9. What is a proxy server and how is it related to HTTP?
10. Why translation is needed in presentation layer?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Examine the various ISO/OSI reference model and their functions with a neat sketch. (16)

(OR)

b) Explain in detail about guided transmission media with a neat sketch. (16)

12. a) i) Given the dataword 1010011010 and the divisor 10111.Show the generation of codeword at the sender side and check the codeword at the receiver side. (6)

ii) Consider the binary data 1001101 is to be transmitted. Implement 11-bit hamming code error detection and correction method using even parity and determine the position of data bits and redundancy bits. If the 7th bit value is changed during transmission, identify and correct the error position in decimal value at the receiver side. (10)

(OR)

b) i) Examine the operations and problems of Stop and Wait protocol in flow control with example. (6)

ii) Elucidate the types of Sliding window ARQ with example. (10)

13. a) Explain about IPv6? Compare IPv4 and IPv6. (16)

(OR)

b) Illustrate Distance Vector Routing with suitable example. (16)

14. a) Explain in detail about TCP segment and User datagram formats. (16)

(OR)

b) Examine the various techniques to improve Quality of Service. (16)

15. a) Explain the working of Domain Name System service and categorize the various kinds of domains. (16)

(OR)

b) Elucidate the architecture of WWW and categories of web documents. (16)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT402 – Phase Transformation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the driving force for nucleation during solidification?
2. Define constitutional super cooling.
3. What is interface-controlled growth?
4. Reason the minimum undercooling is required for homogeneous nucleation.
5. What is the product phase formed after eutectoid transformation in steels?
6. Define spinodal decomposition.
7. What is recovery? When is it important?
8. State the temperature range for hot working process.
9. What is massive transformation?
10. Give any two applications for shape memory alloys.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Draw and explain the cooling curves for pure metal and alloy solidification. (8)

ii) Explain the effect of cooling rate and thermal gradient on cellular and dendritic solidifications. (8)

(OR)

b) i) Explain the concept of activation energy and the applications of Arrhenius equation. (12)

ii) List different stages of phase transformations that occur during solidification of a melt. (4)

12. a) Write the significance of critical nucleus size and critical free energy during nucleation and growth of crystals. (16)

(OR)

b) Explain the significance of wettability during heterogeneous nucleation of the crystals. (16)

13. a) i) Explain the nucleation and growth during eutectoid transformation in steels. (8)

ii) Briefly write the stages in phase transformations that occur during bainitic transformations. (8)

(OR)

b) i) Explain the effect of cooling rate on interlamellar spacing of pearlite. (8)

ii) Shortly write the criteria for precipitation process during heat treatment process. (8)

14. a) Explain the Greenwood's model of particle coarsening in detail. (16)

(OR)

b) Differentiate between cold working and hot working processes. (16)

15. a) i) Explain the different kinetic modes of martensitic transformations. (8)

ii) Write short notes on the martensitic transformations that occur in shape memory alloys. (8)

(OR)

b) i) Explain the characteristic features of martensitic transformation. (8)

ii) Compare briefly the properties and applications of ferrous martensite and non-ferrous martensite. (8)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME402 – Applied Thermodynamics

(Use of Steam tables, Mollier diagram and Psychrometric chart are to be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Which is better efficient? Two stroke or four stroke engines. Why?
2. How does the choke valve help cold starting of an IC engine?
3. A Diesel engine has a compression ratio of 14 and cut-off takes place at 6% of the stroke. Find the air standard efficiency.
4. Draw the p-v diagram of Brayton cycle and state the various processes.
5. Write the condition for maximum discharge through steam nozzle.
6. What is pressure compounding in reaction turbines?
7. Indicate the methods by which work of compression can be reduced.
8. What are the effects of clearance upon the performance of an air compressor?
9. Sketch the T-s and p-h diagrams for the vapour compression cycle, when the vapour after compression is superheated.
10. Define ADP temperature of a cooling coil.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Find the engine dimensions of a two cylinder, two stroke I.C. engine from the following data: engine speed = 4000 rpm, volumetric efficiency = 0.77, mechanical efficiency = 0.75, fuel consumption = 10 lph, (specific gravity = 0.73), air-fuel ratio = 18:1, piston speed = 600 m/min, indicated mean effective pressure = 5 bar. Find also the brake power. Take R for gas mixture as 281 J/kg K at S.T.P. (16)

(OR)

b) i) Explain the working of 4-stroke cycle diesel engine with neat sketch and show the processes on p-v plot. (10)

ii) Draw theoretical and actual valve-timing diagram for the engine. Explain the reasons for the difference. (6)

12. a) Find and compare the air standard efficiencies for the Otto and Diesel cycles on the basis of equal compression ratio of 10 and equal heat rejection of 840 kJ/kg. The suction conditions are 1 bar and 328 K. (16)

(OR)

b) i) A gas turbine unit works on air standard Brayton cycle. The pressure ratio across the compression is 6. Air enters the compressor at 1 bar and 27°C. The maximum temperature of the cycle is 850°C. Calculate the power developed and cycle efficiency. Also calculate the pressure and temperature at salient points. (10)

ii) Draw and compare the actual and theoretical p-v diagrams of a four stroke petrol engine. (6)

13. a) Steam enters a group of convergent-divergent nozzles at a pressure of 22 bar and with a temperature of 240°C. The exit pressure is 4 bar and 9 % of the total heat drop is lost in friction. The mass flow rate is 10 kg/s and the flow up to the throat may be assumed frictionless. Calculate i) the throat and exit velocities and ii) the throat and exit areas. (16)

(OR)

b) A reaction turbine runs at 300 rpm and its steam consumption is 15400 kg/h. The pressure of steam at a certain pair is 1.9 bar; its dryness fraction 0.93 and power developed by the pair is 3.5 kW. The discharging blade tip angle is 20° for both fixed and moving blades and the axial velocity of flow is 0.72 of the blade velocity. Find the drum diameter and blade height. Take the tip leakage steam as 8 %, but neglect blade thickness. (16)

14. a) A single stage, double acting air compressor delivers 15 m^3 of air per minute measured at 1.013 bar and temperature 27°C and delivers at 7 bar. The conditions at the end of the suction stroke are, pressure 0.98 bar and temperature 40°C. The clearance volume is 4 % of the swept volume and the stroke/bore ratio is 1.3/1. If the compressor runs at 300 rpm, calculate (i) the volumetric efficiency ii) cylinder dimensions iii) indicated power and iv) isothermal efficiency of the compressor. Take the index of compression and expansion as 1.3 and R_{air} = 0.287 kJ/kg K. (16)

(OR)

b) i) Explain with a neat sketch, the working of a centrifugal compressor and obtain the expression for the work of compression. (10)

ii) Compare between reciprocating air compressor and rotary air compressor. (6)

15. a) A refrigeration machine using R-12 as refrigerant operates between the pressures 2.5 bar and 9 bar. The compression is isentropic and there is no undercooling in the condenser. The vapour is in dry saturated condition at the beginning of the compression. Estimate the theoretical coefficient of performance. If the actual coefficient of performance is 0.65 of theoretical value, calculate the bet cooling produced per hour. The refrigerant flow is 5 kg per minute. Properties of the refrigerant are given below: (16)

Pressure (bar)	Saturation temperature (°C)	Enthalpy (kJ/kg)		Entropy of saturated vapour (kJ/kg K)
		Liquid	Vapour	
9.0	36	456.4	585.3	4.74
2.5	-7	412.4	570.3	4.76

Take C_p for superheated vapour at 9 bar as 0.97 kJ/kgK

(OR)

b) An office is to be air-conditioned for 50 persons when the outdoor conditions are 30°C DBT and 75% RH. The required air inlet conditions are 20°C DBT and 60% RH. Air is conditioned first by cooling and dehumidifying and then by heating. If the quantity of air supplied is 0.4 m^3/min/person, find the following: (16)

i) capacity of the cooling coil in tonnes of refrigeration

ii) capacity of the heating coil in kW

iii) Amount of water vapour removed per hour and

iv) sensible heat factor of the system.

Register Number:

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

V Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE501 – Power Generation Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between 'Utilization factor' and 'Plant capacity factor'.
2. What are the two forms of expressing the overall annual cost of electrical energy generated by a power station?
3. Mention any two differences between water tube boiler and fire tube boiler.
4. List out the major thermal power stations in Tamil Nadu with their installed capacities.
5. What are the points to be taken into account while selecting the site for a hydro-electric power station?
6. Name the turbines used in high head and medium head hydro-electric power plants.
7. In atomic theory, define the terms: i) Atomic number, ii) Mass number.
8. What are the external hazards due to radiation from radioactive sources?
9. State the objectives of lubrication in diesel engines.
10. Enumerate the advantages of using liquid metal as working fluid in MHD power generation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A generating station of 12 MW capacity has the following daily loads: (12)

Time (Hours)	0-6	6–10	10-12	12-16	16-20	20-24
Load (MW)	40	50	60	50	70	40

Plot the chronological load curve and load duration curve. Determine i) Number of units generated/day, ii) Load factor, and iii) Plant capacity factor.

ii) Explain briefly any two types of Tariff. (4)

(OR)

b) i) A generating station supplies the following loads: 15 MW, 12 MW, 8.5 MW, 6 MW, and 0.45 MW. The station has a maximum demand of 22 MW. The annual load factor of the station is 48%. Calculate the
i) Annual energy generated,
ii) Diversity factor, and
ii) Demand factor. (12)

ii) Explain briefly any one method of determining the annual depreciation charges of a power plant. (4)

12. a) i) Draw the schematic diagram of a thermal power station and explain briefly the functions of i) Economizer, and ii) Feed-water heater. (10)

ii) List few merits and demerits of coal pulverization in thermal power station. (6)

(OR)

b) i) Describe the working of Babcock and Wilcox horizontal water tube boiler with a neat sketch. (10)

ii) What are the types of cooling towers used in thermal power stations? Explain briefly the function of any one type of cooling tower. (6)

13. a) i) With the help of neat schematic diagram of a hydroelectric power plant, explain the functions of its various components. (12)

ii) Write the name, location, and capacity of major hydroelectric power plants in India. (4)

(OR)

b) i) What are the various hydro-dynamic machines involved in hydroelectric plants? Explain the operation of any two hydro-dynamic machines. (12)

ii) State the demerits of hydro-electric power stations. (4)

14. a) i) With neat layout, explain the working principle of Nuclear power station. (10)

ii) Describe briefly the working of 'Fast breeder reactors'. (6)

(OR)

b) i) Explain in detail the features of Pressurized water reactor. (10)

ii) State the properties of control rods in a nuclear reactor. (6)

15. a) i) List the major components of a diesel engine. (6)

ii) Explain the basic principle behind the MHD power generation with neat diagram. (10)

(OR)

b) i) What is Centrifuging? What are the rules to be followed for the proper operation of the centrifuge in a diesel engine? (6)

ii) With a neat schematic arrangement, explain the operation of a combined MHD-steam power plant with a helium gas cooled nuclear reactor capable of producing 500 MW power. (10)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE402 – Synchronous and Induction Machines

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Armature reaction.
2. State the significance of Slip test.
3. State the Hunting phenomenon in a Synchronous motor.
4. Draw V and inverted V curves.
5. Define Slip and Slip speed.
6. State the necessity using starters in three phase induction motor.
7. Sketch the slip-torque characteristics of three phase induction motor.
8. What is the purpose of drawing Circle diagram?
9. Why is single phase induction motor not self starting?
10. List out different types of single phase induction motors.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Elaborate with neat diagram, the constructional features and operation of an Alternator. (10)

ii) Write short notes on synchronization of Alternators. (6)

(OR)

b) i) A 3 phase, star connected 1000kVA, 11000V alternator has rated current of 52.5 A. The a.c. resistance of the winding per phase is 0.45 ohms. The test results are given below. (10)

OC test : Field current :12.5 A ; voltage between lines : 422 V

SC test : Field current :12.5 A ; line current = 52.5 A

Determine the full voltage regulation of the alternator at p.f. 0.8 lagging and 0.8 p.f. leading by using emf method.

ii) Write short notes on Two reaction theory. (6)

12. a) i) Explain with a neat diagram, the principle of operation of a Synchronous motor. (10)

ii) Develop the torque equation of a Synchronous motor. (6)

(OR)

b) i) Elucidate the operation of Synchronous motor at different power factor. (10)

ii) Discuss the starting methods of Synchronous motor. (6)

13. a) i) Explain with a neat diagram, the constructional features and principle of operation of a three phase induction motor. (10)

ii) Discuss the working of DOL starter. (6)

(OR)

b) i) Explain the working of an Auto transformer starter. Mention its advantages and disadvantages. (10)

ii) Describe the principle of self excited induction generator. (6)

14. a) i) Develop the torque equation of a three phase induction motor and derive the condition for obtaining the maximum torque. (6)

ii) Summarize the steps to draw circle diagram for predicting the performance of a three phase induction motor. (10)

(OR)

b) i) Explain the no load and blocked rotor tests on an induction motor for determination of equivalent circuit parameters. (10)

ii) The useful torque of a three phase, 50 Hz, 8 pole induction motor is 190 Nm. The rotor frequency is 1.5 Hz. Calculate the net output at shaft, if mechanical losses are 700 watts. (6)

15. a) i) Explain the principle of Double filed revolving theory and operation of single phase induction motor. (8)

ii) Develop the equivalent circuit of single phase induction motor. (8)

(OR)

b) i) Explain with a neat diagram, the principle of operation of a single phase capacitor start and run motor. (8)

ii) Discuss with neat diagram, the principle of operation of shaded pole induction motor. (8)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC401 – Antenna and Wave Propagation

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define HPBW of an antenna.
2. Relate the gain and directivity of an antenna.
3. What are the advantages of antenna arrays?
4. How can we eliminate minor lobes in case of antenna array?
5. What are secondary antennas? Give examples.
6. Define pitch angle of a helical antenna.
7. Define the characteristic impedance of biconical antenna.
8. State Huygen's principle.
9. Find the critical frequency of an ionosphere layer which has an electron density of $1.5 \times 10^8 cm^{-3}$.
10. What is fading and how it is compensated?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Define and explain the following terms (16)
    i) Beam solid angle
    ii) Radiation pattern
    iii) Directivity
    iv) Polarization
    v) Radiation resistance of an antenna

(OR)

b) Derive the expression for the field quantities radiated from a $\lambda/2$ dipole and prove the radiation resistance to be 73 Ω. (16)

12. a) i) Solve the expressions for directions of pattern minima, pattern maxima, BWFN due to broad side array of two point sources. (8)

    ii) Explain the design procedure for the construction of log periodic antenna. (8)

(OR)

b) i) What is binomial array? Obtain the excitation coefficients of nine element binomial array. (8)

ii) Using pattern multiplications determine the radiation pattern for 8 element arrays separated by the distance $\lambda/2$. (8)

13. a) i) Explain the construction, radiation pattern and features of the rhombic antenna. (8)

ii) With neat diagram explain the principle of parabolic reflector antenna and various types of feed used. (8)

(OR)

b) i) Derive the expression for radiation resistance of small loop antenna. (8)

ii) Explain how a paraboloidal antenna gives a highly directional pattern. (8)

14. a) i) Write short notes on Babinet's principle and how it is applied to slot antenna? (8)

ii) In detail, develop the various methods of feeding a slot antenna. (8)

(OR)

b) i) Discuss the radiation from Huygen's source. (8)

ii) Explain the principle of rectangular horn antenna with a neat sketch. Draw various types of horn structure. (8)

15. a) i) Derive the expression for the refractive index of the ionosphere in terms of the electron number density and frequency? (8)

ii) Describe the troposphere and explain how ducts can be used for microwave propagation. (8)

(OR)

b) i) Describe the space wave propagation and explain the importance of line of sight propagation. (8)

ii) Discuss the effects of earth's magnetic field on ionosphere radio wave propagation. (8)

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B.E. Degree Examinations – April/May 2023

VI & VII Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECPE703 – Internet of Things

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare the main characteristics of M2M and IoT.
2. List the capabilities of IoT
3. What is the overall design objective of IoT architecture?
4. Define M2M value chain.
5. Compile the significance of Gateway in IoT architecture.
6. Identify the key characteristics of M2M data.
7. Summarize the various real word Design constraints in implementing the IoT solutions.
8. Give salient features of OGC functional architecture.
9. Outline the use cases of Building Automation system.
10. SOCRADES Integration Architecture (SIA) has been used in several scenarios as proof of concept for the integration among different devices. Justify this statement.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain the generic M2M System Solution with a neat diagram. (8)

ii) Describe the various emerging IoT applications that are driven by different trends and interests. (8)

(OR)

b) i) Explain the potential and benefits of an IoT oriented approach over M2M by considering a real world use case example. (8)

ii) Explain various trends in Information and communication technologies and its impact on IoT. (8)

12. a) i) Explain the five fundamental roles within I-GVC that companies and other factors are forming around in IoT industrial structure. (10)

ii) Design a solution for a particular problem by making use of applied architecture in M2M/IoT. (6)

(OR)

b) i) Explain the functional layers and capabilities of an IoT solution with a neat diagram. (10)

ii) How do you maximize the security of an IoT system? Which Layer functionality must be enhanced? (6)

13. a) i) Explain the purposes and considerations for analytics in M2M/IoT. (8)

ii) Describe the analytics architecture for M2M/IoT with a neat diagram. (8)

(OR)

b) i) Mention the various M2M/IoT device types and explain their characteristics and the deployment scenarios. (8)

ii) Briefly discuss about the key technologies that are currently in use and under development that enable ad hoc connectivity between the IoT devices. (8)

14. a) i) Illustrate ETSI M2M High Level architecture with a neat diagram. (8)

ii) Explain ETSI M2M service capabilities in detail with a neat diagram. (8)

(OR)

b) i) Illustrate ITU-IoT Reference model in detail with a neat diagram. (8)

ii) Explain device and application functional group, communication functional group, IoT service functional group and virtual entity functional group in detail with a neat diagram of IoT functional view. (8)

15. a) i) Discover the changes required for Web of Things to Cloud of Things. (4)

ii) Describe SOCRADES integration architecture (SIA) enables the coupling of industrial machines at shop floor and enterprise systems with a neat diagram. (12)

(OR)

b) i) Illustrate the components of Building Automation system. (4)

ii) Compare and Contrast the commercial building automation about today and in the future. (12)

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B.E. Degree Examinations – April/May 2023

VI & VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE31– Applied Hydraulics and Pneumatics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State Pascal's Law.
2. What is the volumetric efficiency of a pump?
3. Define hydraulic actuators.
4. Why end cushions are used in cylinders?
5. What is the function of accumulator?
6. What is the purpose of regenerative circuit?
7. Draw the symbol of FRL unit.
8. What is the purpose of a quick exhaust valve?
9. What is the function of Relay?
10. Name the common methods used for designing logic circuits.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in details about any five properties of hydraulic fluid. (10)

ii) Discuss the components requires for basic hydraulic system? Mention their functions. (6)

(OR)

b) i) Explain the working principle of external gear pump with neat sketch. (8)

ii) Explain with simple sketch, working of screw pump. (8)

12. a) Explain the working principle of (16)

i) Single acting cylinder

ii) Double acting cylinder.

(OR)

b) Explain the construction and working of pilot operated sequence valve. (16)

13. a) i) What is meant by meter-in and meter-out? (4)

ii) Draw and explain hydraulic cylinder sequencing circuit. (12)

(OR)

b) i) Differentiate between pressure control valve and pressure relief valve. (4)

ii) Draw and explain the working of Electro Hydraulic Circuit. (12)

14. a) Three pneumatic cylinders A, B, C are used in an automatic sequence operation. Cylinder A extends, Cylinder B retracts, Cylinder C retracts and then Cylinder A retracts, Cylinder C extends, Cylinder B extends. Develop pneumatic circuits by cascade method. Sketch also travel-step diagram and explain briefly. (16)

(OR)

b) Draw the PLC ladder diagram for the following logic functions: (16)

i) AND

ii) OR

iii) NOR

iv) NAND.

15. a) List out any six operating problems associated with pumps and valves and the corresponding possible causes and suitable remedy for each problem. (16)

(OR)

b) Draw and explain the hydraulic circuit in Surface grinding machine. (16)

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B.E. Degree Examinations – April/May 2023

VI & VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE32 – Professional Ethics and Human Values

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define 'spirituality'.
2. Distinguish between 'morality' and 'ethics'.
3. What is Social Responsibility?
4. Differentiate between self-respect and self-esteem.
5. What is meant by conscientiousness?
6. Distinguish between the codes of ethics and codes of conduct.
7. Compare 'safety' and 'risk'.
8. Differentiate between 'Patent' and 'Trade secret'.
9. Define the concept of 'moral leadership'.
10. Identify the reasons for an engineer to involve in weapons development.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the role in caring and sharing in society with suitable examples. (8)

ii) Analyse various actions of an engineer leading to dishonesty. (8)

(OR)

b) i) How integrity plays a major role in work ethics? Discuss with suitable examples (8)

ii) What is Courage? Explain the salient features of courage with suitable example. (8)

12. a) i) List a few models of professional roles and explain any four of them. (8)

ii) Compare the basic features of different ethical theories. (8)

(OR)

b) i) List and explain the skills required to handle moral issues in engineering ethics. (8)

ii) Distinguish between Kohlberg's and Gilligan's approach to moral (8)

judgements.

