

**COMPUTER NETWORKS
(Common to CSE(AIML) & CSE (DS) Branches)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	Illustrate the layers of OSI model in Hierarchy style. And also explain the function of each layer in detail.	14	CO1	K3
(OR)				
2. a)	Discuss about ARPANET.	7	CO2	K2
b)	Compare merits of OSI and TCP IP.	7	CO1	K3
<u>UNIT-II</u>				
3. a)	List and explain the services provided by data link layer.	7	CO3	K2
b)	Discuss about pure ALOHA and slotted ALOHA.	7	CO4	K2
(OR)				
4. a)	Explain stop and wait protocol in detail.	7	CO3	K2
b)	Differentiate static and dynamic channel allocation.	7	CO4	K3
<u>UNIT-III</u>				
5. a)	Differentiate connection oriented and connection less services.	7	CO3	K3
b)	Draw the header format of IPv6 and explain each field.	7	CO1	K2
(OR)				
6. a)	Discuss about shortest path routing.	7	CO2	K2
b)	Briefly explain the overview of CISCO packet tracer tool.	7	CO3	K2
<u>UNIT-IV</u>				
7. a)	Describe the services provided by transport layer.	7	CO2	K2
b)	Explain the fields of UDP header format.	7	CO1	K2
(OR)				
8. a)	Describe the concept of addressing in transport layer. Give few well known port address of TCP.	7	CO3	K2
b)	Describe the process of connection establishment in TCP.	7	CO3	K2
<u>UNIT-V</u>				
9. a)	Discuss about world wide web.	7	CO5	K2
b)	Describe the services of DNS.	7	CO5	K2
(OR)				
10. a)	Explain in detail about the architecture of Email.	7	CO5	K2
b)	Discuss about the services provided by application layer.	7	CO5	K2

Time: 3 Hours**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

		Marks	CO	BTL
1.	a) Classify various types of buildings based on construction and functional requirements and explain them briefly.	7	1	2
	b) Discuss the following	7	1	2
	i. F.A.R ii. Plinth area iii. Set back			

(OR)

2.	a) Explain the objectives of building bye-laws.	7	1	3
	b) Discuss about the following:	7	1	3
	i. lighting and ventilation requirements of residential buildings			
	ii. Explain various principles to be followed while designing a house plumbing system			

UNIT-II

3.	a) Describe the importance of orientation and wind direction in deciding the building layout, and explain factors affecting the orientation.	7	2	3
	b) Explain about Privacy, Elegance, Flexibility, Roominess, and Circulation while planning a residential building.	7	2	3

(OR)

4.	a) What is grouping, and mention the Minimum standards for various parts of buildings, and the requirements of different rooms.	7	2	4
	b) List out the various software tools in building planning and discuss in brief.	7	2	4

UNIT-III

5.	a) Distinguish between Shallow and Deep foundations and mention their applications.	7	3	3
	b) Explain in detail about various Brick masonry bonds.	7	3	3

(OR)

6.	a) List out the different types of foundations and explain them briefly with neat sketches.	7	3	2
	b) Discuss about Water Proofing, Damp Proofing and Termite Proofing, and their material characteristics.	7	3	2

UNIT-IV

7.	a) Explain briefly about fabrication and erection techniques used in the construction of civil engineering structures.	7	4	3
	b) What is scaffolding? State different types of scaffolding.	7	4	3

(OR)

8.	a) Discuss in detail about different form work types used in the construction of structures.	7	4	3
	b) Summarize the different construction techniques for various elements of building.	7	4	3

UNIT-V

9.	a) Name the different types of Cranes and Hoists, and explain any two of them.	7	5	3
	b) Discuss briefly about the basic features of concrete batching plants.	7	5	3

(OR)

10.	a) Explain requirements of pre-stressing jacks and grouting equipment.	7	5	3
	b) Discuss any two excavators and pavers in the civil engineering construction field.	7	5	4

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

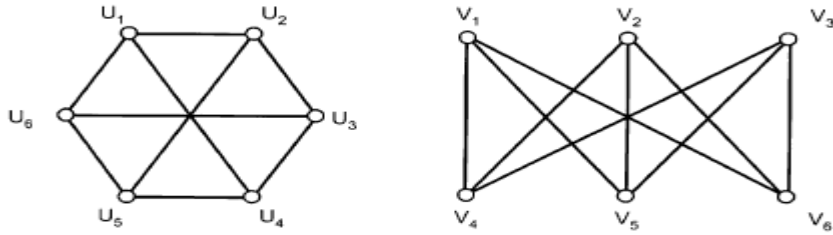
All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		Marks	CO	Blooms Level
UNIT-I				
1.	a) Verify that $(p \wedge (\neg p \vee q)) \vee (q \wedge \neg(p \wedge q)) = q$.	7	1	4
	b) Show $(A \vee B) \wedge [(\neg A) \wedge (\neg B)]$ is a contradiction.	7	1	2
(OR)				
2.	a) Define minterms and maxterms. Obtain a disjunctive normal form of $p \wedge \neg(q \vee r) \vee (((p \wedge q) \vee \neg r) \wedge p)$	7	1	3
	b) Construct truth table for $(P \wedge Q) \vee (\neg P \wedge Q) \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$	7	1	3
UNIT-II				
3.	Write the symbolic form of the following Statements	14	2	2
	i. Every student in this class has studied Logic.			
	ii. Every student in this school is either good at studies or good in sports.			
	iii. Every mammal is warm blooded.			
	iv. Some even integers are divisible by 3.			
	v. Atleast one integer is even.			
	vi. Every integer is either even or odd.			
	vii. If x is even and perfect square then x is not divisible by 3.			
(OR)				
4.	a) Check the following argument is valid or not. Every living thing is a plant or animal. Johns dog is alive and it is not a plant. All animals have heart. Therefore, Johns dog have heart.	7	2	4
	b) Explain different types of quantifiers. Negate the following quantified statements.	7	2	2
	i. Every student sleeps late on Saturdays.			
	ii. There is a professor who is afraid of the ducks.			
	iii. For all students, if they are in the club, then they have a red shirt.			
UNIT-III				
5.	a) Let $x = \{1, 2, 3, \dots, 7\}$ and $R = \{(x, y) / x - y \text{ is divisible by } 3\}$ Show that R is an equivalence relation.	7	3	2
	b) What is POSET? Find the upper bound, lower bound, least upper bound and greatest lower bound for the following POSET.	7	3	1
	i. $\{2, 3, 4, 9, 12, 18\}; /$ ii. $[D_{12}; /]$			
(OR)				
6.	a) Define Hasse diagram. Construct the Hasse diagram representing the partial ordering	7	3	3
	i) $\{(a, b) \mid a \text{ divides } b\}$ on $\{1, 2, 3, 4, 6, 8, 12\}$.			
	ii) $\{(A, B) \mid A \subseteq B\}$ on the power set $P(S)$ where $S = \{a, b, c\}$.			
	b) What is lattice? Check the following whether the given set is lattice or not.	7	3	3
	i. $[D_{30}; /]$ and $B = \{3, 10, 15\}$ ii. $[I_{12}; /]$ and $B = \{2, 7\}$			

