

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered in one place

UNIT-IMarks CO Blooms
Level

1. a) Distinguish between Microscopic and Macroscopic points of view of the study of matter. 8M 1 IV
- b) Explain the quasistatic process with the help of a neat sketch. What are the conditions required to achieve it. 6M 1 II

(OR)

2. a) Define the thermodynamic definition of work and derive an expression for displacement work with the help of a simplified sketch. 5M 1 I
- b) A gas initially is at 100kPa and 6000 cm³. The final volume is 2000 cm³. Determine the moving boundary work for each of the following processes: (i) P is inversely proportional to V (ii) PV² = constant. (iii) P is directly proportional to V 9M 1 V

UNIT-II

3. a) Illustrate the first law of thermodynamics applied to a closed system undergoing a cycle and a process. 4M 2 II
- b) A closed system undergoes a thermodynamic cycle of four separate and distinct processes. The heat and work transferred in such a process are tabulated below. 10M 2 I

Process	Heat Transfer in kJ/min	Work Transfer in kJ/min
1-2	20,000	0
2-3	-10,000	30,000
3-4	0	20000
4-1	15,000	-25,000

Show that the data is consistent with the first law of thermodynamics. Also, evaluate the network output in kW and change in internal energy.

(OR)

4. a) Show the SFEE on a mass basis and time basis. Apply this equation to the following devices (i) Boiler (ii) Reciprocating compressor (iii) Steam turbine (iv) Steam nozzle 8M 2 I
- b) Steam enters a turbine at a velocity of 12 m/s and specific enthalpy 2900 kJ/kg. At the exit of the turbine the steam velocity is 30 m/s and the specific enthalpy is 2400 kJ/kg. The heat loss during the flow is 85 kJ/kg. Determine the work output from the turbine. 6M 2 V

UNIT-III

5. a) Illustrate the Kelvin Planck and Clausius statements of II law of thermodynamics. 6M 3 II
b) A Carnot cycle operates between source and sink temperatures of 260°C and -17.8°C . If the system receives 100 kJ of heat from the source, Find, (i) the Efficiency of the system (ii) The network transfer (iii) Heat rejected to the sink. 8M 3 I

(OR)

6. a) Define Entropy and show that it is a property of a system. 7M 3 I
b) An iron cube at a temperature of 400°C is dropped into an insulated bath containing 10 Kg water at 25°C . The water finally reaches a temperature of 50°C at a steady state. Given that the specific water heat equals 4186 J/kg K. Find the entropy changes for the cube and the water. 7M 3 I

UNIT-IV

7. a) Define available and unavailable energies. Also, define the terms Availability and Irreversibility. 6M 4 I
b) 5 kg of air at 550K and 4 bar is enclosed in a closed system. Determine the availability of the system if the surrounding pressure and temperature are 1 bar and 290 K respectively. 8M 4 V

(OR)

8. a) Illustrate Avagadro's law and write Maxwell's equations 7M 4 II
b) Define specific heat at constant pressure and constant volume and derive the relation between them. 7M 4 I

UNIT-V

9. a) Develop an expression for thermal efficiency of a Diesel cycle. 7M 5 VI
b) The compression ratio of an Otto cycle is 8. At the beginning of the compression process, the pressure is 1 bar and the temperature is 300 K. The heat transfer to the air per cycle is 1900 kJ/kg of air. Find (i) Pressure and temperature at various salient points (ii) air standard efficiency. 7M 5 I

(OR)

10. a) Compare Otto, Diesel, and Dual combustion cycles for the same compression ratio and heat-rejected 6M 5 II
b) In an air standard diesel engine cycle with a compression ratio of 14, the condition of air at the start of compression stroke are 1 bar and 290 K. If heat addition equals to 850 kJ/kg, Determine (i) Maximum temperature and pressure of the cycle (ii) work done and mean effective pressure and (iii) thermal efficiency of the cycle. 8M 5 V