13. a) i) Discuss the problems with law in engineering practice. (8)

ii) In the case of challenger disaster, examine if the principal actors behaved as responsible experimenters. (8)

(OR)

b) i) Compare the engineering experiments with standard experiments. (8)

ii) What are the general features of morally-responsible engineers? Explain with appropriate examples. (8)

14. a) i) Compare "Fault tree analysis" and "Event tree analysis". (8)

ii) Discuss in detail about the employee rights. (8)

(OR)

b) i) Tabulate the difference between employee rights and Professional rights. (8)

ii) How are 'conflicts of interest' solved? Explain with examples. (8)

15. a) i) Explain the role of engineers as 'expert witness' and 'advisors'. (8)

ii) Discuss the ethical issues related to computer ethics. (8)

(OR)

b) i) Discuss the code of ethics in IETE, India. (8)

ii) Discuss on the pros and cons of multinational companies from the point of view of ethics. (8)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE33 – Maintenance Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by Inherent Availability?
2. What do you mean by "Opportunistic maintenance"?
3. Define "Reliability".
4. Define Maintenance Scheduling.
5. What is meant by Reliability Centered Maintenance?
6. What is Failure Analysis?
7. State the objectives of CMMS.
8. State the role of equipment records in maintenance.
9. List down the key features of Condition Monitoring.
10. What are the commonly used leak detection methods?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	State the various objectives of maintenance planning. Also explain the major areas governing the principles of maintenance.	(16)
		(OR)	
	b)	Explain the various types of industrial maintenance organization.	(16)
12.	a)	Discuss in brief the roles of various stakeholders of Maintenance scheduling communication chain.	(16)
		(OR)	
	b)	Explain the important factors considered in maintenance planning.	(16)
13.	a)	Derive an expression for finding the overall system reliability of industrial units connected in series parallel mode.	(16)
		(OR)	
	b)	Explain the various methods of failure analysis.	(16)

14. a) Explain the general structure of computerized maintenance management system considering an example of your own choice. (16)

(OR)

b) What are the methods followed to repair spindles, gear, lead screw and slide ways? Explain. (16)

15. a) What are the methods and instruments used for condition monitoring? Explain in detail. (16)

(OR)

b) What are the various methods of lubrication? Explain the importance of lubricating moving parts of industrial machineries. (16)

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B.E. Degree Examinations – April/May 2023

VI & VII Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MTE55 - Additive Manufacturing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is reverse engineering?
2. Define slicing relevant to CAD.
3. What are the applications of FDM? Give specific examples.
4. Compare solid based rapid prototyping with liquid based rapid prototyping.
5. Define laminated photo polymerization.
6. Write the materials that are used in binder jetting process.
7. Write the applications of customized implants and prosthesis.
8. Give few applications of 3D printing.
9. State any two applications of rapid protyping in automotive sector.
10. How is rapid prototyping useful in the arts and architecture?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain the process chain involved in rapid prototyping process.	(8)
		ii)	Elaborate the need of rapid prototyping in part manufacturing.	(8)
			(OR)	
	b)	i)	Differentiate between soft tooling and hard tooling and Also, compare the direct tooling with indirect tooling.	(8)
		ii)	Explain the futures of RP software and summarize about solid view, view expert, 3D view and STL view in detail.	(8)
12.	a)	i)	Explain in details the working principle of solid ground curing models with its advantages and limitations.	(8)
		ii)	Describe the principle of FDM with its advantages, limitations and applications.	(8)

(OR)

b) i) Discuss the advantages and limitations of powder based rapid prototyping system. (8)

ii) Compare the significance of liquid based with solid based rapid prototyping systems. (8)

13. a) Discuss different types of polymers used in rapid phototyping. (16)

(OR)

b) Discuss the flowing materials usage in rapid phototyping. (16)

1) Metals

2) Ceramics.

14. a) Categorize the applications of rapid prototyping in the areas of planning and simulation of complex surgery, customized implants, design and production of medical devices. (16)

(OR)

b) What is CATE? Elaborate the procedure of producing Prothsis of medical implants. (16)

15. a) i) Explain why the rapid prototyping is essentially applied in the aerospace and automotive industry. (8)

ii) Which rapid prototyping processes are the best suited for production of ceramic part. Justify. (8)

(OR)

b) i) Explain how the rapid prototyping is applied in the oil and gas industry. (8)

ii) Briefly discuss about the applications of Automobile industries relevant to additive manufacturing. (8)

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE601 – Environmental Engineering - II

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Name the various systems of sewerage.
2. What is meant by self-cleansing velocity?
3. Define population equivalent.
4. Write down the purpose of skimming tank.
5. What do you mean by recirculation ratio?
6. Define lagoons.
7. What is sludge thickening?
8. Classify system of plumbing.
9. Sketch Oxygen sag curve.
10. Define sewage farming.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) How do you estimate storm runoff? (8)

ii) What are the materials used for the construction of sewer? (8)

(OR)

b) i) Discuss the test on sewer. (8)

ii) Classify the types of pumps. (8)

12. a) i) Elucidate the characteristics of sewage and explain how to analyze it. (8)

(OR)

b) i) Illustrate the types of sedimentation tank with its merits and demerits. (8)

13. a) Elaborate activated sludge process. (16)

(OR)

b) i) Describe rotating biological contactor. (8)

ii) Explain how to dispose effluent from septictank. (8)

14. a) Demonstrate the sludge digestion process with its salient features. (16)

(OR)

b) i) Sketch general layout of house drainage. (8)

ii) Make a note on street connections. (8)

15. a) Examine the various actions involved in the self-purification process of a stream. (16)

(OR)

b) i) Explain the land disposal methods of sewage. (8)

ii) Write about deep well injection. (8)

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE601 – Microprocessor and Microcontroller

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Appraise the functions of the accumulator.
2. Compare software and hardware interrupts.
3. Classify the addressing modes of 8086 processor.
4. What is the role of BIU in 8086 processor?
5. Examine, how the microcontrollers respond to any interrupt request?
6. Identify the functions of the pins TXD, RXD in 8051 microcontroller.
7. List the use of sample and hold ICs.
8. What is the need of interfacing ICs in 8051 controller?
9. What is the need for 8259 programmable interrupt controller?
10. Give the operating modes of 8255 programmable peripheral interface.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain with timing diagrams, the Opcode fetch machine cycle of 8085 microprocessor. (12)

ii) Develop an assembly language program to do the logical AND operation using the numbers 08H and 04H with 8085 processor. (4)

(OR)

b) i) Explain the operations carried out when 8085 executes the following instructions with suitable examples (i) MOV A, M (ii) XCHG (iii) RAR (iv) DAA. (12)

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

12. a) i) Draw and explain the architecture of the 8086 processor. (12)

ii) Develop an assembly language program to multiply the numbers 03H and 04H with 8086 processor. (4)

(OR)

b) i) Describe in detail the multiprocessor mode of operation in the 8086 processor. (12)

ii) Compare the 8085 and 8086 processors in terms of arithmetic operations. (4)

13. a) i) Explain the architecture of the 8051 microcontroller. (8)

ii) Analyze the mode 0 operation of the timer in 8051 microcontroller. (8)

(OR)

b) i) Describe the interrupt structure of 8051 microcontroller. (8)

ii) List the functions of I/O ports in 8051 microcontroller. (8)

14. 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) Describe how to interface a 7-segment LED display using an 8051 microcontroller. (8)

ii) Summarize with a diagram, how to interface ADC with the 8051 microcontroller. (8)

15. a) i) Explain the architecture of 8255 PPI in detail. (8)

ii) Analyze, how the programmable timer is interfaced with the 8085 processor. (8)

(OR)

b) i) Explain the DMA data transfer scheme. (8)

ii) Describe the programmable timer interfaced with 8085. (8)

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B.E. Degree Examinations – April/May 2023

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 law.
2. Write the relation between potential and electric field.
3. State Ampere's circuital law.
4. Define magnetic flux density.
5. Write point form of Ohm's law.
6. Give the expression for inductance of a solenoid.
7. Explain the significance of displacement current.
8. Write down the Maxwell's equations in point form.
9. What is Brewster angle?
10. Write down the wave equations for E and H in a conducting medium.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the expressions for the electric field intensity and potential at a point P which is situated 'h' meter away from the disc along its axis. The disc is charged uniformly with a charge density of ρ_s c/m^2. (16)

(OR)

b) i) Derive the electric potential due to uniformly charged infinite line with uniform charge distribution. (10)

ii) State and prove Gauss Law. (6)

12. a) i) Derive the expression for magnetic field intensity due to infinitely long straight conductor carrying a current I amps along Z-axis. (12)

ii) Define torque and magnetic moment. (4)

(OR)

b) i) Derive an expression for the force on a wire carrying current I placed in a magnetic field. (12)

ii) State and explain Biot-Savart's Law. (4)

13. a) i) Deduce an expression for the capacitance of a parallel plate capacitor with two dielectrics of relative permittivity ε_1 and ε_2 respectively interposed between the plates. (10)

ii) Derive the equation for continuity of current. (6)

(OR)

b) State and prove boundary conditions for magnetic field. (16)

14. a) Derive and explain the Maxwell's equations in integral and differential forms. (16)

(OR)

b) State and prove Poynting theorem. Hence derive the instantaneous, average and complex Poynting vector. (16)

15. a) Deduce the equation for the propagation of the plane electromagnetic waves in free space. (16)

(OR)

b) Describe the linear, circular and elliptical polarization. (16)

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B.E. Degree Examinations – April/May 2023

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. List the sources of electromagnetic fields.
2. Name a few applications of Gauss's law in electrostatics.
3. Define electric potential.
4. Write the expression for the Poisson's equation for a simple medium.
5. What is Lorentz law of force?
6. Distinguish between magnetic scalar potential and magnetic vector potential.
7. Define mutual inductance and self-inductance.
8. Compare the relation between field theory and circuit theory.
9. Depict the intrinsic impedance of electromagnetic waves.
10. Determine the skin depth of copper at 60 Hz with 5.8 X 10^7 s/m. Given $\mu = 1$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Transform B = y $\hat{a}_x$ - x $\hat{a}_y$ + z $\hat{a}_z$ into Cylindrical Coordinates. (8)

ii) Transform F = 10 $\hat{a}_x$ - 8 $\hat{a}_y$ + 6 $\hat{a}_z$ into Spherical Coordinates. (8)

(OR)

b) i) State and prove divergence theorem. (8)

ii) Analyse the electric field intensity produced by a point charge distribution at P (1, 1, 1) caused by four identical 3 nc point charges located at P_1(1, 1, 0), P_2(-1, 1, 0), P_3(-1, -1, 0) and P_4(1, -1, 0). (8)

12. a) i) Two point charges -4 μC and 5 μC are located at (2, -1, 3) and (0, 4, -2) respectively. Find the potential at (1, 0, 1) assuming zero potential at infinity. (8)

ii) State and derive electric boundary condition for a dielectric to dielectric medium and a conductor to dielectric medium. (8)

(OR)

b) i) Showcase the expression for the capacitance of parallel plate capacitor having two identical media. (8)

ii) Examine the expression for energy density in electrostatic field. (8)

13. a) i) State and explain Ampere's circuit law and show that the field strength at the end of a long solenoid is one half of that at the centre. (8)

ii) Develop an expression for the magnetic field intensity due to straight finite conductor carrying current I amperes using Biot Savart's law. (8)

(OR)

b) i) Obtain an expression for magnetic flux density and magnetic field intensity at any point along the axis of a circular coil. (8)

ii) State and analyse the magnetic boundary conditions. (8)

14. a) State Faraday's law. What are the different ways of emf generation? Explain with governing equation and suitable example for each. (16)

(OR)

b) Formulate the mathematical expressions for Maxwell's equations both in integral and point forms. (16)

15. a) i) Demonstrate the expression for electromagnetic wave equation for conducting and perfect dielectric medium. (12)

ii) Find the velocity of a plane wave in a lossless medium having $\varepsilon_r = 5$ and $\mu_r = 1$. (4)

(OR)

b) i) Obtain an expression for electromagnetic wave propagation in lossy dielectrics. (12)

ii) State and prove Poynting theorem. (4)

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B.E. Degree Examinations – April/May 2023

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. What are the basic elements of an electric drive?
2. List the factors which are influencing the choice of electrical drives.
3. Write the different types of DC motor.
4. Draw the speed-torque characteristics of a three phase induction motor.
5. What is the function of starter in DC series motor?
6. What type of starter is used in slip ring induction motor and list its advantages.
7. What are the control strategies of chopper?
8. It is said that the speed of a DC motor depends on the back emf and on the flux produced. State what kind of proportionality exists between these quantities.
9. What are the speed control methods used in three phase induction motor?
10. What are the advantages of slip power recovery scheme?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the four commonly used methods for the determination of power rating of motor. (16)

(OR)

b) Derive the expression for heating and cooling of an electric motor and draw its heating and cooling curves. (16)

12. a) Draw and explain the mechanical characteristics of various types of types of loads. (16)

(OR)

b) Explain the braking methods used for Induction motors with neat diagram. (16)

13. a) With neat diagram explain the working principle of three point starter. Give its disadvantages and explain how it can be overcome using four point starter. (16)

(OR)

b) State the various starting methods used three phase squirrel case induction motors and explain any two of them in detail. (16)

14. a) With complete diagram explain the working of Ward Leonard speed control. Also mention its advantages and disadvantages. (16)

(OR)

b) Draw the power circuit for single phase controlled rectifier fed DC motor drives and explain its operation. (16)

15. a) With a schematic diagram explain the static slip power recovery scheme for three phase induction motor. (16)

(OR)

b) Explain the operation of V/f control technique for adopted speed control method of induction motors. (16)

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B.E. Degree Examinations – April/May 2023

VI & VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEPE24 – Advanced Steel Structures

(Use of IS 800, IS 801, IS 811, IS 875 Part 3 and Steel Tables are Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate stiffened and unstiffened connections.
2. Draw the neat sketch of bolted clip angle connections.
3. Write short note on tension field action in the plate girder.
4. Draw the neat sketch of different sections used as Gantry girder.
5. List the parameters affect the behavior of Beam-Columns.
6. Draw the moment magnification in column bends in double curvature.
7. Define the term pitch.
8. Why sag rods are provided in the purlin system?
9. List the advantages of cold-formed steel sections.
10. Define local buckling.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Design a seat connection for a factored beam end reaction of 125 kN. The beam section is ISMB 250 @ 365.9 N/m connected the flange of the column section ISHB 200 @ 365.9 N/m using bolted connections. Use 20 mm dia. 4.6 grade bolts. (16)

(OR)

b) Design a welded stiffened seat connection to join ISMB 350@ 514 N/m with a column section ISHB300@ 618 N/m using field weld. The beam transmits an end reaction of 250 kN due to factored loads. Use E250 grade steel. (16)

12. a) Determine the flexural design strength and shear strength of the laterally supported simply supported welded plate girder consists of flange plates 300 mm X 20 mm and a web plate 1500 mm X 10 mm with span 15 m. use Fe410 gradecsteel. (16)

(OR)

b) Calculate the moment and forces due to the vertical and horizontal loads acting on a simply supported electrically operated laterally restrained gantry girder forthe following data: (16)

Simply supported span	= 6 m
Span of crane girder	= 15 m
Minimum hook approach	=1.2 m
Crane wheels centres	= 3.0 m
Self-weight of the rail and girder	= 2.8 kN/m
Weight of crab/trolley	= 40 kN
Maximum hook load	= 250 kN
Weight of crane girder	= 180 kN
Yield stress of steel	= 250 Mpa

Calculate also the serviceability deflection.

13. a) A column ISHB 300 @ 618 N/m is subjected to a factored axial load of 600 kN and Factored major axis moment at top and bottom as 75 kNm. Check the adequacy of the column if effective length of the column as 3m about both axes. Use Fe 410 grade steel. (16)

(OR)

b) Check the adequacy of the Beam-Column ISHB 450@ 855.4 N/m for the factored loads given below. The column is part of non-sway frame with bottom end hinged. The effective length of the member is 3m about both axes. (16)

Factored axial load = 700 kN

Factored moment at top Mz = 40 kNm

Factored moment at top My = 15 kNm

14. a) Calculate the dead load, live load, wind load on FINK type truss with 12 intermediate nodes for the following data and mark the loads on the truss. (16)

Span of truss	= 15m
Pitch	= 1/5
Height at Eaves level	= 12m
Spacing of the truss	= 5m
Location	= Chennai
Terrain Category	= II
Class	= B
Life span	= 100 years
Topography	= Flat terrain
Roof covering material	= G.I sheets

(OR)

b) Write down the design steps involved in the purlin with different load combinations? (16)

15. a) Two light gauge steel lipped channels of 150 x 75 mm with bent lips of 20 mm are connected back to back at webs to act as built-up column. The thickness of the plate is 2.0 mm. Determine the load carrying capacity if the effective length of the column is 3.5 m. Take internal radius = 3.0 mm. Use yield strength of the steel as 235 MPa. (16)

(OR)

b) Two light gauge steel lipped channels of 150 x 75 mm with bent lips of 20 mm are connected back to back at webs to act as built-up beam. The thickness of the plate is 2.0 mm. Determine the allowable load per metre run if the effective span of the beam is 3.5 m. Take internal radius = 3.0 mm. Use yield strength of the steel as 235 MPa. Consider the beam is simply supported one. (16)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSPE709 – Machine Learning

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define inductive Bias in machine learning.
2. List the issues in machine learning.
3. State the significance of back propagation algorithm.
4. How neural network is efficient as compared to conventional programming models?
5. How Bayes theorem calculates posterior probability?
6. List the advantages of EM Algorithm.
7. Mention the steps involved in locally weighted linear regression.
8. What are the advantages and disadvantages of case based learning?
9. Define Horn clause. Give an example.
10. Is Q learning, a temporal difference learning algorithm. Justify your answer.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss about Candidate Elimination Algorithm in Machine Learning. (8)

ii) Consider the hypothesis space defined over the instances. Apply candidate elimination algorithm and show the specific and general boundaries of the version space after processing each example. (8)

Example	Sky	Temperature	Wind	Humidity	Play
1	Sunny	Hot	Strong	High	Yes
2	Sunny	Mild	Weak	High	Yes
3	Sunny	Mild	Strong	High	Yes
4	Rainy	Hot	Weak	Low	No
5	Sunny	Mild	Strong	High	Yes

(OR)

b) i) Construct a Decision tree for classifying the students in a class based on their academic performance as 90-100 = E Grade, 80-89= A+ Grade, 70-79 = A Grade, 60-69= B Grade, 50-59=C Grade and less than 50 =RA. (8)

ii) Compare and contrast Heuristic search technique and basic search methods. (8)

12. a) Explain Multilayer Neural Network with back propagation in detail with gradient descent optimization. (16)

(OR)

b) Explain how a hypothesis is represented in genetic algorithm. Also demonstrate how searching is carried out to select a maximally fit hypothesis. (16)

13. a) i) Apply Naïve Bayes classifier to train the given training set. How many independent parameters are required for training? Justify your answer. (10)

RID	Size	Color	Shape	Class : Good Apple
1	Small	Green	Irregular	No
2	Large	Red	Irregular	Yes
3	Large	Red	Circle	Yes
4	Large	Green	Circle	No
5	Small	Red	Circle	Yes
6	Large	Green	Irregular	No

ii) Discuss in detail about Gibbs algorithms. (6)

(OR)

b) i) Consider a medical diagnosis task. Over entire population of people, only 0.008 have Cancer. The test returns a correct positive result in only 98% of the cases in which the disease is actually present, and a correct negative result in only 97% of the cases in which the disease is not present. In other cases, the test returns the opposite result. A patient takes a lab test and the result comes back positive. Justify whether the patient have cancer or not using Bayes learning? (10)

ii) Compare finite and infinite Hypothesis Spaces. (6)

14. a) i) Apply k-Nearest neighbor algorithm tom predict the diabetic patient with given data set. Predict for the data (BMI=43.6, Age=40). (10)

BMI	Age	Sugar
33.6	50	1
26.6	30	O
23.4	40	O
43.1	67	O
35.3	23	1
35.9	67	1
36.7	45	1

ii) What will be appropriate value for k in the above example and how it is determined? Justify your selection. (6)

(OR)

b) i) Explain about Radial basis function in detail. (10)

ii) Compare and contrast Case based learning or kNN? Which is a better classifier? Justify your answers. (6)

15. a) i) Discuss about sequential covering algorithm. (6)

ii) Explain in detail about learing Rule set. (10)

(OR)

b) i) Elaborate Reinforcement Learning with suitable examples. (6)

ii) Discuss in detail about perfect Domain theories. (10)

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B.E. Degree Examinations – April/May 2023

VI Semester (Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME601 – Engineering Economics and Financial Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the ways by which the economic efficiency can be improved?
2. State the law of Demand.
3. Distinguish value analysis with value Engineering.
4. Define function and list the types of function.
5. What is revenue dominated cash flow?
6. Define rate of return method?
7. What do you meant by time value of money?
8. List the various methods of appraising project profitability.
9. Define Current ratio and mention the significant ideal current ratio for a sound business.
10. Infer the importance of book keeping?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Consider the following data of a company for the year 1998: Sales = Rs. 80,000 Fixed cost = Rs. 15,000 Variable cost = Rs.35,000. Find Contribution, Profit, BEP and Margin of safety. (8)

ii) In the design of a jet engine part, the designer has a choice of specifying either an aluminium alloy casting or a steel casting. Either material will provide equal service, but the aluminium casting will weigh 1.2 kg as compared with 1.35 kg for the steel casting. The aluminium can be cast for Rs. 80.00 per kg. and the steel one for Rs. 35.00 per kg. The cost of machining per unit is Rs. 150.00 for aluminium and Rs. 170.00 for steel. Every kilogram of excess weight is associated with a penalty of Rs. 1,300 due to increased fuel consumption. Which material should be specified and what is the economic advantage of the selection per unit? (8)

(OR)

b) i) Alpha Associates has the following details: Fixed cost = Rs. 20,00,000 Variable cost per unit = Rs. 100 Selling price per unit = Rs. 200 Find The break-even sales quantity, The break-even sales. If the actual production quantity is 60,000, find contribution; and margin of safety. (8)

ii) In the design of buildings to be constructed in Alpha State, the designer is considering the type of window frame to specify. Either steel or aluminium window frames will satisfy the design criteria. Because of the remote location of the building site and lack of building materials in Alpha State, the window frames will be purchased in Beta State and transported for a distance of 2,500 km to the site. The price of window frames of the type required is Rs. 1,000 each for steel frames and Rs. 1,500 each for aluminium frames. The weight of steel window frames is 75 kg each and that of aluminium window frame is 28 kg each. The shipping rate is Re 1 per kg per 100 km. Which design should be specified and what is the economic advantage of the selection? (8)

12. a) i) A person wishes to have a future sum of Rs. 1,00,000 for his son's education after 10 years from now. What is the single-payment that he should deposit now so that he gets the desired amount after 10 years? The bank gives 15% interest rate compounded annually. (8)

ii) A person invests a sum of Rs. 5,000 in a bank at a nominal interest rate of 12% for 10 years. The compounding is quarterly. Find the maturity amount of the deposit after 10 years. (8)

