

**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**MCA I Year I Semester Supplementary Examinations July-2025**

**DISCRETE MATHEMATICS**

**Time: 3 Hours**

**Max. Marks: 60**

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

- 1 a Show that  $R \wedge (P \vee Q)$  is a valid conclusion from the premises  $P \vee Q, Q \rightarrow R, P \rightarrow M$ , and  $\neg M$ . CO1 L1 6M

- b Prove by indirect method  $\neg q, p \rightarrow q$  and  $p \vee t$ , then  $t$ . CO1 L1 6M

**OR**

- 2 a Obtain PCNF of  $A = (p \wedge q) \vee (\neg p \wedge q) \vee (q \wedge r)$  by constructing PDNF. CO1 L4 6M

- b Define Quantifiers and types of Quantifiers with examples. CO1 L1 6M

**UNIT-II**

- 3 a Define Relation? Write the properties of relations. CO2 L1 6M

- b Let  $A = \{0, 1, 2, 3, 4\}$ . Show that the relation  $R = \{(0, 0), (0, 4), (1, 1), (1, 3), (2, 2), (3, 1), (3, 3), (4, 0), (4, 4)\}$  is an equivalence relation. CO2 L4 6M

**OR**

- 4 a Define abelian group, homomorphism and isomorphism. CO2 L1 6M

- b Show that the set of all positive rational numbers forms an abelian group under the composition defined by  $a * b = \frac{(ab)}{2}$ . CO2 L4 6M

**UNIT-III**

- 5 a Out of 5 men and 2 women, a committee of 3 is to be formed. In how many ways can it be formed if at least one woman is to be included? CO3 L1 6M

- b In how many ways can the letters of the word COMPUTER be arranged? How many of them begin with C and end with R? How many of them do not begin with C but end with R? CO3 L1 6M

**OR**

- 6 a Find the minimum number of students in a class to be sure that 4 out of them are born on the same month. CO3 L1 6M

- b In a sample of 100 logic chips, 23 have a defect  $D_1$ , 26 have a defect  $D_2$ , 30 have a defect  $D_3$ , 7 have defects  $D_1$  and  $D_2$ , 8 have defects  $D_1$  and  $D_3$ , 10 have defects  $D_2$  and  $D_3$  and 3 have all the three defects. Find the number of chips having (i) at least one defect, (ii) no defect. CO3 L3 6M

**UNIT-IV**

- 7 a Find the sequence generated by the function  $f(x) = (3+x)^3$ . CO4 L6 6M

- b Find the generating function of  $(n-1)^2$ . CO4 L6 6M

**OR**

- 8 a Find the generating function for the sequence 0, 2, 6, 12, 20, 30, 42... CO4 L5 6M

- b Solve the recurrence relation  $a_{n+2} + 3a_{n+1} + 2a_n = 3^n$  for  $n \geq 0$  given  $a_0 = 0, a_1 = 1$ . CO4 L6 6M

**UNIT-V**

- 9 a Determine the number of edges in (i) Complete graph  $K_n$  (ii) Complete bipartite graph  $K_{m,n}$  (iii) Cycle graph  $C_n$  (iv) Path graph  $P_n$ . **CO5 L2 6M**  
b Explain about complete graph and Bipartite graph with an example. **CO5 L1 6M**
- OR**
- 10 a Let  $G$  be a 4 – Regular connected planar graph having 16 edges. Find the number of regions of  $G$ . **CO5 L2 6M**  
b Draw the graph represented by given Adjacency matrix **CO5 L1 6M**

$$(i) \begin{bmatrix} 1 & 2 & 0 & 1 \\ 2 & 0 & 3 & 0 \\ 0 & 3 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

$$(ii) \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

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