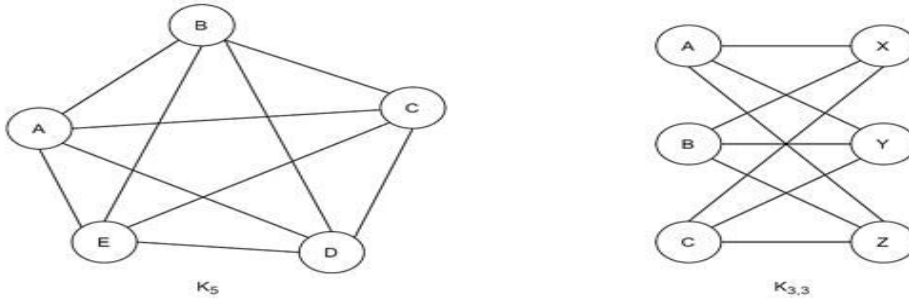
UNIT-IV

7. Verify the graphs are isomorphic or not. 14 4 3

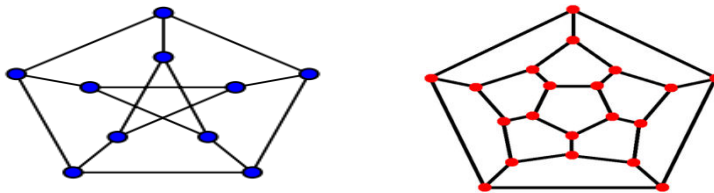


(OR)

8. a) Define planar graph. Check the following graphs are planar or not? 7 4 3

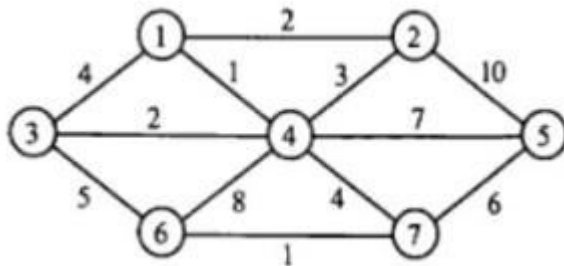


- b) What is chromatic number? Identify the chromatic number for the following graphs? 7 4 3



UNIT-V

9. Apply Krushkal's algorithm to find minimum spanning tree on the following graph. 14 5 3



(OR)

10. a) What is minimum spanning tree? Demonstrate Prims algorithm with example. 7 5 2
 b) Apply generating function method, find the general form of expression for a_n by using: $a_n - 5a_{n-1} + 6a_{n-2} = 0$ for $n \geq 2$. 7 5 3

**NOTE: SCHEME OF EVALUATION MAY BE TYPED OR HAND WRITTEN.
HAND WRITTEN SCHEME SCANNED COPIES ARE REQUIRED TO BE SENT**

UNIT-I - Q1 a) Find transfer function using block-diagram reduction (7 marks)

Correct identification of forward path(s) and feedback paths - 1 mark
Correct sequence of block-diagram reduction steps and simplification - 3 marks
Final closed-loop transfer function - 2 marks

UNIT-I - Q1 b) Compare open-loop and closed-loop systems+ advantages/disadvantages + real-life examples (7 marks)

Clear comparison on accuracy, stability, sensitivity, gain, disturbances etc - 4Marks
Advantages, Disadvantages any two -2marks
At least two real-life examples (one for open-loop, one for closed-loop) with brief justification-1mark

UNIT-I - Q2 a) State and explain Mason's Gain Formula for signal flow graph (7 marks)

Statement of Mason's Gain Formula (correct expression for transfer function in terms of paths, loops, non-touching loops) -- 2 marks
Explanation of each term: forward path, loop gain, Δ , Δ_k etc --3 marks
One simple worked example or final simplified expression showing use (even a small SFG)-2marks

UNIT-I - Q2 b) Develop electrical F-I analogous system and obtain equations (7 marks)

Correct identification of mechanical quantities and their electrical analogues (F-I)- 2 marks
Correct drawing of analogous electrical circuit with components labelled --3 marks
Derive the analogous mathematical equations (KCL/KVL) that match original system and final equations must be correct. -- 2 marks

UNIT-II - Q3 a) evaluate static error coefficients and steady state error (7 marks)

Correct expression for $G(s)$ and closed-loop transfer function--1 mark
Correct calculation of K_p , K_v , K_a as required --3 marks
Compute steady-state error --3 marks

UNIT-II - Q3 b) Estimate the rise time, percentage of peak overshoot, peak time and settling time for a unit step input of 10 units. (7 marks)

- Conversion of open loop transfer fun to closed loop transfer function---1mark
- Correct calculation of natural frequency ω_n and damping ζ -1 mark
- Use standard formulae to compute rise time, percentage of peak overshoot, peak time and settling time - 4marks
- Calculating for unit step input of 10 units---1mark

UNIT-II – Q4 a) Describe the typical behavior of a second-order under-damped system when subjected to a unit step input. (7 marks)

- Second Order Transfer function—1mark
- Under Damped System identification-1mark
- Derivation----4marks
- Graphical representation—1mark

UNIT-II – Q4 b) A system has $G(S) = K / S(1+sT)$ with unity negative feedback, where K and T are constants. Determine the factor by which K must be multiplied to reduce the peak overshoot from 85% to 35%. (7 marks)

- Closed-loop transfer function - 1mark
- Standard 2nd-order comparison - 2marks
- Relation Between Peak Overshoot and Damping Ratio- 2marks
- Ratio of K values & simplification - 1mark
- Final result - 1mark

UNIT-III Q5(a) Root Locus Sketch & Stability (7 marks)

- Identification of poles and zeros -2 marks
- Construction rules & root locus sketch -3 marks
- Comment on stability -2 marks

UNIT-III Q5(b) Effect of adding poles/zeros (7 marks)

- Explanation of pole addition effect -2 marks
- Explanation of zero addition effect -2 marks
- Root locus impact with reasoning -3 marks

UNIT-III Q6(a) Routh Array & Stability (7 marks)

- Routh array formulation -3 marks
- Stability determination -2 marks
- Location of roots on S-plane -1 mark

UNIT-III Q6(b). Root Locus Analysis (7 marks)

- Centroid calculation -2 marks
- Angle of asymptotes determination -2 marks
- Breakpoint calculation -3 marks

