Reg. No: ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code :R3M28

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Third Semester

Artificial Intelligence And Data Science

R21UMA328-DISCRETE MATHEMATICS

(Common to CSD)

(Regulations R2021)

Duration: Three hours   Maximum: 100 Marks

PART A - (10 x 2 = 20 Marks)

1.   Compute PDNF for $(P \vee \neg Q)$ CO1-App

2.   Derive S from the premises $P \vee Q, Q \to S \ and \ \neg P$ CO1-App

3.   Compute the solution of the recurrence relation $a_n - 9a_{n-2} = 0$.   CO2-App

4.   How many different word are there in the word MATHEMATICS.   CO2-App

5.   Define Semi group and give an example   CO6-U

6.   Find the order of $[3],[4]$ & $[6]$ element in $(Z_7, \otimes_7)$ CO3-App

7.   Draw a graph with degree sequence 1, 2,3,4,2. If not Explain otherwise draw a   CO4-App
     graph.

8.   Write the adjacency matrix for the graph K_4.   CO6-U

9.   Draw a Hassee diagram for a poset A = {2,4,6,5,10,30,/}.   CO6-U

10. Prove that $a \wedge (a \vee b) = a$.   CO6-U

PART – B (5 x 16= 80 Marks)

11. (a) (i) Calculate PCNF and PDNF for $(\neg P \to R) \wedge (Q \leftrightarrow P)$ CO1-App   (8)

          (ii) Using the rules of inference derive & using CP Rule.   CO1-App   (8)
          $P \to (Q \to S), \neg R \vee P, Q \Rightarrow R \to S$

Or

(b) (i) Prove the following by direct Method. CO1-App (8)

$P \rightarrow (Q \wedge R), (Q \vee S) \rightarrow U, P \vee S \Rightarrow U$

(ii) Use the direct method to show that CO1-App (8)

$R \rightarrow \neg Q, R \vee S, S \rightarrow \neg Q, P \rightarrow Q \Rightarrow \neg P$

12. (a) (i) Solve: $a_n - 6a_{n-1} + 8a_{n-2} = (2)^n, a_0 = 1\ a_1 = 5$ CO2-App (8)

(ii) Calculate the number of positive integers not exceeding 200 that are divisible by 2, 3, 5 or by 7 CO2-App (8)

Or

(b) (i) How many prime numbers not exceeding 100 are there? CO2-App (8)

(ii) Using generating functions Solve $a_n = 5a_{n-1} + 3^n, a_0 = 3$ CO2-App (8)

13. (a) (i) State and prove Lagrange's theorem. CO3-U (8)

(ii) Let G be a finite group of order 'n' and H be any subgroup of G. Then Show that the order of H divides the order of G. (i.e) O(H) / O(G) CO3-U (8)

Or

(b) (i) Let G and G' be any two groups with identities e and e' respectively. If $f: G \rightarrow G'$ be a homomorphism. Then Prove that kerf is a normal subgroup CO3-U (8)

(ii) Prove that A group G is abelian iff $(a*b)^2 = a^2 * b^2$ CO3-U (8)

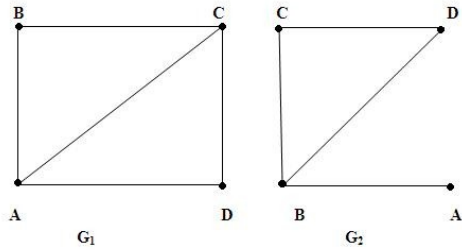14. (a) (i) Verify that following are isomorphic graph are not. CO4-App (8)
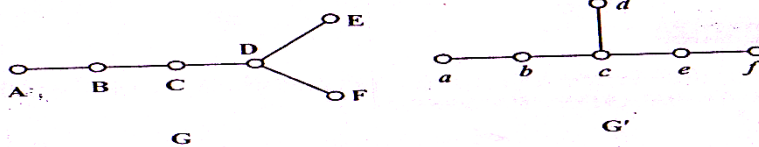
(ii) Prove that a simple graph with n vertices must be connected if it has more than $\frac{(n-1)(n-2)}{2}$ edges. CO4-U (8)

2

(b) (i) Identify the Hamiltonian path and Hamiltonian cycle, if it exist in each of the graphs given below. Also identify which graph is hamiltoinan   CO4-App   (8)

(ii) Prove that a given connected graph is Eulerian if and only if all the vertices of G are of even degree   CO4-U   (8)

15. (a) (i) State and prove DeMargons law for lattices.   CO5-App   (8)

(ii) Prove that following are equivalent   CO5-App   (8)

$(i)\,a \leq b \quad (ii)\,a \wedge b' = 1 \quad (iii)\,a' \vee b = 1 \quad (iv)\,b' \leq a'$

Or

(b) (i) Show that in any Boolean algebra   CO5-App   (8)

$(a + b)(a' + c) = ac + a'b + bc = a'b + bc$

(ii) State and prove isotonic property for Lattices.   CO5-App   (8)

R3M28