Time: 3 Hours

Max Marks: 70

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		Mar ks	CO	Blooms Level
UNIT-I				
1.	a) Convert the following numbers with the indicated bases to decimal: i) $(435)_8$ ii) $(345)_6$ iii) $(10110110)_2$.	7M	1	2
	b) Convert the following numbers. i) $123_{(10)} = \text{----}_{(8)}$ ii) $2568_{(10)} = \text{----}_{(16)}$ iii) $259_{(10)} = \text{----}_{(2)}$	7M	1	2
(OR)				
2.	a) Perform the following subtractions using 1's and 2's complement method. i) $1011-101$ ii) $10110-1011$ iii) $1100.10-1111.01$	7M	1	3
	b) Perform the following subtractions in BCD code using 9's complement method. i) $342.7-108.9$ ii) $206.47-527.89$	7M	1	3
UNIT-II				
3.	a) Simplify the following function using Boolean algebra: $F(A, B, C, D) = AB + A' + BC + A'B'C'D$	7M	2	3
	b) Expand $AB + A'C$ to minterms and maxterms.	7M	2	3
(OR)				
4.	a) Reduce $\sum m(0,2,4,5,6,7,8,10,13,15)$ using k map.	7M	2	3
	b) For the Boolean expression $F(A,B,C,D) = \pi M(0,1,3,4,5,7,9,11,12,13,14,15)$ taking A as MSB in the sequence and D as LSB. Prove the minimized expression using Boolean algebra equivalent to $A'CD' + AB'D' + B'CD'$.	7M	2	3
UNIT-III				
5.	a) Explain the operation of the full-subtractor circuit with necessary equations.	7M	3	2
	b) Realize Half adder using i) only NAND gates & ii) only NOR gates.	7M	3	2
(OR)				
6.	a) Realize a carry look ahead adder.	7M	3	2
	b) Explain the operation of BCD adder in detail with the help of necessary equations.	7M	3	2
UNIT-IV				
7.	a) Implement the full adder using 3-line to 8-line decoder.	7M	4	3
	b) Realize the logic function $F = \sum m(0,2,4,7)$ using 4:1 MUX.	7M	4	3
(OR)				
8.	a) With the help of logic diagram and function table explain an 8-bit multiplexer.	7M	4	3
	b) Realize 2-bit comparator with the help of logic diagram.	7M	4	3
UNIT-V				
9.	a) Draw the truth table, excitation table for i) SR Flipflop ii) JK Flipflop iii) D Flipflop iv) T Flipflop.	7M	5	2
	b) Convert SR flip flop to T flip flop.	7M	5	2
(OR)				
10.	a) Design synchronous 3 bit up counter.	7M	5	2
	b) Explain the operation of ring counter in detail.	7M	5	2

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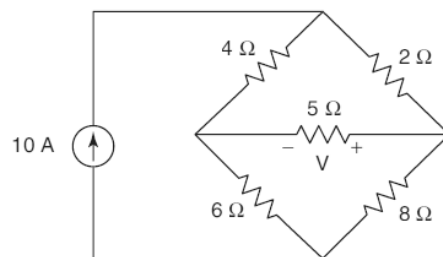
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UNIT-I

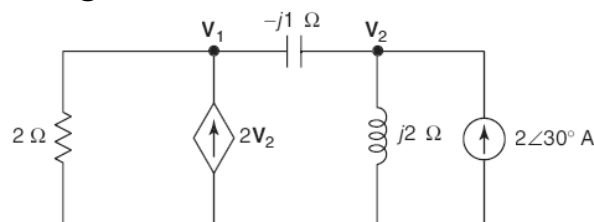
- | | Marks | CO | BTL |
|---|-------|----|-----|
| 1. a) Explain Kirchoff's Laws. | 7 | 1 | 2 |
| b) State and explain the Superposition theorem with a suitable example. | 7 | 1 | 2 |

(OR)

- | | | | |
|---|---|---|---|
| 2. a) Find the voltage V and verify the reciprocity theorem for the network shown in fig. | 7 | 1 | 2 |
|---|---|---|---|



- | | | | |
|--|---|---|---|
| b) Find the node voltages V_1 and V_2 in the network shown in fig. | 7 | 1 | 2 |
|--|---|---|---|

**UNIT-II**

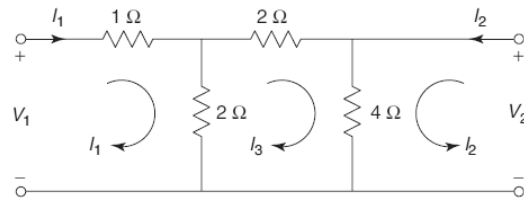
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|---|---|---|---|
| 3. a) Explain the Relationship between Z & Y Parameters. | 7 | 2 | 2 |
| b) Currents I_1 and I_2 entering at port1 and port2 respectively of a two port network are given by the following equation. Calculate Z parameters. | 7 | 2 | 2 |

$$I_1 = 0.5 V_1 - 0.2 V_2$$

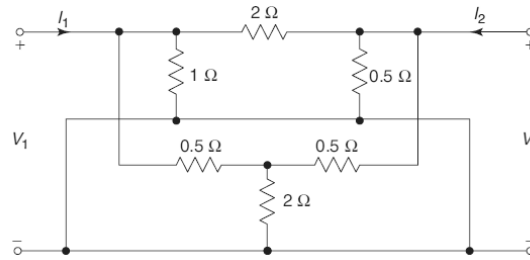
$$I_2 = -0.2 V_1 + V_2$$

(OR)