UNIT-IV Q7(a). Bode Plot (7 marks)

- Transfer function simplification -1 mark
- Bode magnitude plot -2 marks
- Bode phase plot -2 marks
- Gain margin and phase margin calculation -2 marks

UNIT-IV Q7(b). Determine the resonant peak, resonant frequency, and Bandwidth. (7 marks)

Resonant peak calculation -2 marks
Resonant frequency -2 marks
Bandwidth -2 marks
Correct transfer function use -1 mark

UNIT-IV Q8(a). Using Bode plot analysis evaluate gain margin, phase margin, gain crossover frequency and phase crossover frequency for $k=1$. (7 marks)

Bode magnitude & phase plot construction -3 marks
Gain margin & phase margin -2 marks
Gain crossover & phase crossover frequencies -2 marks

UNIT-IV Q8(b). Frequency Domain Specifications for 2nd Order (7 marks)

Definition of ω_n , ζ -1 mark
Resonant peak M_r -1 mark
Resonant frequency ω_r -1 mark
Bandwidth BW -1 mark
Derivations -3 marks

UNIT-V Q9(a). Nyquist Plot (7 marks)

Correct TF identification -1 mark
Nyquist contour sketch -3 marks
Application of Nyquist criterion -2 marks
Comment on stability -1 mark

UNIT-V Q9(b). Polar Plot vs Bode Plot (7 marks)

Definition of polar plot -2 marks
Difference from Bode plot -2 marks
Significance of gain margin & phase margin -2 marks
Stability interpretation -1 mark

UNIT-V Q10(a). Polar Plot & Stability (7 marks)

Identification of poles and zeros of the given transfer function -1 mark
Expression for magnitude and phase -2 marks
Polar plot sketching -3 marks
Comment on stability -1 mark

UNIT-V Q10(b). Nyquist Plot Significance (7 marks)

Definition of Nyquist plot -2 marks
Explanation of Nyquist stability criterion -3 marks
Significance in analyzing closed-loop system stability -2 marks

**ELECTRONIC DEVICES AND CIRCUITS
(ELECTRICAL AND ELECTRONICS ENGINEERING)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

<u>UNIT-I</u>		Marks	CO	BTL
1.	a) Explain the formation of PN junction diode and state its applications.	7	CO1	K2
	b) Explain the working principle of LED and mention its applications	7	CO1	K2
(OR)				
2.	a) What is forward and reverse biasing of PN diode? Recall its application as a switch.	7	CO1	K1
	b) Apply the knowledge of VI characteristics of zener diode and explain how it acts as a voltage regulator.	7	CO1	K3
<u>UNIT-II</u>				
3.	a) Explain the working operation of half wave rectifier and derive its ripple factor	7	CO2	K2
	b) Explain the operation of full wave rectifier with capacitor filter.	7	CO2	K2
(OR)				
4.	a) Explain the working operation of full wave rectifier and derive its ripple factor.	7	CO2	K2
	b) Explain the operation of full wave rectifier with inductor filter.	7	CO2	K2
<u>UNIT-III</u>				
5.	a) Explain the construction and working operation of a BJT. What is the relation between three currents in BJT.	7	CO3	K2
	b) Explain the input and output characteristics of a BJT in CB configuration.	7	CO3	K2
(OR)				
6.	a) Explain the construction and working operation of JFET with its characteristics.	7	CO3	K2
	b) Explain the input and output characteristics of a BJT in CE configuration.	7	CO3	K2
<u>UNIT-IV</u>				
7.	a) What is DC load line? Explain the need for transistor biasing.	7	CO4	K2
	b) Explain the application of transistor as an amplifier with neat diagram.	7	CO4	K2
(OR)				
8.	a) Explain fixed bias circuit and derive its stability factor.	7	CO4	K2
	b) Explain the application of transistor as a switch with neat diagram.	7	CO4	K2
<u>UNIT-V</u>				
9.	Explain the working operation of Wien bridge oscillator with necessary equation and diagram.	14	CO5	K2
(OR)				
10.	Explain the operation of RC Phase shift oscillator with necessary equation and diagram.	14	CO5	K2

**MATERIALS ENGINEERING
(MECHANICAL ENGINEERING)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

<u>UNIT-I</u>		Marks	CO	BTL
1.	a) Briefly cite the main differences between ionic, covalent, and metallic bonding	6	1	L2
	b) Given a cubic lattice with a lattice constant calculate atomic packing factor in BCC and FCC structures.	8	1	L2
(OR)				
2.	a) What are vacancy and interstitial defects? How are they formed?	6	1	L2
	b) Describe twin boundaries and stacking faults with suitable illustrations.	8	1	L2
<u>UNIT-II</u>				
3.	a) State the Hume-Rothery rules for the formation of solid solutions.	6	2	L2
	b) Derive the mathematical expression of the lever rule, Using binary phase diagram.	8	2	L2
(OR)				
4.	a) Draw Fe-Iron carbide diagram with a neat sketch and invariant reactions.	10	2	L2
	b) What is the significance of a constant temperature region on a cooling curve?	4	2	L2
<u>UNIT-III</u>				
5.	a) List the classifications of steels along with their salient features and typical applications.	7	3	L2
	b) Compare white and nodular cast irons with respect to (a) composition and heat treatment, (b) microstructure, (c) mechanical characteristics	7	3	L2
(OR)				
6.	a) What is the carbon content range for steels and cast irons? Give applications for each category.	6	3	L2
	b) What properties make ceramic tools suitable for high-speed machining?	8	3	L2
<u>UNIT-IV</u>				
7.	a) Construct TTT Diagram for Eutectoid steel and explain in detail	8	4	L2
	b) Compare carbon content requirements for effective surface hardening.	6	4	L2
(OR)				
8.	a) Discuss, Explain carburising process ?	8	4	L2
	b) Explain grain flow in hot working and cold working processes.	6	4	L2
<u>UNIT-V</u>				
9.	a) What are the main steps in powder metallurgy?	7	5	L2
	b) Give a brief description on different methods of powder production?	7	5	L2
(OR)				
10.	a) Explain atomization process of making metal powders.	7	5	L2
	b) Define yield strength, ultimate tensile strength (UTS), and fracture strength. Represent them in stress-strain curve.	7	5	L2

