Seat No.: _____ Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA – SEMESTER – 1 • EXAMINATION – SUMMER 2018

Subject Code: 2610003 Date: 22-May-2018

Subject Name: Discrete Mathematics for Computer Science(DMCS)

Time: 02.30 pm to 5.00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** State the importance & purpose of Discrete Mathematical Structures with its application to computers science. **07**

(b) **(i)** Define: Disjoint sets. If A1 ={{1, 2}.{3}}, A2 = {{1},{2,3}} and A3= {{1, 2, 3}}, then show that A1, A2, and A3 are mutually disjoint. **04**

(ii) Construc truth table show that (⅂p ∧ (⅂q ∧ r)) v (q ∧ r) v(p ∧ r) ≡ r **03**

Q.2 **(a)** Write the following Boolean Expression in Sum-of-Product Canonical form in four variable x_1, x_2, x_3

1) $x_1 * x_2$ **02**
2) $(x_1 \oplus x_2)' * x_3$ **02**
3) $x_1 \oplus x_2$ **03**

(b) Define Subgroup of a group. Prove that $<Z_6, +_6>$ is isomorphic to $<Z_7, *_7>$ **07**

OR

(b) Use the Quine-Mccluskey algorithm to find the prime implicants and also obtain a minimal solution for function f(a,b,c,d) = Σ(15,14,13,6,5,2,1) **07**

Q.3 **(a)** Define: Maximal Compatibility Block. Let the compatibility relation on a set {1, 2, 3, 4, 5, 6} be given by following matrix. Construct the graph and find the maximum compatibility blocks **07**

2	1				
3	1	1			
4	1	1	1		
5	0	1	0	0	
6	0	0	1	0	1
	1	2	3	4	5

(b) Define isomorphic lattices with example. Draw the Hasse diagrams of lattices **07**
i) $(S_4 \times S_{25}, D)$ ii) (S_{36}, D)

OR

Q.3 **(a)** Two equivalence relations R and S are given by their relation matrices M_R and M_S.Show that RoS is not an equivalence relation. **07**

$$M_R = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad M_S = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

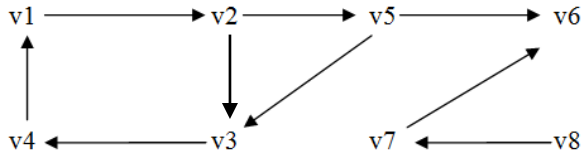
(b) Define isomorphic groups. Prove that groups $<Z_5^*, X_5>$ and $<Z_4, +_4>$ are isomorphic, where $Z_5^* = Z_5 - [0]$ **07**

Q.4 **(a)** Define subgroup of a group, left coset of a subgroup <H, *> in the group <G, *>. Find left cosets of {[0], [3]} in the group <Z6, +6>. **07**

(b) Define weakly connected, unilaterally connected and strongly connected graph with example? Define weak, unilateral and strong components, elementary path with example. **07**

OR

Q.4 **(a)** Define nodebase of a simple diagraph. Find the reachability set of all nodes for the diagraph given in **figure**. Also find the nodebase for it. **07**



(b) Give an abstract definition of graph. When are two simple graphs said to be isomorphic? Give an example of two simple digraphs having 4 nodes and 4 edges which are not isomorphic. **07**

Q.5 **(a)** Give three other representations of tree expressed by **07**
(v0(v1(v2)(v3)(v4))(v5(v6)(v7)(v8)(v9))(v10(v11)(v12)))
Obtain binary tree corresponding to it.

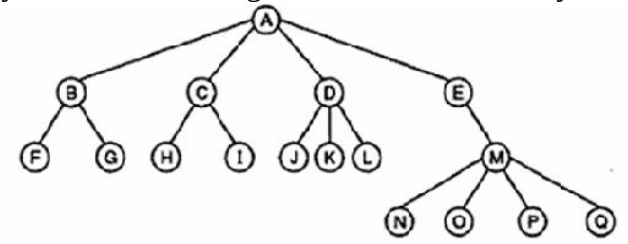
(b) **(i)**Prove that if "All men are mortal." and "Socrates is a man." Then"Socrates is a mortal." by using theory of Inference. **03**

(ii) Give an example of **04**

i) A bounded lattice which is complemented but not distributive.
ii) A bounded lattice which is distributive but not complemented.
iii) A bounded lattice which is neither distributive nor complemented.
iv) A bounded lattice which is both distributive and complemented.

OR

Q.5 **(a)** i) Define Forest with an example **07**
ii) Define Binary tree. Convert the given tree into the Binary tree.



(b) Define Path, Isolated node, circuit, complete binary tree, adjacency matrix, complemented lattice, and sublattice. **07**

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