4. a) Determine hybrid parameters for the network shown in fig. Determine whether the network is reciprocal. 7 2 2

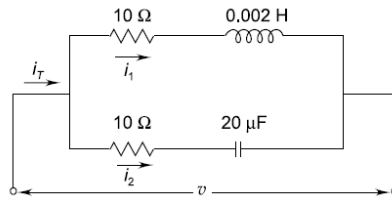


- b) Find Y parameters for the network shown in fig. 7 2 2

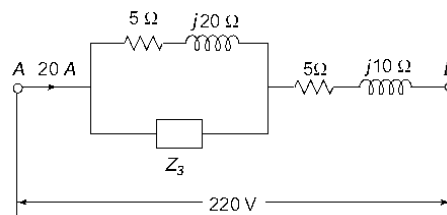


UNIT-III

5. a) In the parallel circuit shown in fig, the applied voltage is $v = 100\sin 5000t$ V. Find the currents in each branch and also the total current in the circuit. 7 3 2

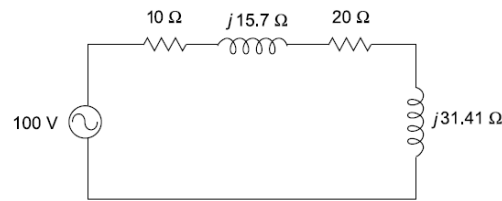


- b) When a voltage of 220 V ac supply connected across the AB terminals, the total power input is 3.26 KW and the current is 20 A. Find current through Z_3 . 7 3 2



(OR)

6. a) Determine the impedance and phase angle in the circuit shown in fig 7 3 2



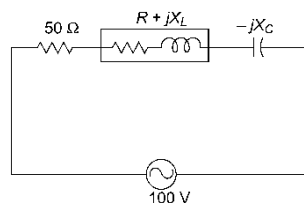
- b) A series RLC circuit consists of resistor of $100\ \Omega$, an inductor of 0.318H and a capacitor of unknown value. When this circuit is energised by a 230V , 50Hz ac supply, the current was found to be 23A . Find the value of capacitor and the total power consumed. 7 3 2

UNIT-IV

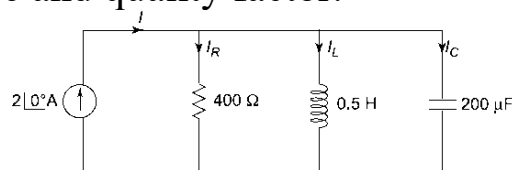
7. a) Obtain the expression for resonant frequency and bandwidth for a series RLC circuit? 7 4 3
- b) Draw the locus diagram for a series RL circuit with variable reactance. 7 4 2

(OR)

8. a) A $50\ \Omega$ resistor is connected in series with an inductor having internal resistance a capacitor and 100V variable frequency supply as shown in fig. At a frequency of 200Hz a maximum current of 0.7A flows through the circuit and voltage across the capacitor is 200V . Determine the circuit constants. 7 4 3



- b) For the parallel circuit shown in fig find resonance frequency, currents in all the branches at resonance and quality factor. 7 4 2

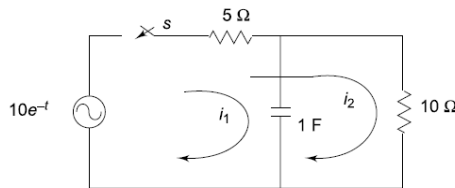


UNIT-V

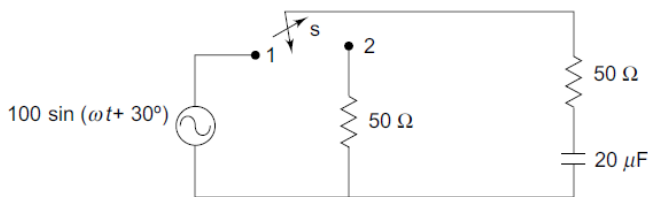
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|----|---|----|---|---|
| 9. | Draw and explain DC transient response series RL circuit. | 14 | 5 | 3 |
|----|---|----|---|---|