**Mechanics of Solids-I
(CIVIL ENGINEERING)****Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1.	a)	<p>Calculate the modulus of rigidity, poisson's ratio and bulk modulus of a cylindrical bar of diameter 30mm and of length 1.5m if the longitudinal strain in a bar during a tensile test is three times the lateral strain. Take E is $1.1 \times 10^5 \text{ N/mm}^2$</p> <p>Given: longitudinal strain $\epsilon_l = 3 \times$ lateral strain $\epsilon_{lat} \Rightarrow$ Poisson's ratio $\nu = 0.333$ (2 M)</p> <p>- Relation $E = 2G(1+\nu) \Rightarrow G = E / 2(1+\nu) = 1.1 \times 10^5 / 2.667 = 41.25 \text{ kN/mm}^2$ (3 M)</p> <p>- Bulk modulus $K = E / 3(1-2\nu) = 1.1 \times 10^5 / 3(0.334) = 109.8 \text{ kN/mm}^2$ (2 M)</p>	7M
	b)	<p>Derive the total extension of a uniformly tapered circular bar of diameters d_1 and d_2 over a length of L, when the rod is subjected to an axial pull P.</p> <p>- Consider an elemental strip dx at distance x; diameter $d_x = d_1 - (d_1 - d_2)x/L$ (1 M)</p> <p>- Area $A_x = \pi/4 [d_1 - (d_1 - d_2)x/L]^2$ (1 M)</p> <p>- Elongation $\delta = \int_0^L P dx / (A_x E) = 4P/(\pi E) \int_0^L dx/[d_1 - (d_1 - d_2)x/L]^2$ (1 M)</p> <p>- Integral gives $\delta = 4PL/(\pi E d_1 d_2)$ (1 M)</p> <p>- Correct final expression (1 M)</p>	5M
(OR)			
2.		<p>Derive an equation for the elastic Constant and write the assumptions.</p> <p>- Start from 3-D Hooke's law & volumetric / shear strain definitions (3 M)</p> <p>- Derive $E = 2G(1+\nu)$ & $E = 3K(1-2\nu)$ (6 M)</p> <p>- List at least 4 assumptions (homogeneous, isotropic, elastic, small strain, etc.) (3 M)</p>	12M

UNIT-II

3.	a)	<p>A cantilever beam 2.5 m long carries point loads of 2 kN, 3 kN and 4 kN at 1.5 m, 2.0 m and 2.5 m from the fixed end respectively. Draw the shear force and bending moment diagrams for the beam.</p> <p>Reactions at fixed end: $V = 9 \text{ kN}$, $M = 2 \times 1.5 + 3 \times 2 + 4 \times 2.5 = 19 \text{ kNm}$ (2 M)</p> <p>- SFD: jumps 2, 3, 4 kN; values 9, 7, 4, 0 kN (3 M)</p> <p>- BMD: linear between loads; $-19, -16, -10, 0 \text{ kNm}$ (2 M)</p>	7M
	b)	Derive relation between rate of loading, shear force and bending moment	5M
(OR)			
4.	a)	<p>A simply supported beam of span 4.5 m carries a uniformly distributed load of 3.6 kN/m over a length of 2 m from the left end A. Draw the shear force and bending moment diagrams for the beam</p> <p>SS beam 4.5 m, UDL 3.6 kN/m on 2 m</p> <p>- $R_A = 5.04 \text{ kN}$, $R_B = 2.16 \text{ kN}$ (2 M)</p> <p>- SFD parabolic & straight; BMD cubic & linear – correct shapes & values (6 M)</p>	8M
	b)	<p>Draw the shear force diagram if a simply supported beam of span "L" is subjected to a couple M at mid span point.</p> <p>Couple M at mid-span (4 M)</p> <p>- SFD zero throughout; BMD jumps by M at centre – sketch & values (4 M)</p>	4M

UNIT-III

5.	a)	Define the Neutral axis and neutral layer of flexural members?	4M
	b)	<p>A simply supported beam of circular section 600mm diameter carries UDL 12kN/m over the span of 6m and point load 3kN at mid span. Find the maximum bending stress at mid span and 4m from right end?</p> <p>Circular SS beam – max BM at mid-span = 58.5 kNm, at 2 m from R = 36 kNm (4 M)</p> <p>- Section modulus $Z = \pi D^3/32 = 6.36 \times 10^6 \text{ mm}^3$ (2 M)</p> <p>- $\sigma_{\text{max}} = M/Z \rightarrow 9.2 \text{ N/mm}^2$ & 5.66 N/mm^2 (2 M)</p>	8M
(OR)			
6.		<p>Derive the bending equation and Write the assumptions.</p> <p>Derivation of bending equation $M/I = \sigma/y = E/R$ 9m</p> <p>Assumptions 3m</p>	12M

UNIT-IV

7.	a)	A circular beam of 100 mm diameter is subjected to a shear force of 30 kN.	6M
----	----	--	----

		<p>Calculate the value of maximum shear stress and sketch the variation of shear stress along the depth of the beam.</p> <p>Given: $V = 30 \text{ kN}$ $R = 50 \text{ mm} \Rightarrow D = 100 \text{ mm}$</p> <p>Area & moment of inertia 1m</p> <p>($\frac{1}{2}$ M) $A = \pi/4 D^2 = 7853.98 \text{ mm}^2$</p> <p>($\frac{1}{2}$ M) $I = \pi/64 D^4 = 4.908 \times 10^6 \text{ mm}^4$</p> <p>Maximum shear-stress formula 2m</p> <p>(2 M) (derived from $\tau = VQ/Ib$ with $Q_{\text{max}} = 2R^3/3$, $b = 2R$) $\tau_{\text{max}} = 4V / 3A$</p> <p>Numerical value</p> <p>$\tau_{\text{max}} = 4 \times 30 \times 10^3 / (3 \times 7853.98) = \mathbf{5.093 \text{ N/mm}^2}$ (2 M)</p> <p>Sketch of distribution Parabolic from zero at extreme fibres to $\mathbf{5.09 \text{ N/mm}^2}$ (1 M) at neutral axis</p>	
	b)	<p>A beam of square section is used as a beam with one diagonal horizontal. Find the maximum shear stress in the cross section of the beam. Also sketch the shear stress distribution across the depth of the section.</p> <p>Geometric properties (1 M) (about horizontal diagonal)</p> <p>$I_{\text{NA}} = a^4 / 12$ ($\frac{1}{2}$ M) $A = a^2$</p> <p>Shear-stress distribution (thin-wedge triangle) 3m</p> <p>At distance y from NA, width $b(y) = 2y$</p> <p>$Q(y) = (a\sqrt{2}/2 - y) \times \text{average width} \times (a\sqrt{2}/2 + y)/2$</p> <p>After simplification $\tau(y) = VQ / (I b)$ gives</p> <p>$\tau(y) = (V / I) [(a\sqrt{2})^2/8 - y^2/2]$</p> <p>Maximum (at neutral axis, $y = 0$) 1m</p> <p>$\tau_{\text{max}} = V (a\sqrt{2})^2 / (8 I) = V a^2 / (8 \times a^4/12) = \mathbf{1.5 V / a^2}$ (1 M)</p> <p>If $a = 100 \text{ mm} \Rightarrow \tau_{\text{max}} = 1.5 V / 10\,000 = \mathbf{1.5 \times 10^{-4} V \text{ N/mm}^2}$ ($\frac{1}{2}$ M)</p> <p>Sketch Parabolic, zero at top/bottom fibres, peak $\mathbf{1.5 V/a^2}$ ($\frac{1}{2}$ M) at mid-depth</p> <p>1m</p> <p style="text-align: center;">1 of 2</p>	6M
(OR)			
8.		Derivation for the shear stress distribution.	12M