(OR)

b) i) A company has to replace a present facility after 15 years at an outlay of Rs. 5,00,000. It plans to deposit an equal amount at the end of every year for the next 15 years at an interest rate of 18% compounded annually. Find the equivalent amount that must be deposited at the end of every year for the next 15 years. (8)

ii) A person is planning for his retired life. He has 10 more years of service. He would like to deposit 20% of his salary, which is Rs.10,000, at the end of the first year and thereafter he wishes to deposit the same amount (Rs.10,000) with an annual increase of Rs. 2,000 for the next 9 years with an interest rate of 20%. Find the total amount at the end of the 10th year of the above series. (8)

13. a) i) A granite company is planning to buy a fully automated granite cutting machine. If it is purchased under down payment, the cost of the machine is Rs. 16,00,000. If it is purchased under installment basis, the company has to pay 25% of the cost at the time of purchase and the remaining amount in 10 annual equal installments of Rs. 2,00,000 each. Suggest the best alternative for the company using the present worth basis at i = 18%, compounded annually. (8)

ii) A motorcycle is sold for Rs. 50,000. The motorcycle dealer is willing to sell it on the following terms: a) Make no down payment but pay Rs.1,500 at the end of each of the first four months and Rs. 3,000 at the end of each month after that for 18 continuous months. b) Make no down payment but pay a total amount of Rs. 90,000 at the end of the 22nd month; till that time the buyer should mortgage property worth of Rs. 50,000, at present. Based on these terms and a 12% annual interest rate compounded monthly, find the best alternative for the buyer based on the future worth method of comparison. (8)

(OR)

b) i) The details of the feasibility report of a project are as shown below. Check the feasibility of the project based on present worth method, using i = 20%. Initial outlay = Rs. 50,00,000 Life of the project = 20 years. Annual equivalent revenue = Rs. 15,00,000 Modernizing cost at the end of the 10th year = Rs. 20,00,000 Salvage value at the end of project life = Rs. 5,00,000. (8)

ii) A company provides a car to its chief executive. The owner of the company is concerned about the increasing cost of petrol. The cost per litre of petrol for the first year of operation is Rs. 21. He feels that the cost of petrol will be increasing by Re.1 every year. His experience with his company car indicates that it averages 9 km per litre of petrol. The executive expects to drive an average of 20,000 km each year for the next four years. What is the annual equivalent cost of fuel over this period of time? If he is offered similar service with the same quality on rental basis at Rs. 60,000 per year, should the owner continue to provide company car for his executive or alternatively provide a rental car to his executive? Assume i = 18%. If the rental car is preferred, then the company car will find some other use within the company. (8)

14. a) i) State and explain the functions of finance. Why is wealth maximization considered as the prime objective of financial management over profit maximization? (8)

ii) The expected cash flow of a project are as follows: (8)

Years	Cash Flow (Rs.)
0	-1,00,000
1	20,000
2	30,000
3	40,000
4	50,000
5	30,000

The cost of capital is 12%. Calculate the Payback period and Discounted Payback Period

(OR)

b) i) "Economic analysis is done from Societal Point of view in contrast to simple financial analysis". How does it bring about a change in the methods of project identification? Illustrate with an example. (8)

ii) Murry's Coffee House is trying to choose between two new coffee bean roasters. The required rate of return for either machine is 10%. Shown below are the after-tax cash flows associated with each machine: (8)

Year	0	1	2	3	4
Project X	(50,000)	20,000	20,000	20,000	20,000
Project Y	(30,000)	20,000	20,000	-	-

Calculate the replacement chain NPV and profitability index for each project.

15. a) i) From the particulars given below, calculate Current and liquid ratio (10)

	Rs.		Rs.
Stock	60,000	Sundry creditors	20,000
Sundry debtors	70,000	Bills payable	15,000
Cash balances	20,000	Tax payable	18,000
Bills receivables	30,000	Outstanding expenses	7,000
Prepaid expenses	10,000	Bank overdraft	25,000
Land and building	1,00,000	debentures	75,000
Goodwill	50,000		

ii) Discuss in brief any four concepts of Accounting. (6)

(OR)

b) i) Following is the Income Statement of ABC Auto. Ltd. For the year ended 31st Dec 2020. You are required to calculate: 1) Gross Profit Ratio; 2) Operating Ratio; 3) Net Profit Ratio. (10)

Particulars	Rs.
Sales	20,00,000
Less: Cost of goods Sold	12,00,000
Gross Profit	8,00,000
Less: Operating Expenses	4,80,000
Operating Profit	3,20,000
Add: Non –operating income	48,000
	3,68,000
Less: Non –operating Expenses	16,000
Net Profit	3,52,000

ii) Describe the long-term solvency ratios? (6)

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II Semester (Full Time)

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MECHANICAL ENGINEERING/METALLURGICAL ENGINEERING

18MA201 – Differential Equations and Complex Variables

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the particular integral of $(D^2 - 4D - 12)y = \sin x \sin 2x$.
2. Solve: $(x+1)^2 \frac{d^2y}{dx^2} + (x+1)\frac{dy}{dx} + y = 0$.
3. Form the PDE from $z = (x^2 + a)(y^2 + b)$ by eliminating the arbitrary constant.
4. Find the complete solution of $\sqrt{p} + \sqrt{q} = 1$
5. Find the particular integral of $(D^2 - 2DD' + 2D'^2)z = \sin(x - y)$.
6. Solve: $(D^4 - D'^4)z = 0$
7. Show that an analytic function with constant real part is constant.
8. Find the fixed point of $w = -\frac{2z+4i}{1+iz}$
9. State the Cauchy theorem.
10. Find the residue of $\frac{z^2}{(z-1)(z+2)^2}$ at $z = -2$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve: $(D^2 - 4D + 3)y = \sin 3x + x^2$ (8)

ii) Solve the simultaneous equations: $\frac{dx}{dt} + 2x - 3y = 5t$; $\frac{dy}{dt} - 3x + 2y = 2e^{2t}$ (8)

(OR)

b) i) Solve: $(x^2D^2 + 4xD + 2)y = x^2 + \frac{1}{x^2}$ (8)

ii) Solve: $y'' + 7y' - 8y = e^{2x}$ by method of variation of parameters. (8)

12. a) i) Form the PDE by eliminating the arbitrary functions f and g in $z = xf\left(\frac{y}{x}\right) + yg(x)$. (8)

ii) Solve: $(3z - 4y)p + (4x - 2z)q = 2y - 3x$ (8)

(OR)

b) i) Solve $9\left(zp^2+q^2\right)=4$. (8)

ii) Find the general solution of $(x^2-yz)p+(y^2-zx)q=(z^2-xy)$. (8)

13. a) i) Solve: $\left(D^2-DD'-6D'^2\right)z=x^2y+e^{3x+y}$ (8)

ii) Solve the equation $2x\frac{\partial z}{\partial x}-3y\frac{\partial z}{\partial y}=0$, by the method of separation of variables. (8)

(OR)

b) Use the method of separation of variables to solve the equation $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$ given that $u(x,0)=6e^{-3x}$ (16)

14. a) i) Find the analytic function $f(z)=u+iv$ given that $v=e^{2x}(xcos2y-ysin2y)$ (8)

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

(OR)

b) i) Prove that the real and imaginary parts of an analytic function w = u + i v satisfy the Laplace equation in two dimensions. (8)

ii) Show that the transformation $w=\frac{z-1}{z+1}$ maps the unit circle in the w-plane onto the imaginary axis in the z-plane. Find also the images of the interior and exterior of the unit circle. (8)

15. a) i) Using Cauchy's integral formula , evaluate $\int_C \frac{(z+1)}{z^2+2z+4}dz$. Where $C:|Z+1+i|=2$ (8)

ii) Expand $f(z)=\frac{1}{z(1-z)}$ in a Laurent's series if $1<|z+1|<2$ (8)

(OR)

b) Show that $\int_{-\infty}^{\infty}\frac{x^2}{(x^2+1)^2(x^2+2x+2)}dx=7\pi/50$ (16)

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18MA202 – Differential Equations and Linear Algebra

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Solve $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 0$.
2. Reduce the equation $[(3x+2)^2D^2 + 3(3x+2)D - 36]y = 3x^2 + 4x + 1$ into differential equation with constant coefficient.
3. Find the complete integral of $p - y^2 = q + x^2$.
4. Find the general solution of $yzp + zxq = xy$.
5. Find the particular integral of $\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial x \partial y} + 4\frac{\partial^2 z}{\partial y^2} = e^{2x+y}$.
6. Solve $(D^2 - DD' + D)z = 0$.
7. Find the rank of the matrix $A = \begin{pmatrix} 0 & -1 & 5 \\ 2 & 4 & -6 \\ 1 & 1 & 5 \end{pmatrix}$.
8. For solving a linear system, compare Gaussian elimination method and Gauss – Jordan method.
9. Define null space of a linear transformation.
10. Show that $S = \{(1,2,4), (1,0,0), (0,1,0), (0,0,1)\}$ is a linear dependent subset of vector space $V_3(R)$ where R is the field of real numbers.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve $(D^2 - 5D + 6)y = (1+x)e^{-2x}$. (8)

ii) Solve $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = logx\ sin(logx)$. (8)

(OR)

b) i) Solve $y'' - 2y' + 2y = e^x tanx$ by the method of variation of parameters. (8)

ii) Solve the simultaneous differential equation $\frac{dx}{dt} - 2y = cos3t$, $\frac{dy}{dt} + 2x = sin3t$ given that $x = 1/5$ and $y = 0$ at $t = 0$. (8)

12. a) i) Form the partial differential equation of eliminating f form $z = xy + f(x^2 + y^2 + z^2)$. (8)

ii) Find the singular solution of $z = px + qy - 2\sqrt{pq}$. (8)

(OR)

b) i) Solve $p^2 + x^2y^2q^2 = x^2z^2$. (8)

ii) Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$. (8)

13. a) i) Solve $(D^2 - 2DD')z = e^{2x} + x^3y$. (8)

ii) Solve $\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y}$, given $u(0, y) = 8e^{-3y} + 4^{-5y}$. (8)

(OR)

b) Find the all possible solutions of one dimensional diffusion equation, using separation of variable method. (16)

14. a) i) Solve the following system of equations by using Cramer's rule $x + 4y + 3z = 2$, $2x - 6y + 6z = -3$, $5x - 2y + 3z = -5$. (8)

ii) Solve the following system of equation by Gauss elimination method $2x + y + z = 10$; $3x + 2y + 3z = 18$; $x + 4y + 9z = 16$. (8)

(OR)

b) i) Find the inverse of the matrix $A = \begin{pmatrix} 2 & 2 & 3 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{pmatrix}$ using Gauss-Jordon method. (8)

ii) Find the real positive root of $3x - \cos x - 1 = 0$ by Newton's method correct to 6 decimal places. (8)

15. a) Let U and V be vector spaces over the field F and T be a linear transformation from U into V. Suppose that U is finite dimensional, then show that $rank(T) + nullity(T) = \dim(U)$. (16)

(OR)

b) i) Prove that (1,1,1), (0,1,1) and $(0, 1, -1)$ generate $R^3(R)$. (8)

ii) Suppose V is the vector space of all 2×2 matrices over R. Let $T: V \to V$ be a linear map such that $TX = AX$, where $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$. Find the matrix of T with respect to the ordered basis $B = \{\alpha_1, \alpha_2, \alpha_3, \alpha_4\}$ for V. (8)

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II Semester (Full Time)

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ELECTRONICS AND COMMUNICATION ENGINEERING

18MA203 – Differential Equations and Laplace Transform

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the Wronskian of $f_1(x) = e^x$ and $f_2(x) = e^{2x}$.
2. Convert the differential equation $\frac{d^2y}{dx^2} + \frac{1}{x}\frac{dy}{dx} = \frac{12logx}{x^2}$ into ordinary differential equation with constant coefficient.
3. Form the partial differential equation by eliminating the arbitrary constants a and b from $z = (x^2 + a^2)(y^2 + b^2)$.
4. Solve $\sqrt{p} + \sqrt{q} = x$.
5. Solve $(D^2 - D'^2 - 3D + 3D')z = 0$.
6. Use separation of variable method, Solve $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 0$.
7. Estimate $L[tcost]$
8. State the Initial value theorem of Laplace Transform.
9. Find the iterative formula to find the reciprocal of a given number N by Newton's method.
10. Write down the condition for the convergence of Gauss-Seidel iteration method.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve $\frac{d^2x}{dt^2} + 4x = t^2 sint$. (8)

ii) Solve $[(2x + 3)^2D^2 - 2(2x + 3)D - 12]y = 6x$. (8)

(OR)

b) i) Solve $y'' + y' = \sec^2 x$ by the method of variation of parameters. (8)

ii) Solve the simultaneous differential equation $Dy + 2x = sin2t$, $Dx - 2y = cos2t$ given that $x = 1$ and $y = 0$ at $t = 0$. (8)

12. a) i) Solve $z = px + qy + \sqrt{1 - p^2 - q^2}$. (8)

ii) Find the general solution of $(y - xz)p + (yz - x)q = x^2 - y^2$. (8)

(OR)

b) i) Form the partial differential equation of eliminating the functions f and g form $z = f(y) + g(x + y + z)$. (8)

ii) Solve $z^2(p^2x^2 + q^2) = 1$. (8)

13. a) i) Solve $(D^3 - 7DD'^2 - 6D'^3)z = \cos(x + 2y) + 4$. (8)

ii) Find the solution of Laplace's equation $r^2\frac{\partial^2 u}{\partial r^2} + r\frac{\partial u}{\partial r} + \frac{\partial^2 u}{\partial \theta^2} = 0$. (8)

(OR)

b) Use separation of variable method to find the solution of the equation $\frac{\partial^2 u}{\partial t^2} = c^2\frac{\partial^2 u}{\partial x^2}$. (16)

14. a) i) Find the Laplace transform of a square wave defined by the function $f(t) = \begin{cases} E & \text{for } 0 < t < a/2 \\ -E & \text{for } a/2 < t < a \end{cases}$ and $f(t + a) = f(t)$. (8)

ii) Using Convolution theorem, find the inverse Laplace transform of $L^{-1}\left[\frac{1}{s^2(s^2+1)}\right]$. (8)

(OR)

b) i) Find $L\{e^{-2t}\, t \sin 3t\}$. (8)

ii) Using Laplace transform evaluate the differential equation $y'' + y = \sin t, y(0) = 1, y'(0) = 0$. (8)

15. a) i) Solve the equation $x^3 + x^2 - 1 = 0$ for the positive root by iterative method. (8)

ii) Solve, by Gauss Seidel method, the following system of equations correct to three decimal places : (8)

$$x + y + 54z = 110$$
$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$

(OR)

b) i) Solve the system of equations by Gauss elimination method (8)
$x + 2y + z = 3$; $2x + 3y + 3z = 10$ and $3x - y + 2z = 13$.

ii) Find the inverse of the matrix $A = \begin{pmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & 2 & 1 \end{pmatrix}$ by Gauss Jordan method. (8)

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B.E. Degree Examinations – April/May 2023

II Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18MA205 – Differential Equations and Transforms

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Find the particular integral of $(D^2 + 1)y = xe^x$.
2. Reduce $(1+x)^2\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin[\log(1+x)]$ into a differential equation with constant coefficients.
3. Form the partial differential equation from $z = (x^2 + a)(y^2 + b)$.
4. Find the complete solution of $p^2 + q^2 = 4$.
5. Solve $\left(D^2 - D'^2 - 3D + 3D'\right)z = 0$.
6. Write down the various solutions of one dimensional wave equation.
7. Find the Laplace transform of $\frac{t}{e^t}$.
8. Find f(t) if $L[f(t)] = \frac{1}{(s+1)^{3/2}}$.
9. State Fourier integral theorem.
10. Prove that $F_c[f(x)\cos ax] = \frac{1}{2}[F_c(s+a) + F_c(s-a)]$

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Solve $(D^2 + 4)y = x\sin x$. (8)

ii) Solve $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log\sqrt{x}$. (8)

(OR)

b) i) Solve $(D^2 + 1)y = \sec x$ by the method of variation of parameters. (8)

ii) Solve the simultaneous equations $Dx + 2y = 5e^t$ and $Dy - 2x = 5e^t$. (8)

12. a) i) Form the partial differential equation by eliminating arbitrary functions f and g from $z = f(y) + g(x + y + z)$. (8)

ii) Solve $z = px + qy + \sqrt{1 + p^2 + q^2}$. (8)

(OR)

b) i) Solve $z^2 = 1 + p^2 + q^2$. (8)

ii) Solve $x(z^2 - y^2)p + y(x^2 - z^2)q = z(y^2 - x^2)$. (8)

13. a) i) Solve $(D^3 + D^2D' - DD'^2 - D'^3)z = e^{2x+y} + \cos(x + y)$. (8)

ii) Solve by using method of separation of variables $2x\frac{\partial z}{\partial x} - 3y\frac{\partial z}{\partial y} = 0$. (8)

(OR)

b) Find the all possible solutions of one dimensional diffusion equation. (16)

14. a) i) Find the Laplace transform of the periodic function (8)

$f(t) = \begin{cases} E, & 0 \le t < \frac{1}{E} \\ 0, & \frac{1}{E} \le t \le \frac{2\pi}{n} \end{cases}$, given that $f\left(t + \frac{2\pi}{n}\right) = f(t)$.

ii) Using convolution theorem to find $L^{-1}\left[\frac{10}{(S+1)(S^2+4)}\right]$. (8)

(OR)

b) i) Find the Laplace transform of the function $f(t) = e^{-t}\sin 3t\cos t$. (8)

ii) Solve $\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y = 2$ given $\frac{dy}{dt} = 0$ and $y = 0$ at $t = 0$ using Laplace transform. (8)

15. a) Find the Fourier transform of the function$(x) = \begin{cases} a^2 - x^2, & |x| < a \\ 0, & |x| > a > 0 \end{cases}$ (16)

Hence deduce that $(i) \int_0^\infty \frac{sint - tcost}{t^3} dt = \frac{\pi}{4}$ and$(ii) = \int_0^\infty \left(\frac{sint - tcost}{t^3}\right)^2 dt = \frac{\pi}{15}$.

(OR)

b) i) Find Fourier cosine transform of $f(x) = e^{-a^2x^2}$. (8)

ii) Using Fourier transform, evaluate $\int_0^\infty \frac{x^2}{((x^2+a^2)^2} dx$. (8)

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B.E. Degree Examinations – April/May 2023

VII Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18EC701 – Optical and Microwave Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List few microwave components.
2. The impedance matrix of a microwave circuit is given as$[Z] = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$. Determine its scattering matrix.
3. List out the microwave frequency bands in Electromagnetic spectrum.
4. What are the advantages of parametric devices?
5. Compare TWTA and Klystron amplifier.
6. Define the quality factor of a resonator.
7. Express Snells law.
8. Compare intermodal delay and intramodal dispersion.
9. Find the responsivity of p-i-n photo diode if the quantum efficiency is around 90 percent and operating wavelength is 1300 nm
10. Define receiver sensitivity.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Write short notes on (16)
    i) Magic Tee
    ii) Hybrid Rings

(OR)

    b) Expound the following (16)
    i) Two hole directional coupler
    ii) Hybrid Coupler

12. a) Discuss about the various Gunn oscillation modes in detail. (16)

(OR)

    b) Derive the expressions for power output and efficiency of TRAPATT diode. Mention its applications and performance characteristics. (16)

13. a) With the help of Applegate diagram, explain the operation of a reflex klystron; show that the theoretical efficiency of reflex klystron is 27.78%. (16)

(OR)

b) What is need of Helix in TWT? Describe the Amplification process for TWT. (16)

14. a) Explain the various design techniques for tailoring the dispersion optimization of single mode fibers. (16)

(OR)

b) Illustrate the material and waveguide dispersion mechanisms with necessary mathematical expressions. (16)

15. a) The minority carrier recombination life time for an LED is 5 ns. When a constant d.c current is applied to the device the optical power is 300 μW. Calculate the optical output power when the device is modulated with an rms drive current corresponding to the d.c drive current at frequencies of a) 20 MHz b) 100MHz. Further determine the 3 dB optical bandwidth for the device and estimate the 3 dB electrical bandwidth assuming gaussian response. (16)

(OR)

b) A double heterostructure laser diode operating at 0.87 μm has an active layer thickness of 0.2 μm. The refractive index of active region is 3.59 and that the confining region is 3.25. Estimate the optical confining factor. (16)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CE401 – Strength of Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. State moment area theorems.
2. State Castigliano's Second Theorem.
3. Find the reaction at prop in a propped cantilever of span 2 m carrying a UDL of 6 kN/m over the entire span.
4. State the theorem of three moments.
5. Define core of a section.
6. State the limitations of Euler's formula.
7. State the parallel axis and principal moment of inertia.
8. What is Unsymmetrical bending?
9. State Lame's theorem.
10. State Maximum Strain Energy Theory.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A beam of uniform section, 12 metres long, is simply supported at the ends. It carries point loads of 120 kN and 80 kN at distances of 4 m and 7 m respectively from the left end. Calculate: (16)
    1) the deflection under each load;
    2) the maximum deflection

(OR)

b) A beam simply supported over a span of 3.5 m carries a UDL of 25 kN/m over the entire span. Taking EI=2.5 MNm^2 and using Castigliano's theorem, determine the deflection at the center of the beam. (16)

12. a) A continuous beam ABCD is simply supported at A,B,C and D, AB=BC=CD=5 m. Span AB carries a load of 30 kN at 2.5 m from A. Span BC carries an UDL of 20 kN/m. Span CD carries a load of 40 kN at 2 m from C. Draw the shear force and bending moment diagrams. (16)

(OR)

b) A fixed beam of 8 m length is loaded with equal point loads of 130 kN each at distance 2 m from each support. Draw the bending moment and shear force diagram where $E=2 \times 10^5$ N/mm^2, $I= 16 \times 10^8$ mm^4. (16)

13. a) Derive an expression for Euler's crippling load when one end of column is fixed and other end is hinged. (16)

(OR)

b) Find the Euler crushing load for a hollow cylindrical cast iron column, 15 cm external diameter and 2 cm thick, if it is 6 m long and hinged at both ends, E=80 GN/m^2. Compare this load with the crushing load given by Rankine's formula, using σ_c=567 MN/m^2 and α=1/1600. For what length of strut of this cross-section does the Euler formula cease to apply? (16)

14. a) Find shear centre of a channel section 300mm x 150mm with thickness of 20mm from first principles. (16)

(OR)

b) Figure 1 shows an unequal angle of dimensions 100 mm x 60 mm and 10 mm thick. Determine: (16)

i) position of the principal axis and

ii) magnitude of the principal moments of inertia for the given angle.