(OR)

- | | | | | |
|-----|--|---|---|---|
| 10. | a) For the circuit shown in fig, determine the total current delivered by the source when the switch is closed at $t=0$. Assume no initial charge on the capacitor. | 7 | 5 | 3 |
|-----|--|---|---|---|



- | | | | | |
|----|---|---|---|---|
| b) | In the network shown the switch is moved from position 1 to position 2 at $t = 0$. The switch is in position 1 for a long time. Initial charge on capacitor is 7×10^{-4} C. Determine current expression $i(t)$ | 7 | 5 | 3 |
|----|---|---|---|---|



**I B. Tech II Semester Supplementary Examinations, August - 2025
CONSTRUCTION MATERIALS AND CONCRETE TECHNOLOGY
(CIVIL ENGINEERING)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

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	<u>UNIT-I</u>	Marks	CO	Blooms Level
1. a)	Classify different types of stones used in construction with their applications.	7	1	2
b)	List the common defects in timber? Explain with neat sketches.	7	1	2
	(OR)			
2. a)	List the different types of cement? Explain their properties and applications.	10	1	2
b)	Differentiate between fine and coarse aggregates in terms of size, shape, and properties.	4	1	2
	<u>UNIT-II</u>			
3. a)	Define workability? Explain the factors that influence the workability of concrete.	7	2	2
b)	Explain the slump cone test for measuring workability of concrete	7	2	2
	(OR)			
4. a)	Explain in detail the manufacturing process of concrete from batching to curing.	10	2	2
b)	Discuss the properties of fresh concrete? Explain.	4	2	2
	<u>UNIT-III</u>			
5. a)	Explain the importance of the water-cement ratio in concrete strength.	7	3	2
b)	Discuss in detail the ultrasonic pulse velocity test for evaluating hardened concrete	7	3	2
	(OR)			
6. a)	Define creep and shrinkage of concrete. Explain their effects on structures.	4	3	2
b)	Discuss the various factors affecting the strength of concrete.	10	3	2
	<u>UNIT-IV</u>			
7.	Define high-strength concrete and high-performance concrete. Explain their applications.	14	4	2
	(OR)			
8.	Explain detailed notes on polymer concrete and geo-polymer concrete with their advantages and limitations.	14	4	2
	<u>UNIT-V</u>			
9.	Design a concrete mix of M25 grade using IS method of mix design. Assume relevant data.	14	5	2
	(OR)			
10. a)	What is a mix design? Explain the steps involved in concrete mix proportioning.	7	5	2
b)	Discuss the statistical methods used in the quality control of concrete.	7	5	2

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)****I B. Tech II Semester Supplementary Examinations, August - 2025****THERMODYNAMICS
(MECHANICAL ENGINEERING)****Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

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UNIT-I

1. a) Discuss in detail about the concept of control volume. 5M
- b) Discuss in detail about zeroth law of thermodynamics. 5M

(OR)

2. a) Describe briefly about extensive and intensive property. 5M
- b) A balloon is filled with air (200 kPa and 300K) such that it becomes as sphere of diameter 1m. It is then gradually heated till the pressure rises to 500 kPa. Determine the amount of work done during the process, assuming that the pressure inside the balloon is proportional to the diameter of the balloon. 5M

UNIT-II

3. Air enters an insulated diffuser operating at steady state with a pressure of 0.7 bar, a temperature of 5.70C and a velocity of 200 m/s. At the exit the pressure is 1 bar. The exit flow area is 20% greater than the inlet flow area. Potential energy effects can be neglected. Determine the air exit temperature and the velocity. Take $C_p = 1.005 \text{ kJ/kgK}$ and $R = 0.287 \text{ kJ/kgK}$. 10M

(OR)

4. Derive the steady flow energy equation. 10M

UNIT-III

5. a) Explain briefly about Clausius statement. 5M
- b) Discuss in detail about the concept of entropy. 5M

(OR)

6. a) Explain Clausius inequality. Write its specialties. 5M
- b) Is the Third law of thermodynamics, an extension of second law? Is it an independent law of nature? Explain. 5M

UNIT-IV

7. An insulated piston–cylinder device contains 3L of saturated liquid water at a constant pressure of 280 kPa. An electric resistance heater inside the cylinder is turned on, and electrical work is done on the water in the amount of 3200 kJ. Assuming the surroundings to be at 30°C and 180 kPa, determine (i) the minimum work with which this process could be accomplished and (ii) the exergy destroyed during this process. 10M