UNIT-V

9.	a)	<p>A solid shaft is subjected to a torque of 12000 N-m. find the necessary diameter of the shaft if the allowable shear stress is 60 N/mm^2, and the allowable twist is 1° for every 20 diameters length of the shaft. Take $C = 0.8 \times 10^5$.</p> <p>Given: 1m</p> <p>$T = 12\,000 \text{ N-m} = 12 \times 10^6 \text{ N-mm}$</p>	
----	----	--	--

		$C = 0.8 \times 10^5 \text{ N/mm}^2$ $\theta_{\text{all}} = 1^\circ \text{ per } 20D \text{ length}$ $\tau_{\text{all}} = 60 \text{ N/mm}^2$ Strength criterion 2m $\tau_{\text{max}} = 16T / (\pi D^3) \leq 60$ $\Rightarrow D^3 \geq 16 \times 12 \times 10^6 / (\pi \times 60) = 1.0186 \times 10^6$ $D \geq 100.6 \text{ mm}$ Stiffness criterion 3m $\theta = 1^\circ = \pi/180 \text{ rad per } L = 20D \text{ mm}$ $J = \pi D^4/32$ with $\theta = TL / (C J)$ $\Rightarrow \pi/180 = (12 \times 10^6)(20D) / (0.8 \times 10^5 \times \pi D^4/32)$ $\Rightarrow D^3 = 12 \times 10^6 \times 20 \times 32 / (0.8 \times 10^5 \times \pi^2/180) = 1.396 \times 10^6$ $\Rightarrow D \geq 111.2 \text{ mm}$ Governed by stiffness Provide D = 112 mm (1 M)	
	b)	<p>A closely coiled helical spring is to carry a load of 800N. Its mean coil diameter is to be 10 times that of the wire diameter. Calculate these diameters if the maximum shear stress in the material of the spring is to be 90 N/mm²</p> <p>Given:1m (spring index $C = 10$) $\tau_{\text{max}} = 90 \text{ N/mm}^2$ $D_m = 10d$ $W = 800 \text{ N}$</p> <p>Shear-stress formula 4m $K = (4C-1)/(4C-4) + 0.615/C \approx 1.144$ where $\tau = 8W D_m K / (\pi d^3)$</p> <p>Substitute $D_m = 10d$ $90 = 8 \times 800 \times 10d \times 1.144 / (\pi d^3)$ $\Rightarrow d^2 = 8 \times 800 \times 10 \times 1.144 / (\pi \times 90) = 259.3$ $\Rightarrow d = 16.1 \text{ mm}$</p> <p>Mean-coil diameter 1m $D_m = 10d = 161 \text{ mm}$</p> <p>Final sizes to specify Wire diameter $d = 16 \text{ mm}$ (available standard) Mean-coil diameter $D_m = 160 \text{ mm}$ (1 M)</p>	
(OR)			
10.		Derive the torsion equation $T/J = q_s/r = C\theta/L$	12M

AR18

CODE: 18EST202

SET-1

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

II B.Tech I Semester Supplementary Examinations, November-2025

**Programming for Problem Solving
(ELECTRONICS AND COMMUNICATION ENGINEERING)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Illustrate different implementation issues in Problem solving and Explain the characteristics of an algorithm. 6M
- b) List out all the operators available in C language and Explain each operator with syntax and examples. 6M

(OR)

2. a) Analyze the algorithm for generating Fibonacci series sequence for n terms. 6M
- b) Explain in detail about various data types in C language. 6M

UNIT-II

3. a) Discuss the importance of for loop with example. 6M
- b) Develop a C Program to perform Arithmetic operations using Switch Statement. 6M

(OR)

4. a) Write the syntax of 'nested if' statement and use it to write a C program to award grade to student based on percentage of marks. 6M
- b) Discuss briefly about nested loop Branching. 6M

UNIT-III

5. a) What is an array? Explain the declaration and initialization of one and two dimensional arrays with examples? 6M
- b) Name any five string handling functions and discuss with suitable examples. 6M

(OR)

6. a) Explain in detail the storage classes in C. 6M
- b) Construct a C program to check the given number is Prime or not using Functions. 6M

UNIT-IV

7. a) Demonstrate the memory allocation functions in C language. 6M
- b) Define a pointer. Describe the concept of Pointers for inter-function communication. 6M

(OR)

8. a) Explain the procedure of declaration of pointer variables with example. 6M
- b) Explain Pointers as function arguments with suitable examples. 6M

UNIT-V

9. a) Explain various file input and output functions. 6M
- b) Explain in detail the properties of a structure. 6M

(OR)

10. a) Differentiate Structure and Union. Give brief description of each with syntax and examples. 6M
- b) Develop a C program to copy the contents of two files into a separate file. 6M

**Strength of Materials
(CIVIL ENGINEERING)****Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

- | | | Marks | CO | BTL |
|-------|---|-------|-----|-----|
| 1. a) | A bar of length 20 cm tapers uniformly from 40 mm dia. to 35mm dia. calculate the change in its length due to an axial pull of 100KN, if $E = 200\text{GPa}$. Derive the formula used in the calculations. | 5M | CO1 | L3 |
| b) | A bar of steel 25mm diameter is subjected to a tensile load of 30KN and the measured extension on a 200mm gauge length is 0.08 mm and the change in diameter is 2.32×10^{-3} mm. Calculate the Poisson's ratio and the values of three moduli. | 5M | CO1 | L2 |

(OR)

- | | | | | |
|-------|--|----|-----|----|
| 2. a) | Deduce the relation between the Modulus of Elasticity and Modulus of Rigidity from fundamentals. | 5M | CO1 | L3 |
| b) | Draw and explain with a neat sketch of stress-strain relationship for mild steel | 5M | CO1 | L2 |

UNIT-II

- | | | | | |
|-------|---|----|-----|----|
| 3. a) | Draw the shear force and B.M. diagrams for a simply supported beam carrying a uniformly varying load from zero at left end to W per unit length at the right end. | 5M | CO2 | L4 |
| b) | Deduce the relation between Shear force and intensity of loading. | 5M | CO2 | L3 |

(OR)