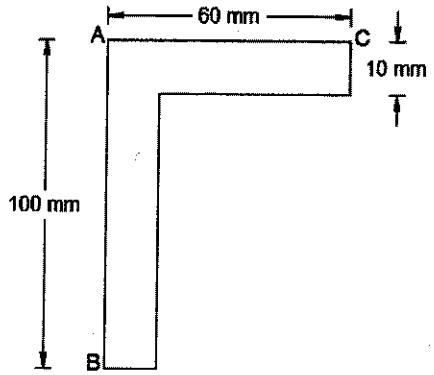

Figure 1

15. a) A thick cylinder of internal diameter 10 cm, external diameter 20 cm, is subjected to an internal pressure of 100 kg/cm^2. Draw diagrams showing the distribution of radial pressure and hoop stress in the wall of the cylinder. (16)

(OR)

b) In a steel member at a point the major principal stress is 250 N/mm^2, and the minor principal stress is compressive. If the tensile yield point is 300 N/mm^2, find the value of the minor principal stress at which yielding will commence, according to each of the following criteria of failure: (16)

i) Maximum shearing stress.

ii) Maximum total strain energy.

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B.E. Degree Examinations – April/May 2023

VII Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEPE29 – Dynamics and Earthquake Resistant Design of Structures

(IS 1893, IS 13920 and IS 4326 codes to be Permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is mean by Degrees of freedom?
2. Define damping.
3. What is meant by first and second mode of vibration?
4. Define coupled and uncoupled equations of motion?
5. Compare: Magnitude and Intensity of an earthquake.
6. What is an accelerogram?
7. What is peak ground acceleration (PGA)?
8. List out the effects of liquefaction.
9. Write the IS 13920 provisions for flexural members.
10. Why is base isolation effective?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Derive the equation of motion for SDOF system damped free vibration. (16)

(OR)

b) A mass 'm' is suspended from a beam shown in figure.1. The beam is of negligible mass and has a uniform flexural rigidity 'EI'. Find the natural frequency of the system. (16)

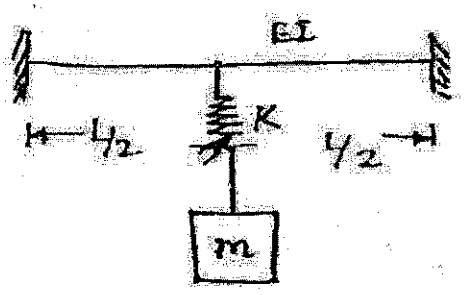

Figure.1.

12. a) Determine the natural frequency and mode shapes of a MDOF system. The mass and the stiffness matrix of a MDOF system is given by (16)

$$[M]=m\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 2\end{bmatrix},\ [K]=K\begin{bmatrix}2 & -1 & 0\\ -1 & 3 & -2\\ 0 & -2 & 2\end{bmatrix}.$$

(OR)

b) Determine the natural frequency and mode of vibration of the system (16)

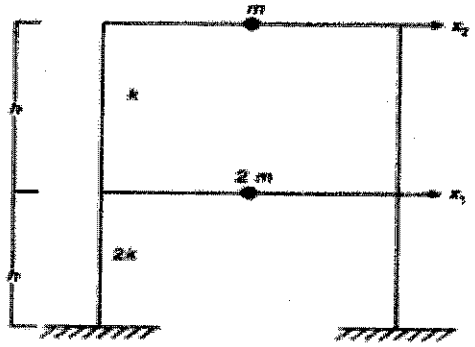

Figure.2.

13. a) Explain the seismic waves with neat sketch. (16)

(OR)

b) Explain the types of earthquakes? (16)

14. a) Explain the factors affecting ductility. (16)

(OR)

b) Define response spectra. Explain the concept and types of response spectra with neat sketch. (16)

15. a) What are the methods used to analyse earthquake resistant structures? Explain the procedure of each method as per IS-1893:2002. (16)

(OR)

b) Write the design procedure for seismic analysis of RC building. (16)

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B.E. Degree Examinations – April/May 2023

IV Semester (Part Time)

(2016 Regulations)

CIVIL ENGINEERING

16PTCE401 – Environmental Engineering - I

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. How do you determine Per Capita Water Demand?
2. State the Objectives of Water Supply system.
3. What are the types of Intake?
4. Write short notes on in filtration galleries.
5. Draw any two line diagrams of Joints in Pipelines.
6. What are the advantages of Centrifugal Pumps?
7. What is Schmutzdecke or Dirty layer?
8. What are the methods of Defluoridation?
9. State the functions of Distribution Reservoir.
10. What is the use of Hardy Cross method?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What are the factors affecting Per capita demand of water? Explain. (8)

ii) Write short notes on BIS for Drinking Water Quality. (8)

(OR)

b) i) Explain the incremental method by which population of a locality in the future is estimated. Also state the advantages over Arithmetic and Geometric Progression methods. (8)

ii) The population of a town is tabulated as follows (8)

Year	Population
1930	8000
1940	12000
1950	17000
1960	22500
1970	29000
1980	37500
1990	47000
2000	57000
2010	66500
2020	75000

Determine the population of the town in 2030 using Arithmetic Increase method and Geometric Progression method.

12. a) i) What are the various sources of water? Discuss their merits and demerits. (8)

ii) Explain briefly about Reservoir Intake with a neat sketch. (8)

(OR)

b) i) What are the important considerations governing the selection of site of an Intake? Explain. (8)

ii) How do you estimate Yield of a Well? Explain. (8)

13. a) i) What are the various types of pipes available for use in Water supply System? (8)

ii) What are the factors to be considered in the selection of pipe material for water transmission? Explain. (8)

(OR)

b) i) What are the various Pipes appurtenances used in Transmission of water? Explain. (8)

ii) What are the various types of Pumps employed for pumping water? Explain. (8)

14. a) i) What are the various types of Sedimentation tanks? Explain any one with neat sketch. (8)

ii) What are the causes of Corrosion of Pipes? How do you prevent it? Explain. (8)

(OR)

b) i) Explain briefly the essential features, arrangements, merits and demerits of Rapid sand Gravity filter. (8)

ii) Write short notes on Iron removal in drinking water. (8)

15. a) i) What are the types of distribution system? Discuss. (8)

ii) What are the functions and requirements of distribution system? Explain. (8)

(OR)

b) i) What are the types of Elevated Reservoirs used in the Distribution System? Explain. (8)

ii) How do you detect and prevent wastage of water in a pipe line? Explain. (8)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18MA401 – Numerical Methods and Linear Programming Problem

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Prove the operator relation : $\Delta \equiv \nabla E$.
2. State Simpson's $1/3^{rd}$ rule and $3/8^{th}$ rule.
3. Find $y(0.1)$, by Euler's method, given that $y' = 1 - xy,\ y(0) = 0$
4. Write the central difference approximation of $y'(x)$ and $y''(x)$.
5. Write down the one-dimensional wave equation and its initial conditions and boundary conditions.
6. Write down the diagonal five-point formula to solve the Laplace equation.
7. Convert the following LPP to the standard form :
   Maximize $Z = 2x_1 - 3x_2 + 4x_3$,
   Subject to $x_1 - 4x_2 \leq 3,\ 3x_1 + 5x_2 + x_3 \geq 2,$ and $x_2, x_3 \geq 0$
8. Write the fundamental theorem of duality.
9. When a feasible solution of a transportation problem is said to be a basic feasible solution?
10. State any two solution methods of an assignment problem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Find the expression $f(x)$ and hence find $f(3)$ using Lagrange's formula for the following data. (8)

x	0	1	4	5
$y = f(x)$	4	3	24	39

ii) Using Newton's divided difference formula, find $u(3)$, given $u(1) = -26, u(2) = 12, u(4) = 256, u(6) = 844$. (8)

(OR)

b) i) Find the first and second derivatives of $y = f(x)$ at $x = 1.5$ from the following data. (8)

x	1.5	2.0	2.5	3.0	3.5	4.0
$y = f(x)$	3.375	7.0	13.625	24.0	38.875	59.0

ii) Evaluate $\int_0^6 \frac{1}{1+x^2}\,dx$ by using Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ rule with $h = 1$. (8)

12. a) i) Using Taylor's series method of the fourth order, find y at $x = 1.1$ by solving the equation $\frac{dy}{dx} = y^2 + x^2$; $y(1) = 2$. (8)

ii) Find $y(0.25)$, using modified Euler's method with $h = 0.25$, given that $\frac{dy}{dx} = 3x^2 + y$, $y(0) = 4$. (8)

(OR)

b) i) Solve the equation $\frac{dy}{dx} = \frac{1}{x+y}$, $y(0) = 1$ for $y(0.1)$, using Runge-Kutta method of the fourth order. (8)

ii) Solve the equation $\frac{dy}{dx} = x - y^2$; $y(0) = 0$ for $y(0.8)$, using Milne's Predictor-Corrector method, given that $y(0.2) = 0.02$, $y(0.4) = 0.0795$, $y(0.6) = 0.1762$. (8)

13. a) Solve the equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square with sides $x = 0, y = 0, x = 3, y = 3$ with $u = 0$ on the boundary and mesh length *is* 1. (16)

(OR)

b) i) Solve the boundary value problem $u_t = u_{xx}$ under the conditions $u(0,t) = u(1,t) = 0$ and $u(x,0) = \sin \pi x$, $0 \le x \le 1$, using Bender-Schmidt's method with $h = 0.2$ and $\alpha = \frac{1}{2}$. (8)

ii) Evaluate the pivotal values of the equation $u_{tt} = 16\, u_{xx}$, taking $\Delta x = 1$ upto $t = 1.25$. The boundary conditions are $u(0,t) = u(5,t) = 0, u_t(x,0) = 0$ and $u(x,0) = x^2(5 - x)$. (8)

14. a) A furniture firm manufactures chairs and tables, each requiring the use of three machines A, B and C. Production of one chair requires 4 hours on machine A, 2 hours on machine B and 5 hours on machine C. Each table requires 4 hour each on machine A, 5 hours each on machine B and 3 hours on machine C. The profit obtained by selling on chair is ₹ 25 while by selling one table the profit is ₹ 40. The total time available per week on machine A is 48 hours, on machine B is 50 hours and on machine C is 60 hours. How many chairs and tables should be made per week so as to maximize profit? Formulate the problem as L.P.P. and solve it graphically. (16)

(OR)

b) Solve the following LPP by simplex method. (16)

Max $z = x_1 + 2x_2 + x_3$

Subject to $2x_1 + x_2 - x_3 \leq 2$

$-2x_1 + x_2 - 5x_3 \geq -6$

$4x_1 + x_2 + x_3 \leq 6$

and $x_1, x_2, x_3 \geq 0$.

15. a) Obtain an optimal basic feasible solution to the transportation problem. (16)

		Warehouse				
		W_1	W_2	W_3	W_4	Capacity
Factory	F_1	19	30	50	10	7
	F_2	70	30	40	60	9
	F_3	40	8	70	20	18
Required		5	8	7	14	

(OR)

b) Five lathes are to be allotted to five operators (one for each). The following table gives weekly output figures (in pieces): (16)

		Weekly output in lathe				
		L_1	L_2	L_3	L_4	L_5
Operator	P	20	22	27	32	36
	Q	19	23	29	34	40
	R	23	28	35	39	37
	S	21	24	31	37	42
	T	24	28	31	36	41

Profit per piece is Rs. 25. Find the maximum profit per week.

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

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ELECTRONICS AND COMMUNICATION ENGINEERING

18MA402 – Probability and Stochastic Processes

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. In a community, 32% of the population are male smokers; 27% are female smokers. What percentage of the population of this community smoke?
2. Find the expected value of the discrete random variable X with the probability mass function $P(X=x)=\begin{cases}\frac{1}{3};x=0\\ \frac{2}{3};x=2\end{cases}$.
3. Find the second moment about the origin of the Geometric distribution with parameter p.
4. If X is a normal variate with $mean$ = 30and S.D = 5, find $P[26 \le X \le 40]$.
5. The joint p.d.f. of R.V. (X,Y) is given as $f(x,y)=\begin{cases}K, 0<y<x\le 1\\ 0, elsewhere\end{cases}$, where $K$is a constant. Determine the value of K.
6. Given $(x,y)=\begin{cases}1-5e^{-5(x+y)}, x>0, y>0\\ 0, otherwise\end{cases}$. Determine $f(x,y)$, if F is the joint cumulative distribution function of two random variables X and Y.
7. State Central limit theorem.
8. State weak law of large numbers.
9. Define auto correlation function and write any two of its properties.
10. Given that the autocorrelation function for a stationary ergodic process with no periodic components is $R(\tau)=25+\frac{4}{1+6\tau^2}$. Find the mean and variance of the process $\{X(t)\}$.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Companies B_1, B_2 and B_3 produce 30%,45% and 25% of the cars respectively. It is known that 2%, 3% and 2% of these cars produced are defective. (8)
    i) What is the probability that a car purchased is defective?
    ii) If a car purchased is found to be defective, what is the probability that this car is produced by company B_1?

ii) If $P(x) = \begin{cases} \frac{x}{15}; x = 1,2,3,4,5 \\ 0 \quad ; elsewhere \end{cases}$ (8)

Find (i) $P\{X = 1 or 2\}$ and (ii) $P\left\{\frac{1/2<X<5/2}{x>1}\right\}$

(OR)

b) i) A random variable X has density function $f(x) = \begin{cases} \frac{K}{1+x^2}, -\infty < x < \infty \\ 0 \quad , \quad Otherwise \end{cases}$ (8)

Determine K and the distribution functions. Evaluate the probability$P(x \geq 0)$.

ii) Find the moment generating function for the distribution whose p.d.f is $f(x) = \lambda e^{-\lambda x}, x > 0$and hence find its mean and variance. (8)

12. a) i) Derive the MGF, mean and variance of Geometric distribution and also state the special property of it. (8)

ii) Let X be a Uniformly distributed R.V over [-5,5]. Determine (8)
i) $P(X \leq 2)$ ii) $P(|X| > 2)$ iii) Cumulative distribution function of X

(OR)

b) i) In a large consignment of electric bulb 10% are defective. A random sample of 20 is taken for inspection. Find the probability that i) All are good bulbs ii) Atmost there are 3 defective bulbs iii) Exactly there are 3 defective bulbs. (8)

ii) The average percentage of marks of candidates in an examination is 42 with a standard deviation of 10. If the minimum mark for pass is 50% and 1000 candidates appear for the examination, how many candidates can be expected to get the pass mark? If it is required, that double the number of the candidates should pass, what should be the minimum mark for pass? (8)

13. a) i) Find the constant k such that (8)

$f(x,y) = \begin{cases} k(x+1)e^{-y}, 0 < x < 1, y > 0 \\ 0, otherwise \end{cases}$ is a joint p.d.f. of the continuous random variable (X, Y). Find k. Are X and Y independent RVs? Explain.

ii) State and prove Chebyshev's inequality. (8)

(OR)

b) i) A joint probability mass function of the discrete RVs X and Y is given as P(X = x , Y = y) = $\begin{cases} \frac{x+y}{32}, x = 1,2, y = 1,2,3,4 \\ 0, otherwise \end{cases}$. Compute the covariance of X and Y. (8)

ii) The joint pdf of the random variables X and Y is defined as (8)

$f(x,y) = \begin{cases} 25e^{-5y}, 0 < x < 0.2, y > 0 \\ 0, elsewhere \end{cases}$

i) Find the marginal PDFs of X and Y ii) Are X and Y independent?

14. a) i) A random sample of size 100 is taken from a population whose mean is 60 and variance is 400. Using central limit theorem, with what probability can we assert that the mean of the sample will not differ from $\mu = 60$ by more than 4. (8)

ii) Classify the random processes with their definition and examples. (8)

(OR)

b) i) State and prove Strong law of large numbers. (8)

ii) If $X_1, X_2, \ldots . X_n$ are Poisson variates with parameter $\lambda = 2$. Use the central limit theorem to estimate $P(120 < S_n < 160)$ where $s_n = X_1 + X_2 + \ldots . . + X_n$ and $n = 75$. (8)

15. a) i) Show that the random process $X(t) = A\cos(\omega t + \theta)$ is WSS if A &ω are constants and θ is uniformly distributed random variable in $(0,2\pi)$. (8)

ii) If the power spectral density of a WSS process is given by (8)

$S(\omega) = \begin{cases} \frac{b}{a}(a - |\omega|); |\omega| \leq a \\ 0; |\omega| > a \end{cases}$ find its autocorrelation function of the process.

(OR)

b) i) The power spectral density function of a WSS process $\{X(t)\}$ is given by $S(\omega) = \begin{cases} S_0; |\omega| < \omega_0 \\ 0; \text{elsewhere} \end{cases}$. Find $R(\tau)$. (8)

ii) Two random processes $\{X(t)\}$ and $\{Y(t)\}$ are given by (8)

$X(t) = A\cos(\omega t + \theta), Y(t) = A\sin(\omega t + \theta)$ where A & ω are constants and θ is a uniform random variable over 0 to 2π. Find the cross-correlation function.

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B.E.Degree Examinations –April/May 2023

IV Semester(Part Time)

(2016 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

16PTEC401 – Microprocessors and Microcontrollers

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the types of interrupt according to the priority.
2. State the flags in 8086 and its functions.
3. What are the special features of Programmable time 8253?
4. Define key debouncing.
5. What is the dual role of port 2 in 8051?
6. What is the need for watchdog timer?
7. Differentiate CISC and RISC processor.
8. Draw the data format for Current Program Status Register.
9. What is the use of SWAP instruction?
10. What are software interrupts?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail about the architecture of 8086. (12)

ii) Write an Assembly language program to perform 16 bit multiplication of any two numbers. (4)

(OR)

b) Discuss the data transfer instruction, Arithmetic instruction and processor control instruction of 8086 with examples. (16)

12. a) Describe the Programmable Peripheral Interface architecture and discuss on the different modes of operation of 8255. (16)

(OR)

b) Elaborate on programmable Keyboard and display interface with 8086. Discuss on each block of 8279. (16)

13. a) i) Explain the timer/counter of 8051 and the different modes of operation. (8)

ii) Discuss the different addressing modes of 8051. (8)

(OR)

b) i) Explain the configuration of parallel IO ports of 8051. (8)

ii) Discuss on the RAM memory space allocation in 8051 microcontroller. What are the different memory banks available in 8051? (8)

14. a) i) Detail the architecture of ARM7TDMI. (10)

ii) Write a note on ARM development tools. (6)

(OR)

b) Draw the block diagram of 3 stage pipeline ARM organization and explain its working principle. Analyze and compare the performance of 5 stage pipeline ARM organization with 3 stage ARM. (16)

15. a) i) Detail the thumb instruction set. (8)

ii) Discuss the ARM instructions that Multiply and Multiply and accumulate for signed and unsigned data. (8)

(OR)

b) i) Detail the architectural support for high level languages. (8)

ii) How branch, branch with link, branch with link and exchange differ in their operations? (8)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE401 – Signals and Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between continuous and discrete time signal.
2. Outline the properties of linear system.
3. Express the necessary and sufficient condition on the impulse response of the system for causality and stability.
4. What is state space analysis of continuous time system? Give an example for state space representation of continuous time systems.
5. Obtain the fourier series coefficients of the signal, x(t)=4(cos t) (sin 4t).
6. State and prove the parseval's theorem for DTFT.
7. Show initial value theorem of Z transform.
8. Express the relationship between s-plane and z-plane in Z transform.
9. List out the different types of sampling techniques.
10. Define zero-order hold in signals and systems and express its transfer function.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain different classification of signals and systems with examples. (12)

ii) Derive the relation between the unit step and unit impulse signals. (4)

(OR)

b) i) Prove the following: (12)
1) Energy of the power signal is infinite over infinite time.
2) Power of the energy signal is zero.

ii) Find whether the following signal is periodic. If periodic determine the fundamental period. $(t) = 3\cos(4t) + 2\sin(\pi t)$. (4)

12. a) i) For each impulse response listed below, determine whether the corresponding system is casual and stable. (10)

1) $h(n)=2^n u(-n)$

2) $h(n)= \delta(n)+\sin(\pi n)$

ii) Evaluate the system function and impulse response of the following system $y(n)-5y(n-1)=x(n)-x(n-1)$. (6)

(OR)

b) i) Find the impulse response, frequency response, magnitude response and phase response of the second order system. (10)

$$y(n) - y(n-1) + \frac{3}{16}y(n-2) = x(n) - \frac{1}{2}x(n-1)$$

ii) Examine the properties of state transition matrix and its role in continuous and discrete time signals. (6)

13. a) i) Realize the fourier transform of each of the following signals and sketch the magnitude and phase as a function of frequency, including both positive and negative frequencies (12)

i) $\delta(t+1)+\delta(t-1)$

ii) $e^{-at}u(t)$, a-real and positive

ii) Determine the fourier series representation of the signal $x(t) = 2+\cos(4t) + \sin(6t)$ (4)

(OR)

b) i) Derive and draw the butterfly diagram for computing 8-point DFT of a sequence x(n) using DIF FFT algorithm. (12)

ii) Find the DTFT of $x(n) = 2\ (3)^n\ u(-n)$. (4)

14. a) i) State and prove any five properties of z transform. (10)

ii) Find the Z transform of $x(n)=n^2u(n)$. (6)

(OR)

b) i) Determine the inverse z transform of (10)

$X(Z) = \frac{1+3Z^{-1}}{1+3Z^{-1}+2Z^{-2}}$, ROC $|Z|>2$.

ii) Find the linear convolution of X(n)={1, 2, 3, 4, 5, 6, 7} with h(n)={2, 4, 6, 8} (6)