(OR)

8. Derive an expression for availability in non-flow system. 10M

UNIT-V

9. a) Derive maxwell equations. 5M
b) Discuss in detail about the different gas laws. 5M

(OR)

10. A 2.8m³ rigid tank contains steam at 280°C. Two third of the volume is in the liquid phase and the rest is in the vapor form. Determine (i) the pressure of the steam, (ii) the quality of the saturated mixture, and (iii) the density of the mixture. 10M

UNIT-VI

11. For an air standard dual cycle, having air intake as 1 bar and 323 K, maximum pressure as 70 bar, heat addition at constant volume is same as the heat addition at constant pressure, determine the (i) mean effective pressure and (ii) thermal efficiency of the cycle. 10M

(OR)

12. A diesel cycle operating on an air standard cycle has a compression ratio of 15. The pressure and temperature at the beginning of the compression are 1.04 bar and 150°C. If the maximum temperature of the cycle is 2330 K, determine the thermal efficiency and (b) the mean effective pressure. 10M

UNIT-I

- 1 a) Define data structures. Explain their types with examples 5M
b) Define Omega (Ω) and Theta (θ) notations with examples. 5M
(OR)
2 What is recursion? Write an algorithm for calculating factorial using recursion and derive its time complexity. 10M

UNIT-II

- 3 Explain Quick Sort with an example. Write its algorithm and analyze its performance in best, worst, and average cases 10M
(OR)
4 Explain collision resolution techniques in hashing. Compare open addressing and chaining methods 10M

UNIT-III

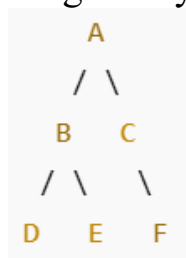
- 5 Demonstrate the following insertion operations on single linked list 10M
a) At the beginning of the list b) at the end of the list c) at any given position
(OR)
6 Perform **Deletion at the beginning , at the end and at the position** of a Circular linked list 10M

UNIT-IV

- 7 a) Convert the infix expression $(A + B) * (C - D) / E$ to postfix notation 5M
b) What is a circular queue? How does it overcome the limitations of a simple queue? 5M
(OR)
8 Write a C program to implement a stack using a linked list and demonstrate push, pop, and display operations 10M

UNIT-V

9. a) Define an AVL tree. Why is it called a self-balancing tree? 5M
b) Write the preorder, inorder, and postorder traversals for the following binary tree: 5M



(OR)

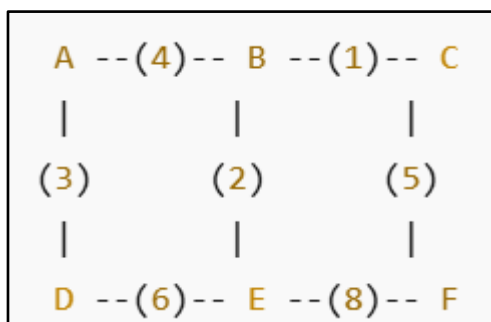
- 10 Construct a B-tree of order 3 for the following keys: **10, 20, 5, 6, 12, 30, 7, 17**. Show all intermediate steps. 10M

UNIT-VI

- 11 a) Describe the working of the Breadth-First Search (BFS) algorithm with an example. 5M
b) Differentiate between directed and undirected graphs with examples. 5M

(OR)

- 12 Explain the working of Dijkstra's Algorithm with an example. 10M
Construct a shortest path tree for the following graph:



Assume A as the source vertex. Show all steps.

**Surveying and Geomatics
(CIVIL ENGINEERING)****Time: 3 Hours****Max Marks: 60**

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UNIT-I

1. a) Explain the following terms (5M)
(a) Representative fraction. (b) Scale of plan. (c) Graphical scale.
- b) Differentiate clearly between plane and geodetic surveying. (5M)
- (OR)**
2. a) Explain clearly the principle of chain surveying. (5M)
- b) What are the instruments used in chain surveying? How is a chain survey executed in the field? (5M)

UNIT-II

3. a) Give, in a tabular form, the difference between prismatic compass and surveyor's compass. (3M)
- b) Determine the values of included angles in the closed compass traverse ABCD conducted in the clockwise direction, given the following fore bearings of their respective lines. Apply the check. (7M)

line	F.B.
AB	40°
BC	70°
CD	210°
DA	280°

(OR)

4. a) What is local attraction? How is it detected and eliminated? (3M)
- b) Below are the bearings observed in a traverse survey conducted with a prismatic compass at a place where local attraction was suspected? (7M)

Line	Fore Bearing	Back Bearing
PQ	124° 30'	304° 30'
QR	68° 15'	246° 00'
RS	310° 30'	138° 15'
SP	200° 15'	17° 45'

At what stations do you suspect local attraction? Find the corrected bearings of the lines.

