Seat No.: ________ Enrolment No.___________

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–I • EXAMINATION – WINTER • 2014

Subject Code: 610003 **Date: 30-12-2014**

Subject Name: Discrete Mathematics for Computer Science

Time: 10:30 am - 01:00 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)** Answer the following,

1. Define Boolean algebra and Subboolean Algebra by giving suitable Example. **04**
2. Define "Symmetric Boolean Expression". Determine whether the following function is a symmetric or not : **03**
   a'bc' + a'c'd + a'bcd + abc'd

(b) Define Binary Relation, Relation Matrix, Reflexive Relation, Partition, Covering, Antisymmetric Relation and Irreflexive Relation. **07**

Q.2 **(a)** Answer the following.

1. Prove that if "All Children have an innocent smile" and "Jennifer is a child", then "Jennifer has an innocent smile". By using theory of inference. **04**
2. Construct the truth table for the following. **03**
   a) $P \rightarrow (Q \vee R)$ b) $(P \vee Q) \rightarrow R$

(b) Define the comaptibility relation and maximal compatibility block. Let the compatibility relation on a set {x1, x2, x3, . . . , x6} be given by the matrix **07**

x2	1				
x3	1	1			
x4	0	0	1		
x5	0	0	1	1	
x6	1	0	1	0	1
	x1	x2	x3	x4	x5

Draw the graph and find the maximal compatibility blocks of the relation.

OR

(b) Define an equivalance relation. Prove that the relation "congruence modulo m" given by ≡ = {<x,y> / x-y is divisible by m} over the positive integer is an euivalance relation. Also draw the relation graph for this relation using m = 5 over the set x = {1,2,3, . . . , 10}. **07**

Q.3 **(a)** Define complemented lattice and distributive lattice. Check whether the lattices <Sn , D> for n = 30 and n = 45 are complemented or not. Draw the hasse diagram of these lattices. **07**

(b) Use the Karnaugh map representation to find a minimal sum-of-products expresion of $f(a,b,c,d) = \sum(0,5,7,8,12,14)$. **07**

OR

Q.3 **(a)** Answer the following.

3. Write the following Boolean Expression in an euivalent sum-of-product canonical form in three variables x1, x2 and x3 **04**
   1) x1 * x2 2) x1⊕ x2

1. Show that **03**
   (x1’ * x2’ * x3’ * x4’) ⊕ (x1’ * x2’ * x3’ * x4) ⊕
   (x1 ’ * x2’ * x3 * x4) ⊕ (x1’ * x2’ * x3 * x4’) = x1’ * x2’

(b) What do you mean by Boolean algebra? Show that lattice <p(A), ∪,∩) is a Boolean Algebra, where A = {a,b,c} and P(A) denotes its power set. Draw the hasse diagram of this Boolean Algebra. **07**

Q.4 **(a)** Define group. Is <Z_5*, $\times_5$> a group ? Is a group <Z_5*, $\times_5$> a cyclic group? If yes, than find its all generators. **07**

(b) Define subgroup of a group, left coset of a subgroup <H, *> in the group. Give a composition table of <Z_6, $+_6$>. Find left coset of {[0], [3]} in the group <Z_6,$+_6$>. **07**

OR

Q.4 **(a)** Define isomorphic groups. Prove that groups <Z_5*, $\times_5$> and <Z_4, $+_4$> are isomorphic where Z_5* = Z_5 – [0] **07**

(b) Define Abelian group, Order of a group, Group homomorphism, Kernel of homomorphism, Normal subgroup, Permutations of a Set S, Automorphism. **07**

Q.5 **(a)** When a simple digraph is said to be weakly connected, unilateraly connected and strongly connected? Define weak, strong and unilateral components. Write the strong, unilateral and weak components for the diagraph given in Fig-1. **07**

(b) Define Graph, Directed edge of graph, Diagraph, Mixed graph, Indegree of a node, Cycle and Length of a path with suitable example. **07**

OR

Q.5 **(a)** Give other three representation 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) Define Nodebase, Reahable set of a node, Isomorphic graphs, m-ary tree, Elematary path. Give an example of a graph of having 4 nodes and 4 edges which is not an isomporphic graph. **07**

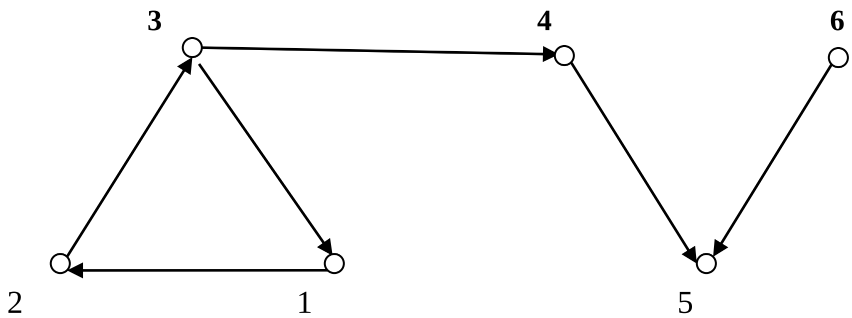

Fig - 1

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