15. a) i) State and prove the sampling theorem and explain how the original signal can be reconstructed from the sampled version with necessary illustrations. (10)

ii) Describe briefly about spectral density and aliasing effect. (6)

(OR)

b) i) Derive the mathematical relation between continuous and discrete time signal. (10)

ii) Summarize the different types of filtering techniques used in signals and systems. (6)

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B.E. Degree Examinations – April/May 2023

VII Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EE701 – Power System Protection and Switchgear

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is a protective relay?
2. What are the differences between instantaneous and time graded overcurrent relays?
3. What is meant by breaking capacity of a circuit breaker?
4. Define Rate of Rise of Restriking Voltage (RRRV).
5. Why directional features provided for impedance relay cannot be used for reactance relay?
6. What is the necessity of using 3-zone stepped distance protection scheme in transmission line?
7. List the limitations of static relay over electromagnetic relay.
8. Compare phase and amplitude comparators.
9. List the merits of numerical relay.
10. State Sampling theorem.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the construction and working of induction type of directional overcurrent relay. (10)

ii) Determine the time of operation of an IDMT rely of rating 5 A and having setting of 125% and TMS=0.5. The relay is connected through a CT of 400/5 A. The fault current is 4000A. The operating time for PSM of 8 is 3.2 seconds. (6)

(OR)

b) i) Explain with necessary diagram, the principle of Translay scheme for feeder protection. (10)

ii) Derive the universal torque equation of an electromagnetic relay. (6)

12. a) i) Describe the construction and principle of operation of a minimum oil circuit breaker. (10)

ii) Discuss the problems encountered in HVDC breaking. Suggest the remedies for them. (6)

(OR)

b) i) Describe the construction and principle of operation of a SF_6 circuit breaker. (10)

ii) Discuss the recovery rate theory of arc interruption in a circuit breaker. (6)

13. a) i) Explain the protection of three-phase star connected alternator by means of percentage differential relay. (10)

ii) Discuss how stator winding of a three-phase alternator is protected against turn to turn faults. (6)

(OR)

b) i) Describe the principle of Merz-Price system of protection applied to a power transformer. (10)

ii) What are the problems arising in differential protection in power transformer? How are they overcome? (6)

14. a) i) With a schematic block diagram, explain the operating principle of directional static overcurrent relay. (10)

ii) Explain any one type of amplitude comparator used in static relay. (6)

(OR)

b) i) With the help of neat diagram, explain the principle of static differential relay. (10)

ii) Explain any one type of phase comparator used in static relay. (6)

15. a) i) Discuss the operation of numerical transformer differential protection with a neat functional block diagram. (10)

ii) Explain how is the phasor estimated using least error squared technique for numerical relay? (6)

(OR)

b) i) Explain the working of numerical relay based distance protection for transmission line. (10)

ii) Discuss briefly any one digital filtering technique utilized in numerical relay. (6)

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IV Semester (Part Time)

(2016 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

16PTEE401 – Linear Integrated Circuits

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the purpose of oxidation process in IC Fabrication?
2. How does masking differ from etching process?
3. List out the dc characteristics of an op-Amp.
4. Define slew rate.
5. List the features of instrumentation Amplifier.
6. Define resolution of DAC.
7. Mention the basic functional blocks of IC 555 timer.
8. Define lock-in-range of a PLL.
9. What are the advantages of switching regulators?
10. What is an opto-coupler IC? Give an examples.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	With neat diagram, Explain the steps involved in the fabrication of the ICs using silicon planar technology.	(8)
		ii)	Write short notes on the etching and diffusion process.	(8)
			(OR)	
	b)	i)	Discuss the Realisation of monolithic ICs and packaging.	(8)
		ii)	Summarize the applications of monolithic ICs and its feautures.	(8)
12.	a)	i)	Explain the AC characteristics of an operational amplifier.	(10)
		ii)	Write short notes on offset voltage and current in an Op-Amp.	(6)
			(OR)	
	b)	i)	Draw the circuit of a voltage series feedback and shunt feedback amplifiers and explain its characteristics.	(10)
		ii)	Compare differentiator and integrator.	(6)

13. a) i) Draw the circuit of a first order and second order active low pass filter and derive its transfer functions. (10)

ii) Differentiate active and passive Filters. (6)

(OR)

b) i) Describe in detail about the successive approximation type of ADC and conversion process with an example. (10)

ii) Compare clippers and clampers. (6)

14. a) i) Draw the block diagram of an astable multivibrator using 555 timer and derive an expression for its frequency of oscillation. (12)

ii) Mention the applications of 555 timer. (4)

(OR)

b) i) Discuss the functioning of 565-phase lock loop circuit. (12)

ii) List the applications of 565-phase lock loop circuit. (4)

15. a) i) Explain the functional block diagram of a 723 regulator with a neat sketch. (10)

ii) Compare isolation amplifier and optocouplers. (6)

(OR)

b) i) Discuss the functioning of IC 8038 function generator IC. (10)

ii) Discuss the types of opto-electronic ICs and its applications. (6)

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME401 – Kinematics of Machinery

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. How many degrees of freedom exist in a revolute pair?
2. What do you understand by Grasshopper mechanism?
3. Write the 'Three Centres in-line Theorem'.
4. State the significance of three position kinematic synthesis.
5. Define 'Cam angle'.
6. Identify two applications of a Barrel Cam.
7. Can the gear ratio be less than 1? Justify.
8. List two applications of helical bevel gears.
9. Share your views about thrust bearings.
10. Distinguish between the uniform pressure and uniform wear theories used in Clutches.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss three inversions of four-bar chain with neat sketches and state their practical uses. (16)

(OR)

b) Sketch and explain the crank and slotted lever mechanism. Also, briefly comment on how the cutting stroke duration is adjusted in it. (16)

12. a) A link AB of a four-bar linkage ABCD revolves uniformly at 120 rpm in a clockwise direction. Find the angular acceleration of link CD and the point E located on the link BC. Consider: AB = 7.6 cm; BC = 17.5 cm; EC = 5 cm; CD = 15 cm; DA = 10 cm and $\angle BAD = 90^0$. (16)

(OR)

b) The dimensions of the various links of a mechanism, as shown in Figure.1, are as follows: OA = 80 mm; AC = CB = CD = 120 mm. If the crank OA rotates at 150 rpm in the anticlockwise direction, find the angular acceleration of the links AB and CD. (16)

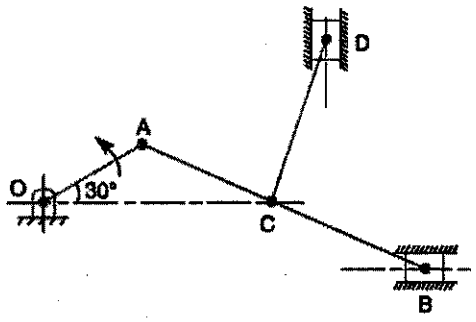

Figure.1.

13. a) A cam with a 30 mm minimum radius is rotating clockwise at 1200 rpm to give the follower motion through a roller follower of 20 mm diameter. Lift is 25 mm; the follower rises during 120° cam rotation with simple harmonic motion and dwells for 60° cam rotation. Subsequently, the follower is to return during the 90° cam rotation with uniform acceleration and retardation, then to dwell for the remaining period. Draw the profile of the cam and determine the maximum acceleration during the return stroke. (16)

(OR)

b) A symmetrical circular cam operating a flat faced follower has the following details: (16)

Minimum radius = 30 mm, Lift = 20 mm, Angle of ascent = 75°, Nose radius = 5 mm and Speed= 600 rpm. Find the dimensions of the cam, acceleration of the follower at the beginning of the lift and at the end of contact with circular flank.

14. a) The pinion has 23 teeth and drives a gear with 57 teeth. The profile of the gears is involute with a pressure angle of 20°, module 8 mm and addendum equal to one module. Calculate the length of arc of contact and contact ratio. (16)

(OR)

b) In the compound gear train shown in figure.2, the power is transmitted from a motor shaft to the output shaft. The motor shaft is connected to gear 1, whereas the output shaft is connected to gear 4. The gears 2 and 3 are mounted on the same shaft. The motor shaft is rotating at 1250 rpm. Determine the speed and rotational direction of the output shaft. The number of teeth in each gear is given below. (16)

Gear	1	2	3	4
No. of teeth	30	75	20	50

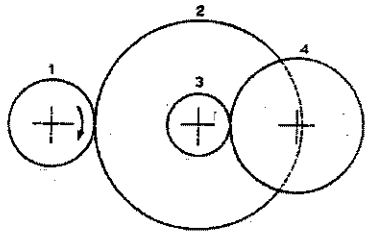

Figure.2.

15. a) A belt embraces the shorter pulley by an angle of 165^0 and runs at a speed of 1700 m/min. The dimensions of the belt are: width = 20 cm, thickness = 8 mm and density = 1 gm/cm^3. Determine the maximum power that can be transmitted, if the maximum permissible stress in the belt is not to exceed 250 N/cm^2 and μ =0.25. (16)

(OR)

b) A simple band brake is applied to a rotating drum of diameter 500 mm. The angle of lap of the band on the drum is 270^0. One end of the band is attached to a fulcrum pin of the lever and other end is attached to a pin 100 mm from the fulcrum. If the coefficient of friction is 0.25 and a braking force of 90 N is applied at a distance of 600 mm from the fulcrum, find the braking torque when the drum rotates in i) clockwise direction ii) anticlockwise direction. (16)

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VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18ME701 - Mechatronics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Identify the applications of Mechatronics system.
2. Summarize the classification of Mechatronics products.
3. Linear time invariant system whose input r(t) and output y(t) is $\frac{d^2y(t)}{dt^2} + 4y(t) = 6r(t)$ find transfer function.
4. How do you model fluid capacitance?
5. Distinguish the DIAC and TRIAC.
6. Air is supplied to a single acting cylinder at a pressure of 4 N/mm^2. The diameter of the piston is 25 mm. Calculate the force produced as the piston outstrokes.
7. Infer the mnemonics used in PLC.
8. Write a PLC program for the following, when a product is completed, C20 will count for one time. When the number reaches 500, target completed indicator Y0 will be ON.
9. List out the important stages of design process.
10. Generalize the Mechatronics approach is useful in machining control of Manufacturing system.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Compare and contrast mechatronics approach with traditional approach. Give suitable examples. (16)

(OR)

b) Illustrate the operations involved in the sequential control of a microprocessor based washing machine. (16)

12. a) i) Write short notes on electrical analogy of mechanical systems. (10)

ii) A hot object with capacitance C and temperature T, cools in a large room at temperature Ta. If the thermal system has a resistance R, derive an equation describing how the temperature of the hot object changes with time and give an electrical analogue of the system. (6)

(OR)

b) i) Formulate the force balance equation for ideal dash pot and ideal spring element. (10)

ii) Derive the equations governing the system as shown in figure.1 and also determine characteristic equation of the given system. (6)

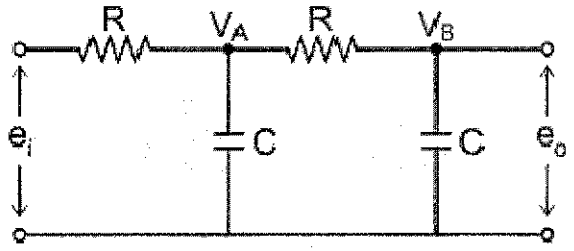

Figure.1.

13. a) How will you specify a stepper motor? Explain the general characteristics of a stepper motor. (16)

(OR)

b) Explain briefly Adaptive Control and its stages of operations. (16)

14. a) i) Develop Ladder logic for: A and B are turned ON by a switch when the switch is turned OFF A goes OFF, immediately. B remains ON for another 20 seconds and then goes OFF. (10)

ii) Briefly explain the impotence and location of Counters in PLC with suitable examples. (6)

(OR)

b) i) Develop a LD program that will latch on an output B, 20 seconds after input A has been turned on. After *A* is pushed, there will be a 10 second delay until *A* can have any effect again. After *A* has been pushed 3 times, Bwill be turned off. (10)

ii) Explain with the help of ladder rungs the jump control mechanism in a programmable and logic controller. (6)

15. a) Explain the concept of Car engine management system by Mechatronics approach. (16)

(OR)

b) Design a Mechatronics system for accepting finished products based on its tolerance when moving on a conveyor system. (16)

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Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E.Degree Examinations –April/May 2023

IVSemester(Part Time)

(2016 Regulations)

MECHANICAL ENGINEERING

16PTME401 – Heat and Mass Transfer

(Heat and Mass Transfer Data book may be permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define thermal diffusivity.
2. Give examples use of fins in various engineering applications.
3. State Wien's displacement law.
4. What is meant by radiosity?
5. Mention the significance of velocity and thermalboundary layer.
6. Differentiate between Natural & Forced convection.
7. What are the modes of condensation?
8. What is meant by NTU? Give its expression.
9. Name the two mechanisms of mass transfer.
10. Define Schmidt Number.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Derive general heat conduction equation in Cartesian coordinates. (8)

ii) A surface wall consists of 23cm of fire brick and 11.5 cm of insulating brick having thermal conductivities of 0.72 W/mK and 0.27 W/mK respectively.Calculate the rate of heat flow per square metre when the temperature difference between inner and outer surface is 650K. (8)

(OR)

b) Circumferential aluminium fins of rectangular profile (1.5cmwide and 1mm thick) are fitted on to a 90 mm engine cylinder with a pitch of 10 mm. The height of the cylinder is 120 mm. The cylinder base temperature before and after fitting the fins are 200°C and 150°C respectively. Take ambient at 30°C and $h_{average}$=100 W/m²K. Estimate the heat dissipated from the finned and the unfinned surface areas of cylinder body. (16)

12. a) i) Discuss how the radiation from gases differ from that of solids. (6)

ii) Two very large parallel plates with emissivities 0.5 exchange heat. Determine the percentage reduction in the heat transfer rate if a polished aluminium radiation shield of c = 0.04 is placed in between the plates. (10)

(OR)

b) i) What are the radiation view factors and why they are used? (4)

ii) Determine the view factor (F1-4) for the figure shown figure.1 below. (12)

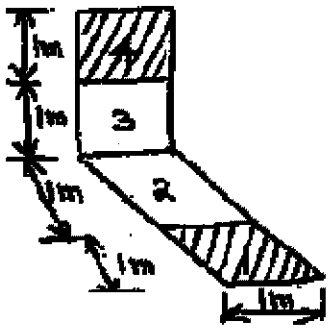

Figure.1.

13. a) i) Air at 20°C is flowing over a flate plate of lm long, 0.5m wide at a velocity of 100m/s.The flow over the whole length of the plate is made turbulent.Calculate the following (10)

1) Thickness of the boundary layer
2) Mean value of heat transfer coefficient

ii) Explain the types of boundary layer in detail. (6)

(OR)

b) Atmospheric air at 300 K with a velocity of 2.5 m/s flows over a flate plate of length L=2 m and width W=1 m maintained at uniform temperature of 400 K.Calculate the local heat transfer coefficient at 1m length and the average heat transfer coefficient from L=0 to L=2 m. Also find the heat transfer. (16)

14. a) Steam condenses at atmospheric pressure on the external surface of the tubes of a steam condenser. The tubes are 12 in number and each is 30 mm in diameter and 10 m long. The inlet and outlet temperatures of cooling water flowing inside the tubes are 25°C and 60°C respectively. If the flow rate is 1.1 kg/s, calculate. (16)

i) The rate of condensation of steam
ii) The number of transfer units
iii) The effectiveness of the condenser

(OR)

b) i) Discuss the general arrangement of parallel flow, counter flow and cross flow heat exchangers. (6)

ii) In a Double pipe counter flow heat exchanger 10000 kg/h of an oil having a specific heat of 2095 J/kg K is cooled from 80°C to 50°C by 8000 kg/h of water entering at 25°C. Determine the heat exchanger area for an overall heat transfer coefficient of 300 W/m^2K. Take Cp for water as 4180 J/kg K. (10)

15. a) i) Explain Fick's first and second laws of diffusion. (8)

ii) Explain the phenomenon of equimolar counter diffusion. Derive an expression for equimolar counter diffusion between two gases or liquids. (8)

(OR)

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

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B.E. Degree Examinations – April/May 2023

IV Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT401 – Mechanical Behaviour of Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the roles of dislocations on the behavior of materials.
2. List the differences between jogs and kinks.
3. Why Al-Si alloys are not precipitation hardenable? Justify.
4. What is meant by severe plastic transformation?
5. Differentiate between ductile and brittle fractures.
6. What is meant by theoretical cohesive strength of materials?
7. Give some examples for components that fail by irregular pattern of cyclic stresses.
8. Compare low cycle fatigue and high cycle fatigue.
9. What is equi-cohesive temperature?
10. How do you develop materials for creep resistant applications?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the types, configuration and characteristics of dislocations in materials with neat sketches. (16)

(OR)

b) Explain the following: (16)

i) Multiplication of dislocations by Frank Reed mechanism

ii) Dislocation pile ups against grain boundaries

12. a) Discuss simply the mechanisms of solid solution strengthening of materials with neat sketches. (16)

(OR)

b) Explain the theory and procedure of strengthening of some alloys by precipitation hardening process with neat sketches. (16)

13. a) What is DBTT and explain how it is measured experimentally with required sketches? (16)

(OR)

b) Explain the procedure of evaluation of plane strain fracture toughness (K_{IC}) of a material by LEFM approach. (16)

14. a) What is fatigue of materials? Explain the different types of stress cycles contributing to fatigue with neat sketches. (16)

(OR)

b) What is S-N curve in fatigue testing? Explain the testing procedure to construct the S-N curve for a material. (16)

15. a) Draw a typical creep curve and explain the three stages of the same. (16)

(OR)

b) Steady state creep data taken for a austenitic stainless steel at a stress level of 70 MPa are given below: (16)

ε_s^0 (s^{-1})	T(K)
1.0×10^{-5}	977
2.5×10^{-3}	1089

If the stress exponent n for this alloy is 7.0, compute the steady state creep rate at 1250 K at a stress level of 50 MPa.

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECPE604 – Wireless Communication

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define frequency reuse & show that it increases the capacity of the system.
2. What are the different Basic Propagation Mechanism in radio wave propagation.
3. Mention the properties of wideband channels.
4. Give the differences between frequency flat and frequency selective fading.
5. State the advantages CDMA over FDMA.
6. List the advantages of digital modulation techniques.
7. What is transmit diversity?
8. What is meant by MIMO systems?
9. Define precoding.
10. What is IS – 95 Standard?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Discuss in detail about shadowing in wireless communication.	(8)
		ii)	Explain about free space path loss model.	(8)
			(OR)	
	b)	i)	Write short notes on transmit and receive signal models.	(8)
		ii)	Explain briefly about simplified path loss model.	(8)
12.	a)		Describe in detail about frequency selective fading channels and define the capacity of frequency selective fading channels.	(16)
			(OR)	
	b)		Explain in detail about Narrowband fading model.	(16)
13.	a)		Identify the channel capacity of CDMA with multiple cell system.	(16)
			(OR)	
	b)		Explain in detail about the Gaussian Minimum Shift Keying (GMSK) modulation with relevant diagrams.	(16)

14. a) i) Discuss in detail about Alamouti Scheme used in Transmit diversity. (8)

ii) Give a detailed description of zero forcing receiver. (8)

(OR)

b) i) Explain Maximal ratio combiner with a block digram. (8)

ii) With block diagram, explain the operation of a V-BLAST Receiver. (8)

15. a) i) Explain the characteristics of speech signals. (8)

ii) Illustrate the block diagram of GSM Codec. (8)

(OR)

b) i) Draw the basic arrangement of Vocoder and discuss its overall operation. (8)

ii) Describe the digital cellular standard DECT with necessary diagrams. (8)

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B.E. Degree Examinations – April/May 2023

VI & VII Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MTE41- Particulate Processing Technology

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the term : Sampling.
2. Differentiate between apparent density and tap density.
3. What is powder conditioning?
4. What are the mechanical methods used in powder manufacturing?
5. What is slurry casting?
6. List the merits of double ended compaction method.
7. List the atmospheres used in sintering operation.
8. What is activated sintering?
9. Mention the advantages of Powder Metallurgy.
10. List the major applications of powder metallurgy routes.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the procedure of Sieve analysis and Microscopic analysis for powder size measurements. (16)

(OR)

b) Explain the procedure of Sedimentation and Permeability methods. (16)

12. a) Discuss the following powder manufacturing methods with neat sketches

1. Ball Milling (8)
2. Water Atomization method (8)

(OR)

b) Discuss the Condensation and Carbonyl methods of powder manufacturing. (16)

13. a) Discuss in detail Cold Isostatic Compaction method with neat sketches. (16)

(OR)

b) Discuss the following compaction methods

1. Powder Rolling (4)
2. Extrusion (4)
3. Explosive Compaction (8)

14. a) i) Explain the Mechanisms of Sintering with a neat sketch. (8)

ii) Explain the Hot pressing process with neat sketches. (8)

(OR)

b) Discuss in detail the following

1. Infiltration (4)
2. Vacuum Sintering (4)
3. Finishing Operations (8)

15. a) Describe the types, methods of production, properties and applications of Bearing Materials. (16)

(OR)

b) Describe the steps used in production of Cemented carbide tool materials and Cermets. (16)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE35 – Rapid Product Development Technologies

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the steps involved in the Rapid prototyping cycle?
2. Write the salient features of STL file.
3. What are the circumstances that influence to prefer the Stereo lithography process in Rapid prototyping?
4. Suggest any four work materials for Selective laser sintering process.
5. How is a Fused deposition modeling device specified?
6. State any two applications of Laminated Object Manufacturing.
7. Write the working principle of Solid ground curing process.
8. What is Ballistic particle manufacturing?
9. Write the advantages of pattern based tooling in Rapid Tooling.
10. Write the applications of Rapid prototyping in Medical field?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Analyze how Rapid prototyping techniques support in the development of new Engineering products and comment on the challenges encountered. (16)

(OR)

b) Elaborate the history and growth of Rapid prototyping techniques and share your understanding of its impacts on Mechanical Engineering Industries. (16)

12. a) Discuss how prototypes are produced by Stereo lithography apparatus with the help of a neat sketch and briefly describe its post-processing activities. (16)