UNIT-III

5. a) What are the different types of levelling staff? State the merits and demerits. (3M)
- b) The following consecutive readings were taken with a level and 3 metre levelling staff on continuously sloping ground at a common interval of 20 metres:
0.602, 1.234. 1.860, 2574. 0.238, 0.914, 1.936. 2.872, 0.568, 1.824, 2.722.
The reduced level of the first point was 192.122. Rule out a page of a level field book and enter the above readings. Calculate the reduced levels of the points and also the gradient of the line joining the first and the last points. (7M)
- (OR)**
6. a) Discuss various methods of interpolating the contours. (5M)
- b) Describe with the help of sketches the characteristics of contours. (5M)

UNIT-IV

7. a) Discuss the principle of theodolite survey and principle of tachometry. (5M)
- b) What are 'face left' and 'face right' observations? Why is it necessary to take both face observations? Why both verniers are read? (5M)
- (OR)**
8. a) Discuss the fundamentals of total station and GPS (5M)
- b) Explain the methods of setting out a simple curve. (5M)

UNIT-V

9. a) Write down the advantages of photogrammetric surveying. (5M)
- b) Explain about terrestrial photogrammetry. (5M)
- (OR)**
10. a) Discuss the perspective geometry of aerial photograph (5M)
- b) Write short on flight planning and Stereoscopy (5M)

UNIT-VI

11. a) Write a short note on remote sensing data acquisition. (5M)
- b) Write a short note on Electromagnetic Spectrum. (5M)
- (OR)**
12. a) Discuss the features used to identify satellite images through visual image interpretation? (5M)
- b) Explain about 5 components of GIS? (5M)

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UNIT-I

1. a) Describe the action of PN junction diode under forward bias and reverse bias conditions with neat diagrams. 6M
- b) Explain the working of full wave rectifier and give waveforms of input and output voltages. 6M

(OR)

2. a) Indicate the differences between the characteristics of silicon and germanium diodes and state approximately their cut-in voltages 6M
- b) A half wave rectifier having a resistive load of 1000 ohms, rectifies an alternating voltage of 325V peak value and the diode has a forward resistance of 100 ohms. Calculate DC output power, AC input power, Efficiency. 6M

UNIT-II

3. a) Elucidate the input and output characteristics of a transistor in common base configuration with neat diagrams. 6M
- b) Explain why BJT's are called bipolar devices while FET's are called unipolar devices. 6M

(OR)

4. a) Explicate the construction of N-channel and P-channel JFET with neat diagrams. 6M
- b) Determine the values of collector current and emitter current for the transistor circuit of $\beta=250$ and $I_B=0.25\text{mA}$. 6M

UNIT-III

5. a) Explicate the operation of common emitter amplifier with neat diagrams. 6M
- b) Explain the importance of coupling capacitor in amplifier circuits with neat diagrams. 6M

(OR)

6. a) What is an amplifier? What are various types of amplifiers? 6M
- b) What do you understand by the term 'equivalent circuit' of a transistor? Draw the equivalent circuit of generalized transistor amplifier and explain the significance of each parameter. 6M

UNIT-IV

7. a) Show that for current series feedback amplifier input and output resistances are increased by a factor of $(1+A\beta)$ with feedback. 6M
- b) Explain the working of Hartley Oscillator with neat diagrams. 6M

(OR)

8. a) Derive the expressions for input impedance, output impedance and voltage gain of voltage series feedback amplifier with the help of topology diagram. 6M
- b) Clarify the operation of a transistorized Wein Bridge oscillator with the help of neat circuit diagram. 6M

UNIT-V

9. a) Briefly explain the necessity and function of different stages of op-amp with the help of block diagram. 6M
- b) Elucidate the operation of a basic differential amplifier circuit with neat diagram. 6M

(OR)

10. a) List the ideal characteristics of an operational amplifier. 6M
- b) Define following parameters as applied to an op-amp 6M
 - a) CMRR
 - b) PSRR
 - c) Slew Rate