- | | | | | |
|----|--|-----|-----|----|
| 4. | A 2 m long cantilever beam has a span of 16 m. The beam carries a load of 13KN at 6 m from the fixed end, and a distributed load the intensity of which varies linearly from zero at fixed end to 6 KN/m at right free end. Draw the shear force and bending moment diagrams. Find the magnitude and position of maximum bending moment. | 10M | CO2 | L4 |
|----|--|-----|-----|----|

UNIT-III

- | | | | | |
|-------|---|----|-----|----|
| 5. a) | Derive the bending equation from fundamentals $M/I = f/y = E/R$ | 5M | CO3 | L3 |
| b) | A 120 mm x 50 mm I- section is subjected to a shearing force of 10 KN. Calculate the shear stress at the neutral axis and at the top of the web. Given $I = 220 \times 10^4 \text{ mm}^4$, $\text{Area} = 9.4 \times 10^2 \text{ mm}^2$, web thickness = 3.5 mm and flange thickness = 5.5 mm | 5M | CO3 | L3 |

(OR)

- | | | | | |
|-------|---|----|-----|----|
| 6. a) | Show that the ratio of maximum shear stress to average shear stress is $3/2$ in case of a rectangular section of width, b and depth, d | 5M | CO3 | L2 |
| b) | The T section of a beam has the following size: Width of the flange 140 mm and depth of the flange 35mm. Width of the web 30 mm and depth of the web is 130 mm. The beam is subjected to a vertical shear force of 60 KN. Calculate the shear stress at the junction of the web and the flange. | 5M | CO3 | L3 |

UNIT-IV

7. a) A cantilever beam of span 7 m carries a point load of 15 kN at a distance of 4 m from the right end. Compute (a) the slope (b) the deflection under the load (c) the maximum deflection and its location. Take $E = 1.5 \times 10^5 \text{ N/mm}^2$ and $I = 5 \times 10^8 \text{ mm}^4$. 7M CO4 L3
- b) What are the limitations of the moment area method 3M CO4 L2
- (OR)**
8. a) Derive the expression for the slope and deflection of a cantilever beam of length L, carrying a point load W at the free end by double integration method. 5M CO4 L3
- b) A beam is 10 m long and is simply supported at the ends. It carries concentrated loads of 100 kN and 60 kN at distances of 2 m and 5 m respectively from the left end. Calculate the deflection under each load. Find also the maximum deflection. Take $I = 18 \times 10^8 \text{ mm}^4$ and $E = 200 \text{ kN/mm}^2$ 5M CO4 L3

UNIT-V

9. a) Derive torsion equation and also mention assumptions 5M CO5 L2
- b) Find the diameter of shaft required to transmit 60 kW at 150 rpm if the maximum torque is likely to exceed the mean torque by 25% for a maximum permissible torsional shear stress of 60 N/mm^2 . Also find the angle of twist for a length of 2.5 meters. Take $G = 80 \text{ GPa}$. 5M CO5 L3
- (OR)**
10. a) A steel solid shaft transmitting 15 kW at 200 rpm is supported on two bearing 750 mm apart and has two gears keyed to it. The pinion having 30 teeth of 5 mm module is located 100 mm to the left of the right hand bearing and delivers power horizontally to the right. The gear having 100 teeth of 5 mm module is located 150 mm to the right of the left hand bearing and receives the power in vertical direction below. Using an allowable stress of 54 MPa in shear, determine the diameter of the shaft. 7M CO5 L4
- b) Discuss in detail about principal stresses 3M CO5 L2

UNIT-VI

11. Derive the equation for Euler's crippling load for both the ends hinged and write the assumptions. 10M CO6 L2
- (OR)**
12. a) Explain in detail about types of columns 5M CO6 L3
- b) A steel bar of solid circular cross-section is 50 mm in diameter. The bar is pinned at both ends and subjected to axial compression. If the limit of proportionality of the material is 210 MPa and $E = 200 \text{ GPa}$, determine the minimum length to which Euler's formula is valid. Also determine the value minimum length. 5M CO6 L3

Time: 3 Hours

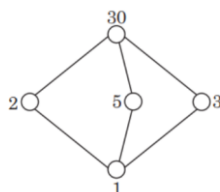
Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

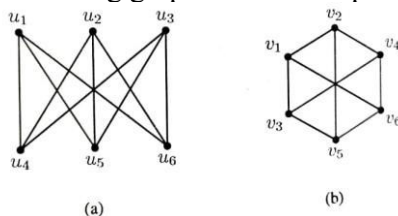
All parts of the Question must be answered at one place

- | | | Marks | CO | BTL |
|-----------------|---|-------|----|-----|
| UNIT-I | | | | |
| 1. | a) Find the Principal Disjunctive Normal Form of $PV (\sim P \rightarrow (QV (Q \rightarrow \sim R)))$. | 5 | 1 | K3 |
| | b) Show that (RVS) follows logically from the premises CVD, $(CVD) \rightarrow \sim H$, $\sim H \rightarrow (AVB)$ and $(AVB) \rightarrow (RVS)$ | 5 | 1 | K3 |
| (OR) | | | | |
| 2. | a) Translate into symbols. Use $E(x)$ for “x is even” and $O(x)$ for “x is odd.”
(i) No number is both even and odd.
(ii) One more than any even number is an odd number.
(iii) There is prime number that is even.
(iv) Between any two numbers there is a third number.
(v) There is no number between a number and one more than that number. | 5 | 1 | K2 |
| | b) Determine compound statement $[(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)] \rightarrow r$ is a tautology using truth table. | 5 | 1 | K3 |
| UNIT-II | | | | |
| 3. | a) Verify the validity of the following argument:
All poets are dreamers.
Some artists are poets.
Therefore, some artists are dreamers. | 5 | 2 | K3 |
| | b) Write the following statements in symbolic form:
i. Something is good ii. Everything is good
iii. Nothing is good iv. Something is not good. | 5 | 2 | K2 |
| (OR) | | | | |
| 4. | a) Using rules of inference, prove the validity of the following inference:
All movies directed by Rajamouli are wonderful.
Rajamouli directed a movie about patriotism.
Therefore, there is a wonderful movie about patriotism. | 5 | 2 | K3 |
| | b) Let $P(x)$ denote the statement x is a professional athlete and let $Q(x)$ denote the statement x plays cricket. The domain is the set of all people. Write each of the following propositions in English words.
i. $(x)(P(x) \rightarrow Q(x))$ ii. $(\exists x)(P(x) \wedge Q(x))$ iii. $(x)(P(x) \vee Q(x))$ | 5 | 2 | K2 |
| UNIT-III | | | | |
| 5. | a) Let $N = \{1, 2, 3, \dots\}$ then show that relation $R = \{(x, y) (x - y) \text{ is divisible by } 2 \text{ for every } x \text{ and } y \in N\}$ is an equivalence relation. | 5 | 3 | K2 |
| | b) Draw the Hasse diagram for the power set $P(A)$ of the set $A = \{a, b, c\}$. | 5 | 3 | K3 |
| (OR) | | | | |
| 6. | a) Given $S = \{1, 2, 3, 4, 5\}$ and a relation R on S where $R = \{(x, y) x \leq y\}$. Write the relation matrix. | 5 | 3 | K2 |
| | b) Determine whether the POSET represented by the following Hasse diagram in the figure is a lattice. | 5 | 3 | K3 |