(OR)

b) With a suitable sketch, explain the Direct metal laser sintering process and discuss how it differs from Selective laser sintering process. (16)

13. a) i) Illustrate the working of a Fused Filament Fabrication process and describe its major influencing parameters. (12)

ii) Discuss about the potential benefits and applications of Fused deposition modelling process. (4)

(OR)

b) i) Discuss the step-by-step procedure followed in the Laminated object manufacturing process and identify the challenges involved. (12)

ii) Describe the factors that influence the materials used in the Laminated object manufacturing process. (4)

14. a) i) Explain the Solid ground curing process and discuss its selection criteria when compared to Stereo lithography. (12)

ii) Analyse the needs of commercially available 3D printers in Mechanical Engineering. (4)

(OR)

b) i) Briefly explain the laser Engineered Not shaping process with neat sketch and share your views on its role in Rapid prototyping processes. (12)

ii) Analyse how a thermal inkjet printer differs from an inkjet printer. (4)

15. a) Describe how indirect rapid tooling differs from direct rapid tooling and explain any two indirect rapid tooling techniques used. (16)

(OR)

b) Discuss any three direct rapid tooling techniques used in Rapid prototyping with neat sketches and evaluate their limitations. (16)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE24 – Machine Drawing

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

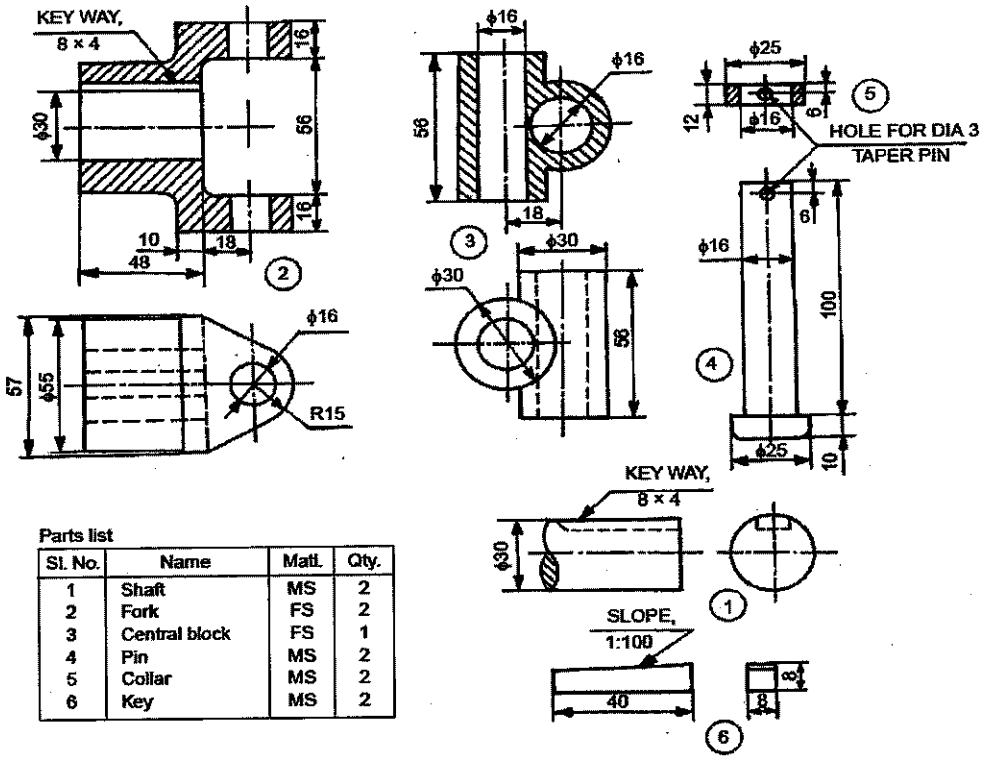
1. Under what conditions, a sectional view is preferred?
2. How is a cutting plane represented in the orthographic views for obtaining, a) full section and b) half section?
3. When is a shaft basis system preferred instead of hole basis system?
4. With the help of sketches, show how the geometrical tolerances are indicated, as prevalent in industries, for the following cases:
   a) parallelism,
   b) perpendicularity,
   c) symmetry and
   d) radial run out.
5. How surface roughness values are indicated on a drawing?
6. With examples, show the method of indicating surface roughness on the following components :
   a) symmetrical surfaces requiring the same quality,
   b) cylindrical part, and
   c) same surface quality all over.
7. Name any four mechanical fasteners.
8. What is the difference between a saddle key and a sunk key?
9. Specify the applications of Plummer block.
10. Differentiate between protected and un-protected type flange coupling.

Part B

(1 x 80 = 80 Marks)

Answer ALL Questions

11. a) Detailed drawing of a universal coupling is given below. Assemble the parts of universal coupling shown in Figure.1 and draw, (80)
    i) Sectional front view and
    ii) Right side view. Show the important dimensions on the assembly drawing.



Parts list

Sl. No.	Name	Matl.	Qty.
1	Shaft	MS	2
2	Fork	FS	2
3	Central block	FS	1
4	Pin	MS	2
5	Collar	MS	2
6	Key	MS	2

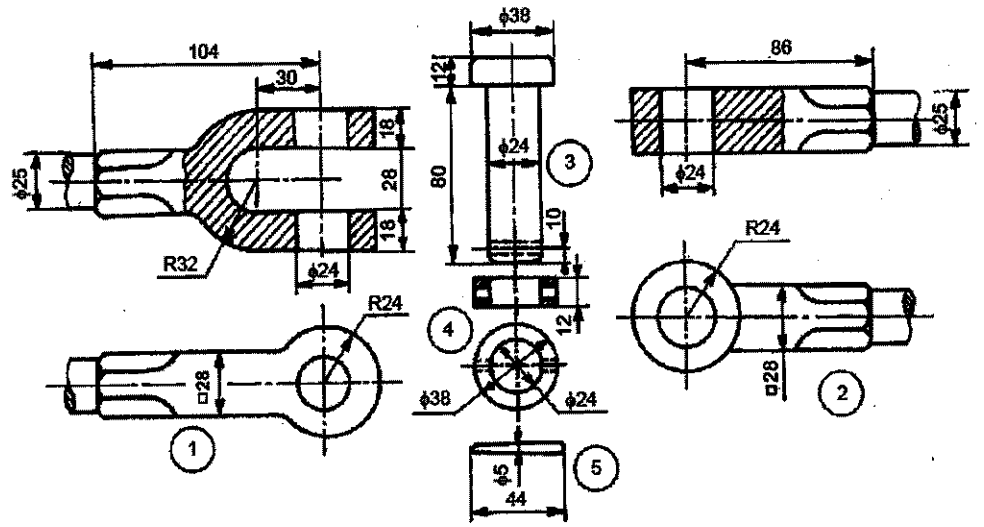
Figure.1.

(OR)

b) Detailed drawing of a knuckle joint is given below. Assemble the parts of a knuckle joint shown in Figure and draw, (80)

i) Sectional front view

ii) Top view. Show the important dimensions on the assembly drawing.



Parts list

Sl. No.	Name	Matl.	Qty.
1	Fork end	Forged steel	1
2	Eye end	Forged steel	1
3	Pin	Mild steel	1
4	Collar	Mild steel	1
5	Taper pin	Mild steel	1

Figure.2

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE23 – Power Plant Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the four important circuits of a steam power plant.
2. Distinguish between fouling and slagging.
3. What are the functions of a steam drum?
4. Describe the procedure for partial blow of down boiler water.
5. Categorize few turbines that are widely used in hydroelectric power stations.
6. Write the functions of the draft tube in turbine outlet.
7. Name the various gas power cycles.
8. Illustrate few characteristics of wind mills.
9. Explain the desirable properties of a coolant.
10. Discuss any four ways of Nuclear Power Plant safety.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Draw a general layout of the steam power plant and explain the working of different circuits. (16)

(OR)

b) Explain in detail the coal handling system with a suitable block diagram. (16)

12. a) Calculate the cost of power generation per kWh for a power station having the following data: (16)

Installed capacity of the plant = 200 MW

Capital cost = Rs.400 Crores

Rate of interest and depreciation = 12%

Annual cost of fuel, salaries and taxation = Rs.5 Crores

Load factor = 50 %

Also estimate the saving in cost per kWh if the annual load factor is raised to 60%.

(OR)

b) Compare the economics of steam, hydro, nuclear, diesel and gas turbine power plants. (16)

13. a) Discuss briefly about the essential elements of a hydropower plant with the help of neat sketches. (16)

(OR)

b) Explain the principle of working and construction of a solar power plant using suitable sketches. State their advantages, disadvantages and applications. (16)

14. a) Discuss the essential components of a diesel power plant with a neat sketch. (16)

(OR)

b) Gas turbine power plant of 20 MW capacity works in a closed cycle using air as the working medium. The plant having a regenerator is designed for maximum specific work output. The inlet air temperature is 300 K and the maximum temperature in the cycle is 960 K. Taking the isentropic efficiency of compressor as 0.8, that of turbine as 0.9, the mechanical efficiency and generator efficiency each as 0.95, the regenerator effectiveness as 0.7, the combustion efficiency as 0.96 and assuming that 90% of the heat released by combustion is transferred to air. Determine the fuel burning rate and the air-fuel ratio. Take the calorific value of fuel used as 37 MJ/kg. (16)

15. a) Elaborately discuss the working principle and construction of Pressurized Water Reactor and Boiling Water Reactor. (16)

(OR)

b) The duct of an MHD generator has a constant spacing between electrodes of 0.4 m. Each electrode has an area of 0.5 m^2. Ionized gas with an electrical conductivity of 30 $(ohm\text{-}m)^{-1}$ flows through the duct at an average velocity of 800 m/s. A cross magnetic flux of 2.5 Wb/m^2 is applied, and an external resistance of 0.04 ohm is connected across the electrodes. What is the theoretical power output? (16)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP10 – Utilization of Electrical Energy

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Identify the main parts of a tidal power plant.
2. What is the need for electrical energy conservation?
3. Define: i) Luminous flux, ii) Lamp Efficiency.
4. Summarize the effects of voltage variations on the performance of incandescent lamp.
5. State the properties required for a good heating element.
6. List the applications of electric arc welding.
7. Draw a typical speed-time curve for train movement.
8. Summarize the recent trends in electric traction.
9. Classify the electric drives.
10. What are the advantages of thyristorized control of DC drives?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) The fixed costs of a thermal power station are Rs.500 per kW of installed capacity per year. The fuel and operating costs are 10 paise per kWh generated. Determine the cost of the electrical energy per kWh at station load factor of i). 25%, and ii). 50%. (10)

ii) With neat schematic, discuss briefly the principle operation of solar power generation plant. (6)

(OR)

b) i) With neat schematic arrangement, explain the operation of hydroelectric power plant. (10)

ii) A generating station has the following daily load cycle: (6)

Time (Hrs)	0 – 6	6 – 10	10 – 14	14 – 20	20 – 24
Load (MW)	20	25	40	50	20

Choose the capacity of the power station to be 20% more than the maximum demand. Draw the load curve. Find the Plant capacity factor.

12. a) i) State and prove cosine cube law of illumination. (6)

ii) Discuss the construction and working principle of fluorescent lamp with neat sketch. (10)

(OR)

b) i) A drawing hall with an area of 18×12 m^2 is to be illuminated with an average illumination of about 150 lux. The lamps are to be fitted at 6 m height. Find out the number and size of incandescent lamps required for luminous efficacy of 20 lumens/W. Assume: Utilization factor = 0.6, Maintenance factor = 0.75, Space-to-height ratio = 1. Assume any other relevant data. (10)

ii) Explain any two types of lighting schemes. (6)

13. a) i) With neat diagram, discuss the working of a vertical core type induction furnace. (8)

ii) Discuss the principle of dielectric heating process. (8)

(OR)

b) i) Explain the design of circular type heating element for an electric furnace. (8)

ii) What is meant by 'Resistance welding'? Explain the principle of 'Spot welding'. (8)

14. a) i) State the important requirements of the driving equipment used for electric traction purposes. (8)

ii) Explain the concept of regenerative braking applied to DC shunt motor. (8)

(OR)

b) i) Categorize the various track electrification systems. Explain briefly any two track electrification systems. (8)

ii) Explain the features of DC series motor that make it suitable for traction purpose. (8)

15. a) i) What are the various factors affecting the selection of motor for a particular drive? (4)

ii) Explain the selection of motors for i) Rolling mills, and ii) Textile mills. (12)

(OR)

b) i) Explain briefly why it is desirable to study the transient behavior of the drive. (4)

ii) With the help of neat schematic diagrams, explain the dynamic braking of DC drives using Thyristors. (12)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSPE607 – Data Mining and Warehousing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. List the types of data.
2. What is the need to integrate data mining system with a data warehouse?
3. What is a Data cube?
4. What is data warehouse? List three kinds of its applications.
5. Write inter dimensional association rule for the statement "Purchase of a laptop is associated if age is ranged between 20 and 25 and the income ranged between 20,000 to 40,000".
6. Consider total number of records in the dataset for classification is 100, number of records that matches with the rule R is 40 and there are 36 records that are correctly classified. Evaluate the Coverage and Accuracy for given rule R.
7. Apply Euclidean distance and compute the distance between two objects A(25, 35, 5, 10) and B(35, 20, 10, 25).
8. 80, 85, 90, 90, 75, 35, 60, 50 and 40 are the marks scored by the students in maths subject. Create two clusters for the above by considering 85 and 50 are the initial center points of the cluster.
9. How to mine the multimedia data? List its issues.
10. Differentiate spatial and temporal database.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) List and explain the major functionalities of data mining. (8)

ii) Consider the data for the attribute "Percentage" (% in 10th) for 12 students: (8)

90, 85, 80, 70, 95, 70, 65, 85, 90, 95, 70 and 60.

A. Compute mean, median and mode.

B. Compute range, variance and standard deviation.

(OR)

b) i) What is data mining? List and explain the major issues in data mining. (8)

ii) Consider the price of 6 products in online store as 1000, 600, 850, 920, 420 and 120. Normalize the data by the following methods: (8)

a. Min-Max normalization (range of 1 to 5)

b. Z-Score normalization.

12. a) i) What is data warehouse? How it can be differentiated from the operational database systems? (8)

ii) Explain in detail about the data warehouse architecture. (8)

(OR)

b) i) What is data mining? Explain how the data can be mined from the data warehouse. (8)

ii) How a data cube can be efficiently computed? Explain with an example. (8)

13. a) i) Set of product IDs that were sold from the shop are listed in the following table: (8)

Id	Items Purchased
101	W, X, Y, Z
102	X, Y, Z
103	W, X, Y
104	X, Y, Z
105	W, Y, Z

Taking minimum support count of 2, apply Apriori algorithm and find the frequently purchased items.

ii) What is association and correlation? Give examples for each. (4)

iii) Can correlation analysis gives better association rules than support and confidence measure? Justify your answer. (4)

(OR)

b) i) Apply the Bayesian Classification Algorithm to predict the class of following un classified data X(Outlook=sunny, Temperature=hot, Humidity = high) (8)

Outlook	Temperature	Humidity	Class: play
sunny	hot	high	no
sunny	hot	high	no
overcast	hot	high	yes
rainy	mild	high	yes
rainy	cool	normal	yes
rainy	cool	normal	no

ii) What is classification and prediction? Give examples for each. (4)

iii) For linearly separable data, a support vector machine is more accurate than rule based classifier. Analyse above statement and comment your answer. (4)

14. a) i) Consider the coordinates of the points in a 2-dimensional space as (20, 20), (35, 25), (35, 40), (50, 35), (40, 40). Compute 2-Fuzzy clusters using EM algorithm. (Note: Perform only one iteration). (8)

ii) Write short note on hierarchical method of clustering with an example. (4)

iii) Shortly explain how to design the cluster for high dimensional data. (4)

(OR)

b) i) Marks obtained by 6 students in Maths & Science exams are given as follows: S1(70, 60), S2(80, 60), S3(75, 65), S4(90, 95), S5(65, 50), S6(70, 60). Taking Student-2 (S2) and Student-7 (S5) as initial centroid of the clusters, apply K-Means algorithm to find the clusters with k=2. (8)

ii) What is the need of outlier analysis? Explain shortly. (4)

iii) Design the density based cluster for clustering the percentage of 12^{th} students (90, 98, 67, 87, 80, 85, 56, and 65). Assume the radius for density is 20. (4)

15. a) i) Elucidate different methods to perform data mining for spatial and multimedia databases. (8)

ii) Explain how to mine the complex data objects such as sequence data, graphs and networks. (8)

(OR)

b) i) Compare and contrast the time series and sequence data with examples for each. (8)

ii) List and explain the data mining applications in different fields. (8)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

CIVIL ENGINEERING

18CEPE19 - Hydrology

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define hydrology.
2. Mention the different forms of precipitation.
3. What is effective rainfall?
4. Define infiltration indices.
5. Write the limitations of unit hydrograph.
6. What is base flow separation?
7. Define flood routing.
8. What is Recurrence Interval?
9. State Darcy's law.
10. Define Transmissibility.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain with the help of a neat sketch about the hydrological cycle with its various components. (16)

(OR)

b) How is precipitation measured? Discuss any three methods of precipitation measurement. (16)

12. a) Describe briefly the various measures to reduce loss of water due to evaporation in reservoir. (16)

(OR)

b) Elaborate the concept of Infiltration. Discuss briefly the factors affecting Infiltration. (16)

13. a) i) Describe briefly the various factors affecting hydrograph. (8)

ii) Explain in detail about S-curve hydrograph. (8)

(OR)

b) i) Discuss in detail about Unit Hydrograph. (8)

ii) Write about the derivation of Unit Hydrograph. (8)

14. a) Describe the Gumbel's method for flood frequency analysis. (16)

(OR)

b) Explain briefly the various methods of flood control. (16)

15. a) i) Discuss the various types of aquifers. (8)

ii) Write a detailed note on Recuperation test. (8)

(OR)

b) i) Describe the Dupuit's assumptions and its uses in ground water hydrology. (8)

ii) Write short notes on Pumping Test. (8)

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VI Semester (Full Time)

(2018 Regulations)

COMPUTER SCIENCE AND ENGINEERING

18CSPE602 – Artificial Intelligence

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Give any two applications of Artificial Intelligence.
2. What are the functionalities of the agent function?
3. Discover what optimal solution is?
4. What is meant by Ridge?
5. Define Mental events.
6. Differentiate forward chaining and backward chaining.
7. List out the characteristics of multi agent systems.
8. What is a purely reactive agent?
9. Mention the characteristics of robot.
10. Compare Active sensors with Passive sensors.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)		Discuss in details about different types of Intelligent Agent.	(16)
			(OR)	
	b)		Explicate steps performed by problem solving agents and some example problems.	(16)
12.	a)	i)	Write short notes on breadth first search and Depth first search.	(10)
		ii)	Describe about Local search algorithms and its types.	(6)
			(OR)	
	b)	i)	Briefly explain about Alpha-Beta pruning with an example.	(10)
		ii)	Write short notes on game playing.	(6)

13. a) Explain in detail about forward chaining and backward chaining algorithms with an example. (16)

(OR)

b) Elaborate the following, (16)

i) Types of Knowledge representation.

ii) The mental events and mental objects related to knowledge representation.

