

Roll No.

Total Pages : 3

BT-3/D-18

33003

DISCRETE STRUCTURE

Paper : CSE 205(E)

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT-I

1. (a) Let R be the relation on set $A = \{a, b, c, d\}$ defined by $R = \{(a, b), (b, c), (d, c), (d, a), (a, d), (d, d)\}$.

Determine (a) Reflexive closure of R and (b) Transitive closure of R . 10

- (b) Prove the following proposition by PMI.

$$P(n) = 1/1(3) + 1/3(5) + \dots + 1/(2n-1)(2n+1) = n/2n + 1. \quad 10$$

2. Let $D_{100} = \{1, 2, 4, 5, 10, 20, 25, 50, 100\}$ and let the relation $R(\leq)$ be the relation (divides) a partial ordering on D_{100} .

- (i) Draw the Hasse Diagram for the above relation :

- (a) Determine the GLB of B , where $B = \{10, 20\}$.
- (b) Determine the LUB of B , where $B = \{10, 20\}$.
- (c) Determine the GLB of B , where $B = \{5, 10, 20, 25\}$.
- (d) Determine the LUB of B , where $B = \{5, 10, 20, 25\}$.

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- (ii) Determine whether (D_{100}, R) is a lattice or not. 4

UNIT-II

3. (a) Solve the recurrence relation $a_{r+2} - 2a_{r+1} + a_r = 2^r$ by the method of generating functions with the initial conditions $a_0 = 2$ and $a_1 = 1$. 10

- (b) Find the particular solution of the difference equation
$$a_{r+2} - 4a_r = r^2 + r + 1. \quad 10$$

4. (a) Solve the recurrence relation

$$a_{r+2} - 5a_{r+1} + 6a_r = r^2. \quad 10$$

- (b) Find the particular solution of the difference equation
$$a_{r+2} - 2a_{r+1} + a_r = 3r + 5. \quad 10$$

UNIT-III

5. (a) Consider an algebraic system $(Q, *)$, where 'Q' is the set of all rational numbers and '*' is a binary operation defined by $a * b = a + b - ab \forall a, b \in Q$. Determine whether $(Q, +)$ is a group or not. 10

- (b) Explain Ring Homomorphism with example. 10

6. (a) Consider an Algebraic system $(Q, *)$, q is set of rational numbers and $*$ is defined as $a * b = a + b - ab. \forall a, b \in Q$. Determine whether $(Q, +)$ is a group. 10

- (b) Consider a Ring $(R, +, *)$ is defined by $a * a = a$. Determine whether the ring is commutative or not. 10

UNIT-IV

7. (a) Explain various binary tree traversals with example. 10
(b) Determine whether $K_{2,3}$ is planar or not. 10
8. (a) Differentiate between homomorphic and Isomorphic graph with example. 10
(b) Explain Dijkstra's algorithm with example. 10