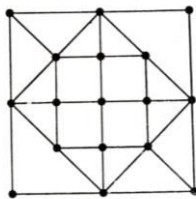


UNIT-IV

7. a) Verify whether the following graphs are Isomorphic or not? 5 4 K3

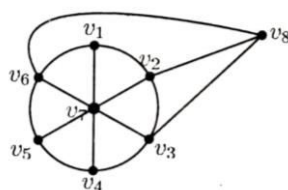


- b) Define the Euler formula and verify Euler's formula for the planar graph given below 5 4 K3



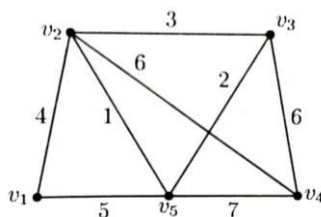
(OR)

8. a) Show that the complete bipartite graph $K_{3,3}$ is non-planar. 5 4 K2
 b) Define Chromatic number. Find the Chromatic Number of the graph shown below 5 4 K3



UNIT-V

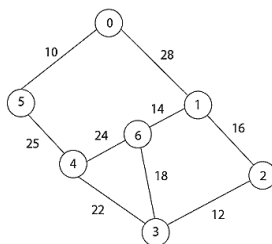
9. a) Use the Prim's algorithm to find the minimal spanning tree of the following weighted graph. 5 5 K3



- b) Illustrate the DFS algorithm with a suitable example. 5 5 K2

(OR)

10. a) Use the Kruskal algorithm to find the minimal spanning tree of the following weighted graph. 5 5 K3



- b) Illustrate the BFS algorithm with a suitable example. 5 5 K2

UNIT-VI

11. a) Solve the recurrence relation $a_n - 9a_{n-1} + 18a_{n-2} = 2^n$ using the characteristic root method. 5 6 K3
 b) Find the generating function of the following sequences 5 6 K2
 (i). $0, 1, 2, 3, 4, \dots$ (ii). $1^2, 2^2, 3^2, 4^2, \dots$

(OR)

12. a) Solve the recurrence relation $a_n - 2a_{n-1} + a_{n-2} = 0$, with $a_0 = 2$ and $a_1 = 1$. 5 6 K3
 b) Find the sequence of the following functions 5 6 K2
 (i). $2x^2(1-x)^{-1}$ (ii). $2x^2 + \frac{1}{1-x}$

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		<u>UNIT-I</u>	Marks	CO	BTL
1.	a)	Draw the CC amplifier and derive the expression for A_i , R_i , A_v , Y_o	5	1	K2
	b)	A CE amplifier is drawn by a voltage source of internal resistance $R_S = 800$ ohms and load impedance is a resistance $R_L = 1000$ ohms. The h-parameters are $h_{ie} = 1.0$ K ohms, $h_{re} = 2 \times 10^{-4}$, $h_{fe} = 50$ and $h_{oe} = 25 \mu A/V$. compute A_i , R_i , A_v , R_o using exact analysis.	5	1	K3
		(OR)			
2.	a)	State and Prove Millers Theorem	4	1	K2
	b)	Analyze the common emitter (CE) amplifier circuit by deriving A_i , R_i , A_v , Y_o	6	1	K2
		<u>UNIT-II</u>			
3.	a)	Draw the circuit of Darlington pair and derive the expression for voltage gain	6	2	K2
	b)	Compare different coupling Mechanisms.	4	2	K2
		(OR)			
4.	a)	Sketch two stage RC coupled Amplifier and explain its working.	7	2	K2
	b)	Discuss the method to select the transistor configuration in implementing cascading principle.	3	2	K2
		<u>UNIT-III</u>			
5.	a)	Define Barkhausen criterion	2	3	K2
	b)	Draw the circuit of Weinbridge Oscillator and derive the expression for frequency of oscillations	8	3	K2
		(OR)			
6.	a)	Discuss the feedback applied in oscillators and derive the expression for gain of the oscillators	3	3	K2
	b)	Draw the circuit diagram of Colpitt's Oscillator and derive the expression for frequency of oscillations	7	3	K2
		<u>UNIT-IV</u>			
7.	a)	Draw the circuit of Hybrid pi model of CE amplifier and explain role of each hybrid pi component (hybrid pi resistances and capacitances).	5	4	K2
	b)	Derive the expression for hybrid pi conductance.	5		K2
		(OR)			
8.	a)	What is the relationship between f_T and f_β ? Discuss the significance of f_T .	4	4	K2
	b)	Determine the hybrid $-\pi$ parameters of a Transistor operating at Collector Current $I_C(Q)=2mA$, $V_{CE}(Q)=20V$ and $I_B(Q)=20\mu A$. Transistor specifications are $\beta=100$, unity gain frequency $f_T=50MHz$, $C_c=3pF$, $h_{ie}=1.4K\Omega$, $h_{re}=2.5 \times 10^{-4}$, $h_{oe}=25\mu mhos$. Assume that the Operating temperature is 3000K.	6	4	K2
		<u>UNIT-V</u>			
9.	a)	Draw the circuit of series fed Class A power amplifier and derive the expression for efficiency	6	5	K2
	b)	Discuss different categories in which power amplifiers can be classified.	4	5	K2
		(OR)			
10.	a)	Derive the expression for efficiency of Class B Push pull power amplifier	6	5	K2
	b)	Discuss the concept of heat sink	4	5	K2
		<u>UNIT-VI</u>			
11.	a)	What is a tuned amplifier and how do you classify tuned amplifier. Briefly explain.	5	6	K2
	b)	Discuss the operation of stagger tuned amplifiers with neat diagram.	5	6	K2
		(OR)			
12.	a)	Derive the expressions for Bandwidth and Q-factor of single tuned, capacitively coupled amplifiers. List the assumptions made for the derivation	8	6	K2
	b)	Define selectivity in tuned amplifiers.	2	6	K2

ELECTRIC CIRCUIT THEORY
(Electrical and Electronics Engineering)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

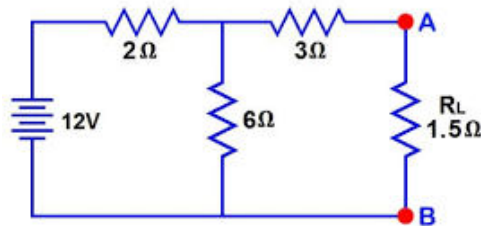
1. Explain Superposition Theorem with example.