14. a) i) Elucidate Commitment-Based Multi-agent Approach. (8)

ii) Examine the Argumentation among Agents. (8)

(OR)

b) i) Explain the Hybrid agents architecture with neat diagram. (8)

ii) Illustrate the concepts of trust and reputation in multi-agent systems with an example. (8)

15. a) i) Elaborate Information retrieval with the steps involved in information retrieval process. (8)

ii) Define Robotics. Discuss the various Hardware components required for a robot. (8)

(OR)

b) i) How does Natural Language Processing Works? Also mention the techniques used in NLP. (8)

ii) Illustrate the speech recognition system with an example. (8)

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VI Semester (Full Time)

(2018 Regulations)

ELECTRONICS AND COMMUNICATION ENGINEERING

18ECPE601 – Electronic Measurements

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. A Voltmeter reads 154 volts for a particular measurements. If the true value of the measurement is 156 volts, Determine the Percentage static relative error and static correction.
2. Mention the applications of Multimeter.
3. State the advantages of sine wave generator.
4. Differentiate wave analyzer and Harmonic Distortion.
5. State the principle of oscilloscope.
6. Enumerate the advantages of MSO.
7. Why there are two conditions of balance in AC bridge?
8. What type of errors can occur while using bridges?
9. Define gage factor.
10. Catalogue the elements of digital data acquisition system.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Describe the static characteristics of measuring instruments. (8)

ii) Enumerate the different types of errors possible in an instrument. (8)

(OR)

b) i) Explain the construction and working principle of DC voltmeter. (8)

ii) What is ohm meter? Discuss in detail about series type ohm meter. (8)

12. a) With a neat block diagram, explain in detail about sweep frequency generator. (16)

(OR)

b) Describe the block diagram of general purpose spectrum analyzer. Also explain the Phase-locked circuit for the first local oscillator of a spectrum analyzer. (16)

13. a) i) Explain the block diagram of general purpose oscilloscope. (10)

ii) Draw and explain the simplified block diagram of sampling oscilloscope. (6)

(OR)

b) i) With a neat diagram, describe the construction and working of digital storage oscilloscope. (10)

ii) Discuss the lissajous method of frequency measurement. (6)

14. a) i) With a neat circuit diagram, explain the Kelvin bridge for the measurement of low resistance. (8)

ii) Derive the bridge balance condition for Hay's bridge with neat sketch. (8)

(OR)

b) i) Explain the Wein bridge circuit for measurement of frequency. (8)

ii) Describe the working of Schering bridge for the measurement of capacitance with neat diagram. (8)

15. a) Describe the basic construction of LVDT and Piezo electric transducers with a neat sketch. (16)

(OR)

b) What is meant by multiplexing? Explain the digital-to-analog multiplexing and analog-to-digital multiplexing technique with necessary diagrams. (16)

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B.E. Degree Examinations – April/May 2023

VI & VII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE14 – Renewable Energy System

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is a thermal collector? State its types.
2. What do you understand by photovoltaic conversion.
3. What is meant by stalling?
4. Define performance coefficient related to wind machine.
5. Define biomass energy.
6. List any two applications of biogas.
7. State the limitations of OTEC plants.
8. State the basic principle of tidal energy production.
9. What are the applications of a geo thermal energy?
10. What are the main components of fuel cell?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)		Explain briefly about non-concentrating collectors types. List advantages and disadvantages.	(16)
			(OR)	
	b)		Give a brief description about PV applications.	(16)
12.	a)	i)	Illustrate the functions of different components of WECS, With a suitable block diagram.	(12)
		ii)	Discuss the different types of rotors used in wind turbine.	(4)
			(OR)	
	b)	i)	Classify the wind energy conversion systems.	(12)
		ii)	Explain "Wind energy collectors".	(4)
13.	a)	i)	Define biomass. Give a descriptive classification of biomass resource.	(12)
		ii)	Write short note on bio gasifiers.	(4)
			(OR)	

b) i) Explain the anaerobic digestion methods of biogas generation. (12)

ii) List the different methods of biogas plants in India. (4)

14. a) What are the main types of OTEC power plants? Describe their working in brief. (16)

(OR)

b) What is tidal power plant? With a neat diagram, explain single and double basin arrangement. (16)

15. a) Explain the principle and operations of power generation using geothermal energy. (16)

(OR)

b) What is fuel cell? Discus about various fuel cells and its applications. (16)

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B.E. Degree Examinations – April/May 2023

VI Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MTE31 – Non Metallic Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between the terms "Polymers" and "Plastics".
2. Calculate the degree of polymerization for CF_4 (C=12 g/mol, F=19 g/mol) having a molecular weight of 5,00,000 g/mol.
3. List the various applications of engineering plastics.
4. Write about creep in polymers.
5. What are the major differences between conventional and advanced ceramics?
6. Name any one ceramic used as i) an abrasive and ii) an insulator.
7. State the significance of critical fiber length.
8. Justify the statement – decrease in fiber diameter increases the ultimate strength.
9. How particulate reinforced composites differ from dispersion strengthened composites?
10. List four engineering applications of honeycomb structure composites.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Give a detailed account on the structure, properties and applications of PE and PS. (8)

ii) Discuss in detail about the various polymer additives and their purpose. (8)

(OR)

b) i) List the major differences in structure between thermoplastic and thermosetting plastic. Also, analyze its effect on the properties of the polymers. (8)

ii) Give a detailed account of Glass Transition Temperature (T_g) in polymers, mentioning the influence of T_g on the properties of polymers. (8)

12. a) i) Discuss in detail on the elastomers: types, properties and applications. (8)

ii) Explain with neat sketches any two techniques for processing of Thermoplastics. (8)

(OR)

b) i) Write a brief note on viscoelastic behavior of polymers. (8)

ii) Define the term 'crazing' in polymers. Explain how crazing occurs in polymers and mention its effect on the properties of polymers. (8)

13. a) i) Compare the physical, chemical and mechanical properties of metals, ceramics and polymers. (8)

ii) Briefly explain the production, properties and applications of Silicon carbide and SIALON. (8)

(OR)

b) i) List the various types of glasses. Explain the various glass production techniques with required sketches. (8)

ii) Compare float Glass with normal glass. Also, explain the production of float glass with a neat sketch. (8)

14. a) i) What is the need for a composite? Explain the role of matrix and fiber in a composite. (8)

ii) Explain why composite materials are the best solution for aerospace applications with a suitable sketch. (8)

(OR)

b) i) Derive the rule of mixtures for calculating the Young's modulus of an aligned fiber reinforced composite loaded parallel to the direction of fiber orientation. (8)

ii) Discuss any two techniques for producing fiber reinforced composites with simple sketches. (8)

15. a) i) Briefly explain about Dispersion strengthened composites. Also discuss about the effect of particle size and inter particle spacing on the properties of composites. (8)

ii) Explain in detail about the production techniques of Dispersion strengthened composites. (8)

(OR)

b) i) What is meant by hybrid composite? Also, explain the need for hybrid composites with a suitable example. (8)

ii) Name the composite with skeletal structural arrangement and explain it in detail. List its advantages and applications. (8)

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VI Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE12 – Design of Transmission Systems

(Usage of Approved design data book is permitted)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Distinguish between open drive and cross drive of a belt drive. Which is better?
2. Define the coefficient of friction. What do you mean by the angle of friction?
3. Why is the dedendum value more than the addendum value?
4. Differentiate between the involute and cycloid profiles.
5. Under what situation are bevel gears used?
6. Why is the efficiency of worm gear drive comparatively low?
7. Compare sliding mesh and synchromesh gearbox.
8. State any three basic rules to be followed while designing a gearbox.
9. Name any four profiles commonly used in cams.
10. Under what conditions is a uniform clutch rate of wear assumption more valid?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) A flat belt drive is required to transmit 24 kW from a motor running at 720 rpm. The belt is 12 mm thick and has a mass density of 0.001 gm/mm^3. Permissible stress in the belt is not to exceed 2.5 N/mm^2. The driving pulley's diameter is 250 mm, whereas the speed of the driven pulley is 240 rpm. The two shafts are 1.25 m apart, coefficient of friction is 0.25. Determine the width of the belt. (16)

(OR)

b) Design a V-belt drive and calculate the actual belt tension and average stress for the following data. Driven pulley diameter, D = 500 mm, driver pulley diameter, d =150 mm, center distance is 925 mm, speed N1 = 1000 rpm, N2 = 300 rpm and power, P = 7.5 kW. (16)

12. a) Design a spur gear pair to transmit 22.5 kW at 900 rpm. The speed reduction ratio is 2.5. The material for the pinion and wheel are C15 steel and cast iron grade 30, respectively. Take a pressure angle of 200, and the working life of the gear is 10,000 hours. (16)

(OR)

b) A helical gear with 30^0 helix angles must transmit 35 kW at 1500 rpm with a speed reduction ratio of 2.5. If the pinion has 24 teeth, determine the necessary module, pitch diameter, and face width for 20^0 full-depth teeth. Assume 15Ni 2Cr 1 Mo15 material for both pinion and wheel. (16)

13. a) Design a straight bevel gear drive between two shafts at right angles to each other is expected to work two hrs per day for ten years. The speed of the pinion shaft is 360 rpm, and the speed of the gear wheel shaft is 120 rpm. The pinion is made of steel, and the wheel is made of cast iron. (16)

(OR)

b) A hardened steel worm rotates at 1440 rpm and transmits 8 kW to a phosphor bronze gear with a gear ratio of 18. Design the worm gear drive and determine the power loss by heat generation. (16)

14. a) Design a 9-speed gearbox for the following data: minimum speed: 180 rpm, maximum speed: 1800 rpm. Draw the speed diagram and kinematic layout using the standard step ratio. Also, find the number of teeth on each gear. (16)

(OR)

b) A six-speed gearbox is required to provide output speeds of 125 to 400 rpm with a step ratio of 1.25 and transmit power of 5 kW at 710 rpm. Draw the speed diagram and kinematics diagram. Determine the number of teeth modules and face width of all gears, assuming suitable materials for the gears. Determine the length of the gearbox along the axis of the gear shaft. (16)

15. a) Effective on both sides, a single plate sketch is required to transmit 25 kW at 3000 rpm. Determine the outer and inner diameter of frictional surfaces if the coefficient of friction is 0.25, the diameter ratio is 1.25, and the maximum pressure is not to exceed 0.1 N/mm^2. Determine i) the face width required and ii) the axial spring force necessary to engage the clutch. (16)

(OR)

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

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VI Semester (Full Time)

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CIVIL ENGINEERING

18CEPE07 – Repair and Rehabilitation of Structures

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define maintenance.
2. List the causes of deterioration.
3. How will you control cracks in structure?
4. Recommend any two tests to assess frost damage.
5. Comment on the emergence of special concrete.
6. Why curing compounds are used nowadays?
7. Define strengthening of structures.
8. Mention any two repair techniques for a damaged structure.
9. List any four methods of demolition.
10. How safely demolition is carried out?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	How will you assess and evaluate a damaged structure? Explain with the help of a flow diagram.	(16)
		(OR)	
	b)	Enumerate on quality insurance.	(16)
12.	a)	What is the first sign of damage in any structure? Suggest the methods to measure it.	(16)
		(OR)	
	b)	Highlight on the effects of errors in construction practice in detail.	(16)
13.	a)	Suggest the concrete to be used in congested reinforcement and explain in detail.	(16)
		(OR)	
	b)	Suggest a suitable technique to resist corrosion in building reinforcement.	(16)

14. a) How will you identify first stage of distress? What measures you recommend for repairing it? (16)

(OR)

b) At what stage strengthening process is recommended? Comment. (16)

15. a) Which demolition technique is preferred in site? Highlight. (16)

(OR)

b) A building has to be demolished since it is structurally weak. Recommend suitable technique to do demolition and explain in detail. (16)

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MECHANICAL ENGINEERING

18MEPE17 – Operations Research

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define the terms: Objective function.
2. State the purpose of artificial variable in simplex method.
3. What is the optimality in transportation problem?
4. How does an assignment problem differ from a transportation problem?
5. What is the difference between slack and float?
6. Distinguish between PERT and CPM.
7. What is an individual replacement policy?
8. Mention any two assumptions made while dealing with sequencing problems.
9. What is the meaning of [(M/M/1): (LCFS/∞/∞)]?
10. What are the advantages of simulation techniques?

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Solve the following problem by simplex method: (16)

Maximize $Z = 3X_1 + 2X_2 + 5X_3$

Subject to $X_1 + X_2 + X_3 \leq 9$

$2X_1 + 3X_2 + 5X_3 \leq 30$

$2X_1 - X_2 - X_3 \leq 8$

$X_1, X_2, X_3 \geq 0$

(OR)

b) Solve the following problem by using Big- M technique: (16)

Minimize $Z = 3X_1 + 5X_2$

Subject to $2X_1 + 8X_2 \geq 40,$

$3X_1 + 4X_2 \geq 50,$

$X_1, X_2 \geq 0$

12. a) Given below is the unit costs array with supplies a_i = 1, 2, 3 and demands b_j = 1, 2, 3 and 4 (16)

Source		Sink				
		1	2	3	4	a_i
	1	8	10	7	6	50
	2	12	9	4	7	40
	3	9	11	10	8	30
	b_j	25	32	40	23	120

Find the optimal solution to the above problem.

(OR)

b) A company has one surplus truck in each of the cities A, B, C, D and E and one deficit truck in each of the cities 1, 2, 3, 4, 5 and 6. The distance between the cities in kilometers is shown in the matrix below. Find the assignment of trucks from cities in surplus to cities in deficit so that the total distance covered by vehicles is minimum. (16)

	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

13. a) The table shown below list all the activities which together constitute a small engineering project. The table also shows the necessary immediate predecessors for each activity. (16)

Activity	Immediate predecessor	Activity Duration (days)	Activity	Immediate predecessor	Activity Duration (days)
A	-	2	F	C,D	3
B	A	3	G	D	4
C	A	4	H	B	7
D	A	5	I	E,F,G	2
E	B	6	J	G	3

a) Construct an activity network.
b) Determine the earliest finish date for the entire project, assuming the project begins at day 0.
c) The total float for each activity
d) The Critical path
e) The latest start day for activity B
f) The earliest finish date for activity F
g) The effect on the project duration if activity I were to take 3 days
h) The effect on the project duration if activity F were to take 6 days

(OR)

b) A project schedule has the following characteristics as shown in table below: (16)

Activity	Name	Time	Activity	Name	Time
1–2	A	4	5-6	G	4
1-3	B	1	5-7	H	8
2-4	C	1	6-8	I	1
3-4	D	1	7-8	J	2
3-5	E	6	8-10	K	5
4-9	F	5	9-10	L	7

1. Construct a network diagram
2. Compute TE and TL for each activity
3. Find the critical path.

14. a) A computer has 20000 resistors. When any of the resistors fail, it is replaced. The cost of replacing a resistor individually is Rs.1. If all the resistors are replaces at the same time the cost per resistor is reduced to be Rs.0.40. The percentage surviving at the end of month t, and the probability of failure during the month are given below: (16)

	0	1	2	3	4	5	6
Percentage surviving at the end of t	100	96	90	65	35	20	0
Probability of failure during month t	-	0.04	0.06	0.25	0.30	0.15	0.20

(OR)

b) There are four jobs of each of which has to be processed on machines A, B, C, D, E and F in the order A B C D E F. Processing time in hours is given below. Find out the optimal sequencing of jobs, minimum time required to process these jobs and the idle time for each of the machines. (16)

Job	A	B	C	D	E	F
1	15	8	6	14	6	26
2	17	7	9	10	15	22
3	21	7	12	9	11	19
4	18	6	11	12	14	17

15. a) Customers arrive at a one-window drive-in bank according to poisson's distribution with mean 10 per hour. Service time per customer is exponential with mean five minutes. The space in front of the window including that for the serviced car can accommodate a maximum of three cars. Others can wait outside this space. (16)

i) What is the probability that an arriving customer can directly to the space in front of the window?

ii) What is the probability that an arriving customer will have to wait outside the indicated space?

iii) How long is an arriving customer expected to wait before starting service?

(OR)

b) The distribution of interarrival times in a single server model is (16)

T	:	1	2	3
f(t)	:	1/4	1/2	1/4

and the distribution of service times is

S	:	1	2	3
f(s)	:	1/2	1/4	1/4

Compute the following table, using the two digit random numbers 11, 20, 47, 68, 90, 62 and 35 to generate arrivals and 15, 86, 20, 42, 11, 36 and 48 to generate corresponding service times.

Arrivals	Arrival time	Time service begins	Time service ends	Waiting time in queue
1				
2				
3				
4				
5				
6				
7				

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VI & VIII Semester (Full Time)

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ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP19 – Special Electrical Machines

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by reluctance torque in synchronous reluctance motor?
2. What are the main differences between the axial and radial air gap synchronous reluctance motors?
3. What are the advantages and disadvantages of BLDC motor?
4. Why the permanent magnet brushless DC motor is called electronically commutated motor?
5. What are the assumptions made in the derivation of emf equation for permanent magnet synchronous motor?
6. Distinguish between self-control and vector control of permanent magnet synchronous motor.
7. What are the effects of saturation in switched reluctance motor?
8. What are the different types of power controllers used in the control of switched reluctance motor?
9. Define holding torque and detent torque.
10. What are the applications of stepper motor?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the principle of operation and construction features of synchronous reluctance motor with neat diagrams. (16)

(OR)

b) Describe the principle of operation of vernier motor and discuss about the air gap permeance distribution in detail. (16)

12. a) Derive the emf and Torque equation of a Brushless permanent magnet square wave motor. (16)

(OR)

b) Explain the classification of PMBLDC motor based on the number of phase windings and number of pulses given. (16)

13. a) Explain the construction and working principle of operation of PMSM. (16)

(OR)

b) Explain the microprocessor based control of PMSM with a neat block diagram. (16)

14. a) What are the different types of power controllers used for SRM and explain any three topologies in detail? (16)

(OR)

b) Discuss about the relationship between stator inductance and rotor in SRM. (16)

15. a) Explain the modes of excitation of a stepper motor with neat diagram. (16)

(OR)

b) Explain in detail, the static and dynamic characteristics of a stepper motor. (16)

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VI & VIII Semester (Full Time)

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METALLURGICAL ENGINEERING

18MTE61- Nano Materials

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are zero, one and two dimensional nano structures?
2. Give a brief note on the magnetic structure of nano materials.
3. What are the different types of nano material synthesis process?
4. What is high energy ball milling process?
5. List the Applications of Nanotechnology in electronics.
6. What is Carbon fullerenes?
7. Write short note on Nano medicines.
8. What is nano crystalling diamond film?
9. Write principle of atomic force microscopy.
10. On which concept the Raman spectroscopy is working?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What is Nano technology? Enumerate the challenges of Nano technology. (8)

    ii) Describe the effects of nano scale dimensions on various properties of nano structures. (8)

(OR)

    b) i) Explain in detail opto electonic properties of nano structured materials. (8)

    ii) Explain how the thermal properties of nano materials can be evaluated using a suitable characterization techniques. (8)

12. a) i) What are the significance of top down and bottom up approaches? Give examples for each process. (8)

    ii) With a suitable sketch, explain the photo lithography process. (8)

(OR)

b) i) Describe CVD with a neat sketch. (8)

ii) Explain in detail the synthesis procedure of nano materials by Sol-Gel process with appropriate examples. (8)

13. a) i) Discuss the applications of Nano technology in nano electronics. (8)

ii) Explain the importance nanosensors in electronics industries. (8)

(OR)

b) i) Briefly explain quantum dot fabrication and its applications. (8)

ii) Discuss the applications of Nano fluids in automobile industries. (8)

14. a) Discuss the applications of Nano technology in energy and environment. (16)

(OR)

b) i) Describe in detail the synthesis procedure of carbon nano tubes. (8)

ii) Discuss the properties of CNT. Also give the applications of CNTs. (8)

15. a) Explain how to characterize the structural behavior of material using scanning electron microscope (SEM) with a neat sketch. (16)

(OR)

b) Describe the principle and different working modes of AFM and its advantages. (16)

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VII & VIII Semester (Full Time)

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CIVIL ENGINEERING/MECHANICAL ENGINEERING

18MTOE04 – Nano Science and Technology

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is the importance of surface area to volume ratio in nano technology?
2. What is the effect of size on melting point of nano particles?
3. Name the technique(s) used to produce (i) nano aluminium particles and (ii) nano titania particles.
4. What is graphene?
5. State any two techniques used for producing Clay based nanocomposites.
6. Differentiate between conventional composites and nanocomposites.
7. Dynamic Light Scattering is used for determining the particle size distribution. Yes or No. Justify your answer.
8. What is the principle of AFM?
9. What are SMART materials?
10. What is the use of nano technology in LEDs?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the importance of nano science and technology in industrial and social developments. (16)

(OR)

b) Explain the effect of nano size in mechanical and electrical properties of materials. (16)

12. a) With sketches, briefly explain any two approaches used for synthesizing nano materials. (16)

(OR)

b) Explain the procedure for synthesis and purification of carbon nanotubes. (16)

13. a) Explain the procedure for manufacturing CNT-polymer composites and their applications. (16)

(OR)

b) Explain any one method used for consolidation of nanomaterials. (16)

14. a) Explain any one method for characterizing the surface of nano materials. (16)

(OR)

b) Explain any one technique used to determine the size and shape of nano particles. (16)

15. a) Explain the electronic and biomedical applications of nano materials. (16)

(OR)

b) Explain any four applications of nano materials with examples. (16)

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VIII Semester (Full Time)

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CIVIL ENGINEERING

18CEPE23 – Prestressed Concrete Structures

(IS 1343 shall be permitted and assume suitable data wherever required)

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Recall the Principles of prestressed concrete beam.
2. What is load balancing method?
3. Define: Anchorage slip.
4. List out the influencing parameters for the deflection of prestressed concrete structures.
5. How to improve the bond strength in concrete structure?
6. Show the expression of minimum Prestressing force and eccentricity.
7. Define: Bursting tension.
8. What is the role of end block in prestressed concrete structure?
9. Define: Partial prestressing.
10. What is concordant profile?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) A prestressed concrete beam, 250 mm wide and 350 mm deep, is used over an effective span of 5 m to support an imposed load of 5 kN/m. The density of concrete is 24 kN/m^3 at the quarter span section of the beam, find the magnitude of the concentric prestressing force necessary for zero fibre stress at the soffit when the beam is fully loaded. (8)

ii) A concrete beam of rectangular c/s 350 mm wide by 700 mm deep supports an UDL of 20 kN/m in addition to its self-weight. Suggest a suitable cable profile and the prestressing force having an eccentricity of 200 mm at centre of span to support the dead load and live loads. (8)

(OR)

b) i) What is the necessity to prefer high strength materials in prestressed concrete structures? (8)

ii) Enumerate any one method of prestressing briefly with neat sketches. (8)

12. a) i) A concrete beam with cross-sectional area of 36 X 10^3 mm^2 and the radius of gyration is 76 mm is prestressed by a parabolic cable carrying an effective stress of 1200 N/mm^2. The span of the beam is 6 m. The cable composed of 6 wires of 7 mm diameter, has an eccentricity of 60 mm at the centre and zero at the supports. Neglecting all losses, find the central deflection of the beam as follows: self-weight + prestress. (8)

ii) A simply supported concrete beam of span 8 m and rectangular cross section 125 mm wide and 250 mm deep, is prestressed by a single cable in which the total tensile force is 220 kN. The center line of the cable is parallel to the axis of the beam and 75 mm above the soffit over the middle – third of the span and is curved upward in a parabola over the outer – thirds of the span to 175 mm above the soffit at the supports. If E_C = 35 kN/mm^2 and density of concrete is 24 kN/m^3. Calculate: (8)

1. The upward deflection at mid-span due to prestress only,
2. The deflection when the beam is supporting its own weight, and the magnitude of concentrated loads Q placed at third points of the span, which would result in a limiting short-term deflection of span/500.

