Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA - SEMESTER–1 • EXAMINATION – WINTER 2013

Subject Code: 610003 Date: 23/12/2013

Subject Name: Discrete Mathematics for Computer Science (DMCS)

Time: 02:30 pm TO 05:00 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)** What do you mean by reflexive, symmetric, transitive, irreflexive, antisymmetric, covering and partition? **07**

(b) Draw Hasse Diagram of the poset <{2,3,5,6,9,15,24,45},D>.Find **07**

(i) Maximal and Minimal elements.

(ii) Greatest and Least members, if exist.

(iii)Upper bound of {6,9} and Least upper bound of {6,9}, if exist.

(iv) Lower bound of {24,45} and greatest lower bound of {24,45}, if exist.

Q.2 **(a)** What do you mean by "Boolean algebra"? Show that lattice $<P(A), \cup, \cap>$ 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**

(b) What do you mean by an "Equivalence relation"? Prove that the relation "congruence modulo m" given by = {<x,y>/x-y is divisible by m} over the positive integer is an equivalence relation. Also draw the relation graph for this relation using m=7 over the set x={1,2,3,4,…,20}. **07**

OR

(b) What do you mean by "compatibility relation" and "maximal compatibility block"? Let the compatibility relation on a set {1,2,3,4,5,6} be given by the matrix **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

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

Q.3 **(a)** What do you mean by "Lattice", "Complete Lattice" and "Complement"? **07**

Let the sets A,B,C,D,E,F,G,H be given by

A={1,2,3,4,5,6}, B={1,2,3,4,5}, C={1,2,3,5,6}, D={1,2,3,5}, E={1,2,3}, F={1,2}, G={1,3} ,H={1}

Draw the diagram of $<L, \subseteq>$, where L={A,B,C,D,E,F,G,H}

(b) What do you mean by Boolean algebra? **07**

Use the Quine McClusky method to simplify the SOP expansion,

$$F(a,b,c,d) = \sum(0,2,4,6,8,10,12,14)$$

And draw the circuit diagram of the minimized function.

OR

Q.3 **(a)** What do you mean by "Symmetric Boolean expression"? Determine whether the following function are symmetric or not: **07**

(i) a'bc' + a'c'd + a'bcd + abc'd

(ii) abc' + ab'c + a'bc + ab'c' + a'bc' + a'b'c

(b) Prove that (S_{30}, D) is a Boolean algebra. **07**

Q.4 **(a)** What do you mean by "Group" "Abelian group" "Normal subgroup"? Determine all the subgroup of the symmetric group $<S_3, \ \lozenge>$. Is this group normal? Justify your answer. **07**

(b) What do you mean by "Cyclic group"? Is $<z_8, +_8>$ a cyclic group? If yes, find its generators. **07**

OR

Q.4 **(a)** What do you mean by Sub- group? Find all the subgroup of following: **07**

(i) $<Z_{12},+_{12}>$

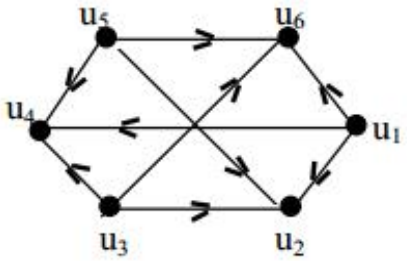
(ii) $<Z_5,+_5>$

(b) Use the Karnaugh map representation to find a minimal sum-of-product expression of each of the following function: **07**

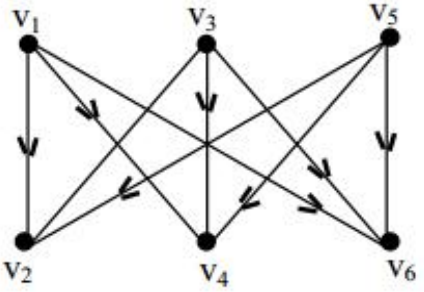
(i) $F(a,b,c)=\sum(0,1,4,6)$

(ii) $F(a,b,c,d)=\sum(0,5,7,8,12,14)$

Q.5 **(a)** What do you mean by isomorthic graph.Determine the graphs A and B given in figure - 1(i),(ii) are isomorphic. **07**



Graph-A
Figure-1(i)



Graph-B
Figure-1(ii)

(b) What do you mean by "path", "simple path" "elementary path"? For the graph given in Figure-2: **07**

(i) Find an elementary path of length 2 from v_1 to v_3.

(ii) Find a simple path from v_1 to v_3, which is not elementary.

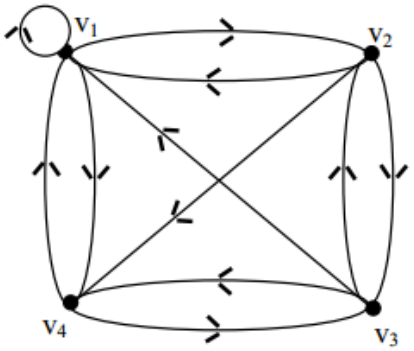
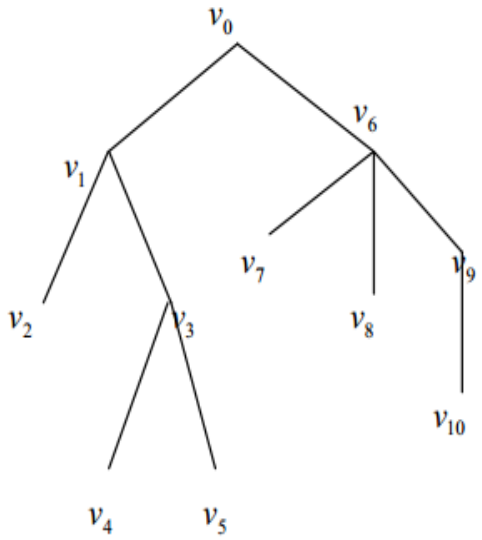


Figure-2

OR

Q.5 **(a)** Give three other 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) What do you mean by directed tree? Draw different representation of the following tree. **07**


v_0
v_6
v_1
v_7
v_9
v_2
v_3
v_8
v_{10}
v_4
v_5

****