CSE / AM 221 (R-20)

Total No. of Questions : 10] [Total No.of Pages : 02

II/IV B. Tech. DEGREE EXAMINATIONS, AUGUST - 2024

Second Semester

CSE / AM

DISCRETE MATHEMATICS

Time : **Three Hours** Maximum : **70** Marks

Answer ONE question from each Unit. 5x14=70 M

All Questions carry equal marks.

UNIT - I

1. a) Test the validity of the argument : if 8 is even then 2 does not divide 9.7 is not prime or 2 divides 9. But 7 is prime, therefore, 8 is odd.

   b) Define the following terms with appropriate truth table

   (i) Conjunction (ii) Disjunction (iii) Conditional (iv) Negation.

(OR)

2. a) Prove that a relation on a set A is symmetric if and only if $R = R^{-1}$.

   b) Obtain the principal conjunctive normal form

   (i) p^q using truth table (ii) (~p=>r) ∧ (q<=>p) without using truth table

UNIT - II

3. a) In how many ways can 6 men and 6 women be seated in a row

   (i) If any person may sit next to any other ?

   (ii) If men and women must occupy alternate seats ?

   b) Out of 12 employees a group of four trainees is to be sent for software testing and QA training of one month.

   (i) In how many ways can the four employee be selected ?

   (ii) What if there are two employees who refuse to go together for training.

(OR)

4. a) In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together ?

   b) In how many ways can a team of 5 persons can be formed out of a total of 10 persons such that two particular persons should not be included in any team ?

   c) In a birthday party, every person shakes hand with every other person. If there was a total of 28 handshakes in the party, how many persons were present in the party.

P.T.O.

UNIT - III

5. a) Find solution of the recurrence relation $a_n = -3a_{n-1} - 3a_{n-2} - a_{n-3}$, with initial conditions $a_o = 1$, $a_1 = -2$, $a_2 = -1$.

   b) Prove by principle of mathematical induction that: $P(n) : 10^n+3.4^{n+2}+5$ is divisible by 9.

(OR)

6. a) Solve the recurrence relation $a_k = 3a_{k-1}$ for k= 1, 2, 3, ... and initial condition $a_o = 2$ using generating function.

   b) Find the recurrence relation and the initial condition for the sequence 0, 2, 6, 12, 20, 30, 42, ... Hence find the general terms of the sequence.

UNIT - IV

7. a) Let A be a given finite set and ρ(A) its power set. Let $\subseteq$ be the inclusion relation on the elements of ρ(A). Draw Hasse diagram of $\langle \rho(A), \subseteq \rangle$ for
   (i) A = {a}; (ii) A = {a, b}; (iii) A = {a, b, c}; (iv) A = {a, b, c, d}

   b) Explain why the depth first traversal runs in worst case $O(n^2)$ time on an n-vertex graph that is represented with an adjacency matrix structure.

(OR)

8. a) Draw the Hasse diagrams of {1, 2, 3} x {1, 2, 3, 4} with dictionary order and the lattice order : (m, n) ≤ (p, q) if m ≤ p and n ≤ q.

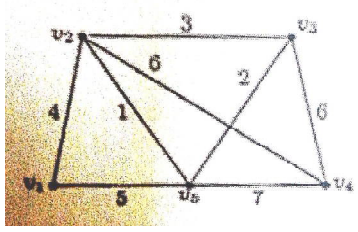
   b) Explore different representations of directed graph and its applications.

UNIT - V

9. a) Show that a simple graph is strongly connected if and only if there is a cycle in G which includes each node at least once and no isolated node

   b) Explain the following terms with example :
   (i) Euler Graph and Hamiltonian Graph.
   (ii) Bipartite and Complete Bipartite Graph.

(OR)

10. a) Define (i) Graph (ii) Directed Graph (iii) Simple Graph (iv) Multi Graph (v) Finite Graph (vi) Null Graph and give one example to each.

    b) Using Prim's algorithm, find a minimal spanning tree for the weighted graph shown below :