(OR)

b) i) A concrete beam is pre-stressed by a cable carrying an initial pre-stressing force of 500 kN. The cross-sectional area of the wires in the cable is 300 mm^2. Calculate the percentage loss of stress in the cable only due to shrinkage of concrete using IS: 1343 recommendations assuming the beam to be pre-tensioned. Assume Es = 210 kN/mm^2 and age of concrete at transfer = 7 days. (8)

ii) A concrete beam of rectangular section, 100 mm wide and 300 mm deep, is pre-stressed by five wires of 7 mm diameter located at an eccentricity of 50 mm, the initial stress in the wires being 1200 N/mm^2. Estimate the percentage loss of stress in steel due to creep of concrete using the ultimate creep strain method and the creep coefficient method (IS: 1343-1980). Use the following data:
$E_s = 210\ kN/mm^2$; $E_c = 35\ kN/mm^2$; $I = 225 \times 10^6\ mm^4$;
Ultimate creep strain $\varepsilon_{cc} = 41 \times 10^{-6}$ mm/mm per N/mm^2,
Creep coefficient (φ) = 1.6. (8)

13. a) i) A pretensioned, T-section has a flange 1000 mm wide and 125 mm thick. The width and depth of the rib are 350 and 1500 mm respectively. The high tensile steel has an area of 4500 mm^2 and is located at an effective depth of 1400 mm. If the characteristic cube strength of the concrete and the tensile strength of the steel are 40 and 1600 N/mm^2 respectively; calculate the flexural strength of the T-section. (8)

ii) A prestressed concrete T beam is to be designed to support an imposed load of 4.4 kN/m over an effective span of 5 m. The T beam is made up of a flange 400 mm wide and 40 mm thick. The rib is 100 mm wide and 200 mm deep. The stress in concrete must not exceed 15 MPa in compression and zero in tension at any stage. Check for the adequacy of the section provided and calculate the minimum prestressing force necessary and the corresponding eccentricity. Assume 20% loss of prestress. (8)

(OR)

b) i) Explain the step-by-step design procedure for prestressed structures under shear with neat sketches. (8)

ii) Enumerate the procedure to improve bond strength in prestressed structures with neat sketches. (8)

14. a) The end block of a post tensioned PSC beam is 200 mm wide and 300 mm deep. The beam is post tensioned by two Freyssinet anchorages each of 100 mm diameter with their centres located at 65 mm from top and bottom of the beam. The force transmitted by each anchorage being 1000 kN. Compute the bursting tension and design the anchorage zone with neat sketches according to IS 1343 code provisions. (16)

(OR)

b) Construct the anchorage zone with salient points as per Magnel's method. (16)

15. a) i) Explain the advantages of composite construction. (8)

ii) Enumerate the design procedure of prestressed concrete pipes. (8)

(OR)

b) A precast pre tensioned beam of rectangular section has a breadth of 150 mm and depth of 300 mm. The beam with an effective span of 7 m is prestressed by tendons with their centroids coinciding with the bottom kern. The initial force in the tendon is 125 kN. The loss of the prestress may be assumed to be 15%. The beam is incorporated in a composite T beam by casting a top flange of breadth 450 mm and thickness 60 mm. If the composite beam supports a live load of 10 kN/m^2, calculate the resultant stress developed in the precast and in situ cast concrete assuming the pre tensioned beam as (16)

i) unpropped

ii) propped during the casting of the slab.

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ELECTRONICS AND COMMUNICATION ENGINEERING

18ECPE811 – Bio-Medical Electronics

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Action Potential.
2. What is EOG?
3. Define Cardiac Output.
4. What is the use of Ultrasound method?
5. Compare CT and MRI system.
6. List the advantages of PET.
7. What is meant by fibrillation?
8. Write some application of LASER in medicine.
9. Define let-go current.
10. What is Spectrophotometry?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	i)	Explain Polarization, Depolarization the Repolarization.	(8)
		ii)	What are Bio-potential electrodes? Discuss the different types of Electrodes used in bio-potential measurement.	(8)
			(OR)	
	b)	i)	With neat block diagram explain the working of ECG machine.	(8)
		ii)	Discuss in detail 10-20 Electrode placement system for measuring EEG signals.	(8)
12.	a)	i)	Write short notes on Audiometer.	(8)
		ii)	Explain the methods used for Pulse measurement.	(8)
			(OR)	
	b)	i)	Explain Lung Volume measurement with diagram.	(8)
		ii)	Explain Blood pressure measurement in detail.	(8)

13. a) With block diagram explain the principle and operation of Computed Tomography. (16)

(OR)

b) With block diagram explain the principle and operation of MRI system. (16)

14. a) Discuss briefly about working of Cardiac pacemaker. (16)

(OR)

b) With neat diagram explain the principle and operation of Hemodialysis. (16)

15. a) Discuss briefly about the importance and strategies involved for Electrical safety in hospitals. (16)

(OR)

b) Describe the working and construction of the Automatic Chemical Analyzer. (16)

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CIVIL ENGINEERING

18CEPE01 – Traffic Engineering

Time : 3 Hours | Maximum Marks : 100

Part A

(10 x 2 = 20 Marks)

Answer ALL Questions

1. Define skid resistance.
2. State the components of traffic Engineering.
3. What is meant by parking survey?
4. What are the effects of road accidents on human?
5. Explain danger signs in two sentences.
6. List different lighting layout.
7. Distinguish between intersections and interchanges.
8. List out any four regulatory signs.
9. What is TSM?
10. Write any two advantages of closing side streets.

Part B

(5 x 16 = 80 Marks)

Answer ALL Questions

11.	a)	Explain about the vehicle performance characteristics.	(16)
		(OR)	
	b)	Write in detail about on land use transport integration.	(16)
12.	a)	Explain in details different methods of origin and destination studies	(16)
		(OR)	
	b)	Write the various methods of traffic accident mitigation.	(16)
13.	a)	Explain advantage and disadvantage of various traffic signals.	(16)
		(OR)	
	b)	Explain street lighting with its objectives.	(16)
14.	a)	Explain in detail the channelization of intersection and its purposes with neat sketches.	(16)
		(OR)	
	b)	With a neat sketch explain four arm rotary intersection.	(16)

15. a) Explain briefly various traffic management regulatory measures commonly implemented. (16)

(OR)

b) Explain the applications of intelligent transportation system. (16)

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COMPUTER SCIENCE AND ENGINEERING

18CSPE804 – Mobile Computing

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What are the characteristics of mobile computing?
2. What is hidden and exposed terminal problem? How it can be eliminated?
3. Define COA and mention the types of COA.
4. State the use of port address and mention some well known ports.
5. What are the services provided by the GSM?
6. In what way UMTS networks differ from 2G networks?
7. What are proactive and reactive routing protocols?
8. Compare MANET and VANET.
9. What are the advantages of Microkernel design approach over Monolithic design approach?
10. What are the security issues in M-Commerce?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) State the three-tier structure of a mobile computing application. Also explain the functionalities defined in each tier with clear diagram. (8)

ii) How RTS and CTS are helpful in reservation schemes? Explain how MAC issues are solved by the MACA reservation protocol? (8)

(OR)

b) i) Explain different fixed assignment MAC protocols in detail. (8)

ii) Compare how CSMA schemes MAC protocol differs from ALOHA with their pros and cons? (8)

12. a) What are the Key mechanisms in Mobile IP? Explain each in detail. (16)

(OR)

b) List down the improvement in TCP for mobile networks over wired networks. Briefly discuss the various TCP improvements. (16)

13. a) What are the three main subsystems in GSM architecture? Draw and explain each entity in GSM. (16)

(OR)

b) Explain the architecture of GPRS with neat diagram. (16)

14. a) With sample network diagram explain the table driven DSDV routing protocol in detail. (16)

(OR)

b) Explain the route discovery and route maintenance of Dynamic Source Routing Protocol with an example. (16)

15. a) i) Explain the generations and features of Windows mobile operating system. (8)

ii) Draw and explain the layers in Android software stack. (8)

(OR)

b) i) Discuss about Android SDK Environment and Android Application Components. (8)

ii) Explain the most popular Mobile Payment Systems. (8)

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ELECTRONICS AND COMMUNICATION ENGINEERING

18ECPE806 – Wireless Sensor Networks

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. What is meant by energy scavenging in wireless sensor networks?
2. What is dynamic voltage scaling?
3. List the factors that influence physical layer design in WSNs.
4. What is wake up radio concept?
5. Write the need for time synchronization in wireless sensor networks.
6. Define localization.
7. List the three main options for topology control in WSNs.
8. Define accuracy and latency in data aggregation.
9. List the sensor network programming challenges.
10. Define component in nesC.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Discuss the characteristic requirements and the required mechanisms to realize the requirements of wireless sensor networks. (10)

ii) Bring out the differences between mobile ad-hoc networks and wireless sensor networks. (6)

(OR)

b) i) Elucidate on the potential applications of wireless sensor networks. (10)

ii) Discuss on operation states with different power consumption. (6)

12. a) Explain the design approaches and performance of S-MAC protocol. (16)

(OR)

b) Write short notes on (16)

i) Assignment of MAC addresses for WSN

ii) The mediation device protocol.

13. a) Explain the Lightweight Time Synchronization (LTS) protocol to synchronize the clocks of a sensor network. Also compare LTS protocol with Timing-synch protocol for sensor networks (TPSN). (16)

(OR)

b) Elaborate on the approaches used for positioning in multihop environments in wireless sensor networks. (16)

14. a) Write short notes on LEACH, pilot-based power control, ANDA and CLUSTERPOW. (16)

(OR)

b) i) Give an overview on data centric storage. (8)

ii) Write the techniques for adaptive node activity. (8)

15. a) Discuss in detail the node-level software platforms. (16)

(OR)

b) Explain with a suitable example the state-centric programming for sensor networks. (16)

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MECHANICAL ENGINEERING

18MEPE65 – Design of Production Tooling

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Classify the various angles in cutting tool.
2. Write any two advantages and limitations of broaching.
3. Name the various cutting tool materials.
4. What do you understand by the term "Tool Designation or Tool Signature"?
5. Define stack clamping.
6. State the use of grinding fixtures.
7. What is the function of jig bushes?
8. Give the names of any four types of jigs.
9. What is a progressive die? When should a progressive die be used?
10. List down the various methods of arranging guide pins in the die set.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Concept of rake and clearance angles of cutting tools. (8)

ii) Explain Nomenclature of a single point cutting tool with neat sketches. (8)

(OR)

b) i) During an orthogonal cutting a chip length of 160 mm was obtained from an uncut chip length of 350 mm. The cutting tool has 22° rake angles and a depth of cut is 0.8 mm. Determine the shear plane angle and chip thickness. (8)

ii) Describe the forms of wears on the cutting tool with neat sketches. (8)

12. a) i) Explain various classifications of machine tools. (8)

ii) Describe the mechanism of metal cutting. (8)

(OR)

	b)	i)	What are the importance of economics of machining in detail?	(8)
		ii)	With a neat sketch, describe the different types of a boring bar.	(8)
13.	a)	i)	Discuss the basic principles of location and clamping methods of jigs.	(8)
		ii)	With neat sketches explain the assembly and and inspection fixtures.	(8)
			(OR)	
	b)	i)	Briefly explain the construction and working of faceplate turning fixture.	(8)
		ii)	Explain briefly 3-2-1 location of principle.	(8)
14.	a)	i)	With neat sketches explain the uses of plate and channel jigs.	(8)
		ii)	Briefly explain about different tool holding devices in drilling.	(8)
			(OR)	
	b)	i)	With neat sketches explain the uses of Turnover and Box jigs.	(8)
		ii)	Explain automatic drill jigs mechanisms with sketch.	(8)
15.	a)	i)	Select the proper stripper springs for a compound die. The work piece material is 1020 steel and thickness is 3.25 mm, with a blanking perimeter of 70 mm, Consider the free length of the spring to be 51 mm.	(8)
		ii)	With a neat sketch explain the drawing operations.	(8)
			(OR)	
	b)	i)	Explain the step-by-step procedure for the computation of capacities and tonnage Requirements for drawing operation by assuming a suitable example.	(8)
		ii)	Differentiate between compound die and progressive die.	(8)

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CIVIL ENGINEERING

18CE801 – Construction Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Define Work task.
2. What are the relationships considered among construction activities?
3. Compare Activity on Arrow system with Activity on Node System
4. Indicate the different advanced scheduling techniques.
5. How to do cost control in construction projects?
6. Show the cost performance index and mention its significance.
7. List the different safety measures are to be checked before starting construction work.
8. Why sampling is to be done during Quality Control?
9. How will you check the accuracy of project information? Justify.
10. What is the purpose of doing information transfer?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Describe the main concepts considered and documents required during planning of construction projects. (16)

(OR)

b) Identify the parameters involved in estimation of activity duration. Also estimate activity duration and resource requirements for 10 m^3 of earthwork excavation. (16)

12. a) Draw the network for the given project. Find the Critical path. Calculate Earliest Start Time, Earliest Finish Time, Latest Start Time, Latest Finish Time. Also find different floats. (16)

Node	1-2	1-3	1-4	2-6	3-4	3-5	3-6	4-5	5-6
Duration	3	4	14	5	2	4	6	1	1

(OR)

b) Write a detailed note on (16)

1. Resource Oriented scheduling.
2. Scheduling with resource constraints.

13. a) Prepare project budget for concrete pavement construction work of 1km length. (16)

(OR)

b) Illustrate the roles and responsibility of financial accounting system. (16)

14. a) Explain the significance, tools and techniques used for quality control. (16)

(OR)

b) Describe the various sampling methods followed to control the quality. Also represent the acceptance criteria. (16)

15. a) Outline the steps involved in organising suitable information in construction projects. (16)

(OR)

b) Describe the database management system with suitable applications in construction industry. (16)

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COMPUTER SCIENCE AND ENGINEERING

18CSPE802 – Business Intelligence and its Applications

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate between business intelligence and business analytics.
2. State the BI value chain.
3. What are the different types of Digital data?
4. State the different types of OLAP.
5. How is an "Operational Data Store" different from a Data Warehouse? Justify.
6. How is data integrity different from data quality? Justify.
7. Differentiate between ER-Modeling and Multi dimensional Modeling.
8. State the modified balanced scorecard?
9. Differentiate between balanced scorecard and Dashboards.
10. Illustrate with a neat diagram, map the metrics to business phases.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Discuss the Malcolm Baldrige Criteria for performance Excellence framework. (16)

(OR)

b) Why do we need core business function? Explain in detail about the Core Business functions. (16)

12. a) Elaborate briefly about BI roles and responsibilities. (16)

(OR)

b) i) Describe the important features of BI. (8)

ii) Explain the role of DSS, EIS, MIS and digital dashboards. (8)

13. a) i) Discuss the various stages in ETL process with neat diagram. (8)

ii) Illustrate with suitable example about the two main approaches to data Integration. (8)

(OR)

b) What is Data Profiling? When and how to conduct data profiling? Mention the major advantages of data profiling. (16)

14. a) Design a Multidimensional Data Modelling (MDDM) for day to-day application like hospital, library, organization etc., (any one application). Construct MDDM for the Case Studies. (16)

i) Star schema

ii) Snowflake schema

iii) Fact Constellation schema

iv) Data cube

v) Concept hierarchy.

(OR)

b) Explain briefly about business metrics and KPIs. (16)

15. a) Explain the steps in creating dashboards? Discuss briefly about the various types of dashboards? (16)

(OR)

b) Take any enterprise or organization, design Balance scorecard and Dashboards visually. (16)

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ELECTRONICS AND COMMUNICATION ENGINEERING

18ECPE802 – Multimedia Compression Techniques

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. A source image file of size 310 x 310 pixels is compressed in to a file with 19,220 pixels. Calculate the compression ratio.
2. Write any three techniques for lossy compression.
3. Give some applications of LZW.
4. When a prefix code can be considered as optimum prefix code?
5. If we violate the Nyquist rule what would happen? Suggest a method to avoid the effect.
6. What is the purpose of vocoder? List the various types of vocoders.
7. What is the basic idea behind the transform coding?
8. Write short notes on JBIG standards.
9. Compare MPEG1 and H.261
10. What are the profiles in MPEG-2 video standards?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) What is the need for quantization? Briefly discuss about scalar and vector quantization with necessary diagrams and mention the advantages of vector quantization over scalar quantization. (16)

(OR)

b) What is data compression and why do we need it? Classify the compression technique and discuss. (16)

12. a) Explain Lempel Ziv Welch Compression technique with a suitable example and encode the following sequences using LZW algorithm: "wabbacwabba". (16)

(OR)

b) With the flow chart, explain the steps involved in the updating procedure of Adaptive Huffman coding algorithm and design a Huffman code for a source that puts out letters from an alphabet A = {a1, a2, a3, a4, a5} with P(a1) = P(a3) = 0.2, P(a2) = 0.4, and P(a4) = P(a5) = 0.1. Calculate the entropy and find the length of this code. (16)

13. a) Brief about the MPEG audio coding algorithm with neat sketch. (16)

(OR)

b) With the block diagram, enumerate the sub band coding algorithm. How sub band coding is applied to speech coding? Explain with G.722. (16)

14. a) Explain the steps involved in EZW image coding algorithm with an example. (16)

(OR)

b) Discuss the techniques of DPCM with neat diagram. What are the advantages of ADPCM over DPCM? (16)

15. a) Describe the principle of MPEG 4 with diagrams of encoder and decoder. (16)

(OR)

b) Explain the different types of frames in video compression principles. (16)

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ELECTRICAL AND ELECTRONICS ENGINEERING

18EEP23 – Industrial Electrical Systems

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Differentiate MCCB and ELCB.
2. What is the function of isolator switch?
3. What is the necessity of earthing?
4. List the factors affecting the selection of wiring.
5. Define luminous intensity.
6. What is meant by waste light factor?
7. Draw power triangle.
8. What is the necessity of power factor correction in power system?
9. What is the function of PLC in automation systems?
10. List the advantages of process automation.

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) What are the factors to be considered in the selection of wires and cables for LT system wiring? (8)

ii) Explain briefly about the operation of fuse and also explain the inverse characteristics of fuse. (8)

(OR)

b) i) A plant costs Rs.80,000 and has a useful life of 15 years. If the salvage value of the equipment is Rs.5,000 determine the amount which should be saved annually to replace the equipment at the end of the time by (8)

i) the straight line method

ii) the sinking fund method. Assuming the annual rate of compound interest is 5%.

ii) Discuss about Electrical safety practices. (8)

12. a) i) Explain the various types of residential wiring system. (8)

ii) Discuss about the rules and guidelines of electrical installation. (8)

(OR)

b) i) Explain the necessity of distribution board and protective devices in residential wiring. (8)

ii) Explain how to choose the lighting scheme and number of lamps for a residential building. (8)

13. a) i) Discuss briefly about the construction and principle of operation of incandescent lamp. (8)

ii) Discuss briefly about the construction and principle of operation of CFL lamp. (8)

(OR)

b) i) An illumination on the working plane of 32 lux is required in a room 80 mx15 m. The lamps are required to be hung 4.5 m above the work bench. Assume a utilization factor of 0.5, lamp efficacy of 14 lumens per watt and candle power depreciation of 0.2, estimate the number rating and disposition of the lamps. Assume a suitable value of space ratio. (8)

ii) Discuss briefly about the flood lighting. (8)

14. a) i) Describe briefly the operation of the industrial substation. (8)

ii) An alternator is supplying a load of 300 kW at a p.f. of 0·6 lagging. If the power factor is raised to unity, how many more kilowatts can alternator supply for the same kVA loading? (8)

(OR)

b) i) Describe briefly the operation of the industrial loads. (8)

ii) Describe briefly the operation of the LT panel components. (8)

15. a) With an example explain briefly about the operation of PLC based control system design. (16)

(OR)

b) With an example explain briefly about the operation of SCADA system for distribution automation. (16)

Register Number :

Government College of Engineering :: Salem

(An Autonomous Institution Affiliated to Anna University, Chennai)

B.E. Degree Examinations – April/May 2023

V & VIII Semester (Full Time)

(2018 Regulations)

MECHANICAL ENGINEERING

18MEPE53 – Nuclear Engineering

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Compare nuclear reaction with chemical reaction.
2. What is radioactivity?
3. Write the nuclear reaction with thorium 292 with neutron.
4. Name any three-thorium isotope.
5. Define core burnup.
6. Why voloxidation is important?
7. Identify the heat exchanging mediums used for breeder reactor.
8. Define doubling time.
9. What is Ingestion hazard index?
10. What are the general requirement of a solidification product against destructive influences?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) Explain the nuclear chain reaction and balancing of nuclear reaction. (16)

(OR)

b) Describe the classification of radioactivity decay with suitable illustration. (16)

12. a) Discuss in detail about Caustic soda process of uranium extraction from its ore. (16)

(OR)

b) Describe the thorium purification by solvent extraction method with a schematic diagram. (16)

13. a) Explain the requirements of dissolution process and write the dissolution equations for uranium metal and its combinations. (16)

(OR)

b) Describe the multistage counter current SX bank with suitable schematic diagram. Mention its advantages. (16)

14. a) Explain the working fast breeder reactor with neat diagram. What are the advantages of using liquid sodium for exchanging heat. (16)

(OR)

b) Compare contrast the construction and working of BWR and PWR. (16)

15. a) Discuss the various alternate ways of nuclear fuel disposal. (16)

(OR)

b) Describe the important safety systems followed in the nuclear power plant. (16)

Register Number :

Government College of Engineering :: Salem

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B.E. Degree Examinations – April/May 2023

VIII Semester (Full Time)

(2018 Regulations)

METALLURGICAL ENGINEERING

18MT801 – Total Quality Management

Time : 3 Hours | Maximum Marks : 100

Part A (10 x 2 = 20 Marks)

Answer ALL Questions

1. Give the basic concepts of TQM.
2. What is QMS?
3. Write down the categories of quality costs.
4. Define calibration.
5. State the primary objectives of Six Sigma.
6. Give the applications of Business Process Reengineering.
7. Mention the purpose of control chart.
8. Define is Cost/Time diagram.
9. Differentiate Classical and Industrial approach of employee involvement.
10. How an employee is involved in TQM?

Part B (5 x 16 = 80 Marks)

Answer ALL Questions

11. a) i) Explain in detail the various principles of TQM. (8)

ii) Describe the various dimensions of quality with its necessity and mention its advantages. (8)

(OR)

b) i) Explain briefly the Bench marking process and its types. (8)

ii) Discuss the objectives and different policies of a quality. (8)

12. a) i) Explain the measures of performance in evaluating the success of an organization. (8)

ii) Discuss the techniques for presenting performance measures. (8)

(OR)

b) i) Write a technical note on Appraisal and Failure costs. (8)

ii) Explain the role of Quality Control. (8)

13. a) Write the fourteen steps of Deming's philosophy for improving quality, productivity and competitiveness. Explain each step with a suitable engineering example. (16)

(OR)

b) Discuss in detail the objectives, process and benefits of Quality Functional Deployment (QFD). (16)

14. a) Discuss in detail the different types of control charts with industrial examples. (16)

(OR)

b) Discuss in detail the Histogram and Scatter diagram of SPC techniques. (16)

15. a) Describe the four aspects of employee involvement with industrial engineering approaches. (16)

(OR)

b) Describe the phases of PDCA cycle with suitable illustration. (16)