Marks	CO	BTL
10M	1	L1

(OR)

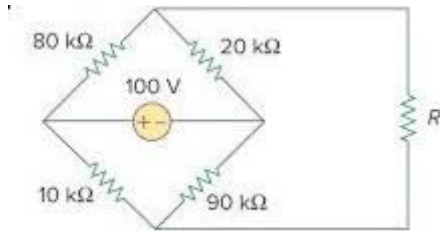
2. a) Explain Thevenin's Theorem.
-
- b) Find Thevenin's Equivalent Circuit.

5M	1	L1
5M	1	L3

**UNIT-II**

3. a) Derive maximum power transfer theorem condition for DC Circuits.
-
- b) Calculate R using Maximum Power Transfer Theorem.

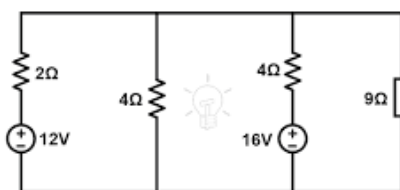
5M	2	L3
5M	2	L3



(OR)

4. a) Explain Millman's, Theorem.
-
- b) Find Current Through 2Ω using Millman's, Theorem.

5M	2	L1
5M	2	L3

**UNIT-III**

5. Derive the relation between line and Phase quantities in balanced Star and delta Connected 3-
- Φ
- circuit.

10M	3	L3
-----	---	----

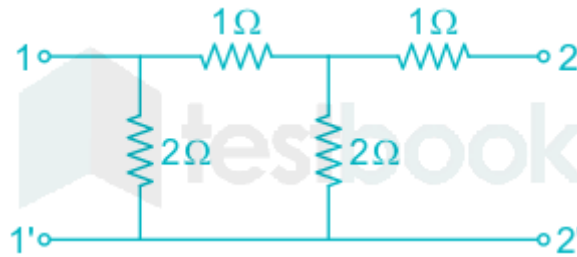
(OR)

6. Explain the Measurement of Active and Reactive power in balanced three phase systems with neat circuit diagram.

10M	3	L1
-----	---	----

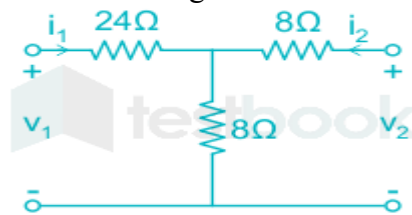
UNIT-IV

- | | | | | |
|----|---|----|---|----|
| 7. | a) Explain Z- Parameters. | 5M | 4 | L1 |
| | b) Find Z- Parameters for the following circuit | 5M | 4 | L3 |



(OR)

- | | | | | |
|----|--|----|---|----|
| 8. | a) Derive Symmetrical condition in Y- Parameters | 5M | 4 | L1 |
| | b) Find Y- Parameters for the following circuit. | 5M | 4 | L3 |

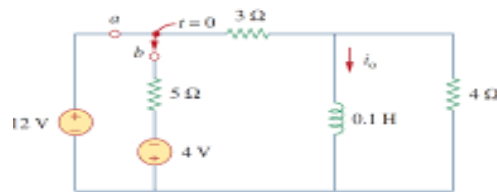


UNIT-V

- | | | | | |
|----|--|-----|---|----|
| 9. | Find Current $i(t)$ of R-L circuit in DC excitation. | 10M | 5 | L1 |
|----|--|-----|---|----|

(OR)

- | | | | | |
|-----|--|----|---|----|
| 10. | a) Derive the Transient Response for series R-L Circuit. | 5M | 5 | L1 |
| | b) The switch has been in position a for long time but moves instantaneously to position b at $t=0$. Determine $i_0(t)$. | 5M | 5 | L3 |



UNIT-VI

- | | | | | |
|-----|--|-----|---|----|
| 11. | Find Foster 1 st form and Caur 2 nd form for the given admittance function | 10M | 6 | L3 |
|-----|--|-----|---|----|

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

(OR)

- | | | | | |
|-----|--|-----|---|----|
| 12. | Find Foster 2 nd form and Caur 1 st form for the given admittance function | 10M | 6 | L3 |
|-----|--|-----|---|----|

$$Y(s) = \frac{(s^2 + 2)(s^2 + 4)}{s(s^2 + 3)}$$

Time: 3 Hours**Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

	<u>UNIT-I</u>	Marks	CO	Blooms Level
1.	a) Describe briefly about metallic bond and its characteristics.	5M	CO1	L2
	b) Explain in detail about the factors affecting grains in metals	5M	CO1	L2
	(OR)			
2.	a) Discuss in detail about point defects.	5M	CO1	L2
	b) Explain in detail about the factors affecting grain boundaries on metals	5M	CO1	L3
	<u>UNIT-II</u>			
3.	a) Describe briefly about the electron compounds	5M	CO2	L2
	b) Draw and explain in detail about the iron and iron carbide phase diagram	5M	CO2	L3
	(OR)			
4.	a) Discuss in detail about experimental methods of construction of equilibrium phase diagrams	5M	CO2	L3
	b) Discuss in detail about the Lever rule	5M	CO2	L2
	<u>UNIT-III</u>			
5.	a) Describe briefly about the structure and properties of Malleable cast iron	5M	CO3	L3
	b) Discuss in detail about tool and die steels	5M	CO3	L2
	(OR)			
6.	a) Explain in detail about the structure and properties of Spheroidal graphite cast iron	5M	CO3	L3
	b) Explain in detail about the classification of steels	5M	CO3	L2
	<u>UNIT-IV</u>			
7.	a) Differentiate between hot working and cold working	5M	CO4	L2
	b) Discuss in detail about the surface hardening methods	5M	CO4	L2
	(OR)			
8.	a) Define hardenability and also explain factors affecting it	5M	CO4	L3
	b) Discuss in detail about the stages of cooling methods	5M	CO4	L3
	<u>UNIT-V</u>			
9.	Discuss in detail about the stages in powder metallurgical components preparation and also explain design considerations	10M	CO5	L2
	(OR)			
10.	Explain in detail about the structure and properties of Titanium	10M	CO5	L3
	<u>UNIT-VI</u>			
11.	a) Draw with a neat sketch and explain Rockwell hardness test	5M	CO6	L3
	b) Draw stress - strain diagram for ductile material (Mild Steel) and represent feature point.	5M	CO6	L3
	(OR)			
12.	Discuss in detail about the fatigue tests and also explain the factors affecting it	10M	CO6	L2