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

**MCA I Year I Semester (R16) Supplementary Examinations June 2017**

**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**

(For Students admitted in 2016 only)

Time: 3 hours

Max. Marks: 60

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

**UNIT-I**

- 1 a. Explain the converse, contrapositive and inverse of an implication with suitable examples. 6M  
 b. Explain tautology, contradiction, contingency with suitable examples 6M

**OR**

- 2 a. Show that  $((p \vee q) \wedge (\neg p \wedge (\neg q \vee \neg r))) \vee (\neg p \wedge \neg q) \vee (\neg p \wedge \neg r)$  is a tautology without constructing truth table. 6M  
 b. Define disjunctive normal form and find the disjunctive normal form of  $(\neg p \rightarrow q) \wedge (p \vee q)$  by using the truth table 6M

**UNIT-II**

- 3 a. Prove that the relation “congruence modulo m” given by  $R = \{ \langle x, y \rangle \mid x - y \text{ is divisible by } m \}$  over the set of positive integers is an equivalence relation. 6M  
 b. Find the inverse of the following functions 6M  
 (i)  $f(x) = \frac{10}{(7-3x)^{\frac{1}{5}}}$       (ii)  $f(x) = 4e^{(6x+2)}$

**OR**

- 4 a. Consider the algebraic system  $(Q, *)$ , where  $Q$  is the set of rational numbers and  $*$  is a operation defined by,  $a * b = a + b - ab, \forall a, b \in Q$ . 7M  
 (i). Find  $3 * 4, 2 * (-5)$  and  $7 * \frac{1}{2}$   
 (ii). Is  $(Q, *)$  a semi group? 5M  
 b. Prove that every homomorphic image of an abelian group is abelian. 5M

**UNIT-III**

- 5 a. How many numbers can be formed using the digits 1, 3, 4, 5, 6, 8 and 9 if no repetitions are allowed? 6M  
 b. In how many ways can a committee of 5 ladies and 4 gents be chosen from 9 ladies and 15 gents, if gent, A refuses to take part if lady, B is on the committee? 6M

**OR**

- 6 a. How many arrangements are there for the word ‘MISSISSIPPI’ with no two pair of consecutive same letters? 8M  
 b. Show that if 8 people are in a room, at least two of them have birthdays that occur on the same day of the week. 4M

**UNIT-IV**

7 Solve the recurrence relation  $a_n - 9a_{n-1} + 26a_{n-2} - 24a_{n-3} = 0$ , for  $n \geq 3$ . 12M

**OR**

8 a. Solve  $a_n = 3a_{n-1}, n \geq 1$ , using generating functions. 6M

b. Solve  $a_n + 5a_{n-1} + 6a_{n-2} = 42(4)^n$ . 6M

**UNIT-V**

9 Explain Breadth-First search (BFS) algorithm. 12M

**OR**

10 Define the following graphs with one suitable examples for each graphs

(a) Complement graph

(b) Subgraph

(c) Wheel graph

(d) Spanning subgraph

12M

**\*\*\* END \*\*\***