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MCA/D-15 **10612**

DISCRETE MATHEMATICAL STRUCTURE

Paper–MCA-14-14

Time Allowed : 3 Hours] [Maximum Marks : 80

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

(Compulsory Question)

1. Write short notes on the following :
   (a) Inverse function
   (b) Counting principles
   (c) Recurrence Relation
   (d) Bipartite Graph
   (e) Homomorphism
   (f) Normal forms
   (g) Dual Graph
   (h) Properties of tree.

UNIT-I

2. Prove that :

   (a) $A \cap (B \oplus C) = (A \oplus B) \cap (A \oplus C)$

   (b) $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$

(c) $(A \times \overline{B}) \cup (\overline{A} \cap B) \cup (\overline{A} \cap \overline{B}) = \overline{A} \cup \overline{B}$

(d) $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

3. How to represent the relation? Discuss with example Also show that relation R is reflexive and ciruclar if and only if it is an equivalence relation.

UNIT-II

4. (a) Prove by using law of Logic :

$(p \wedge \upsilon q) \vee q \vee (\upsilon p \wedge q) = q \vee p$

(b) In how many ways can a committee of three ladies and four gentlemen be chosen from eight ladies and seven gentleman? What is the number of ways if Miss. X refuses to serve if Mr. Y is a member?

5. Prove that :

(a) ${}^{n}C_{r} + {}^{n}C_{r-1} = {}^{n+1}C_{r}$

(b) $n.{}^{n-1}C_{r-1} = (n-r+1)\,{}^{n}C_{r-1}$

(c) $1 - 1.1P_1 + 2.{}^{2}P_2 + 3.{}^{3}P_3 + \ldots\ldots - n.{}^{n}P_n = (n+1)!$

(d) ${}^{n}P_{r} = {}^{n-1}P_{r} + r.{}^{n-1}P_{r-1}$.

UNIT-III

6. Prove that :

(a) $(a+b)^1 = a^1 \times b^1$

(b) $(a \times b)^1 = a^1 + b^1$

(c) Solve the recurrence relation

$a_r + a_{r-1} = 3r^2 2^r$

(d) Prove that if L be a lattie then,
$a \wedge b = a$ if $a \vee b = b$.

7. Solve the following difference equation :

$a_r - 5a_{r-1} + 6a_{r-2} = 2^r + r$, $a_0 = 1$ $a_1 = 1$ and $r \geq 2$.

UNIT-IV

8. Discuss the method of transverse the binary tree with suitable examples.

9. Find the shortest path between K and L in the graph as shown in fig. below using Dijkstra's algorithm :