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.
- What do you mean by reflexive, symmetric, transitive, irreflexive, antisymmetric, 07 Q.1 (a) covering and partition?
 - (b) Draw Hasse Diagram of the poset < {2,3,5,6,9,15,24,45},D>.Find
 - (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 $\langle P(A), \cup, \cap \rangle$ is a Boolean 07 algebra, where $A = \{a, b, c\}$ and P(A) denotes its power set. Draw the Hasse diagram of this Boolean algebra.
 - What do you mean by an "Equivalence relation"? Prove that the relation "congruence 07 **(b)** modulo m" given by = $\{\langle x, y \rangle / x - y \}$ 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 $x = \{1, 2, 3, 4, \dots, 20\}$.

OR

- (b) What do you mean by "compatibility relation" and "maximal compatibility block"? Let 07 the compatibility relation on a set $\{1,2,3,4,5,6\}$ be given by the matrix
 - 2 | 1 3 1 1 4 1 1 1 5 0 1 0 0 0 0 1 0 1 6 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 $A = \{1, 2, 3, 4, 5, 6\}, B = \{1, 2, 3, 4, 5\}, C = \{1, 2, 3, 5, 6\}, D = \{1, 2, 3, 5\}, E = \{1, 2, 3\}, F = \{1, 2\}, A = \{1, 2, 3, 4, 5\}, C = \{1, 2, 3, 5, 6\}, D = \{1, 2, 3, 5, 6\}, C = \{1, 2, 3, 5, 6\}, C$ $G = \{1,3\}, H = \{1\}$ Draw the diagram of $<L, \subseteq>$, where L={A,B,C,D,E,F,G,H} 07
 - (b) What do you mean by Boolean algebra? 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 07 following function are symmetric or not:
 - (i) a'bc' + a'c'd + a'bcd + abc'd
 - (ii) abc' + ab'c + a'bc + ab'c' + a'bc' + a'b'c

07

- (b) Prove that (S_{30}, D) is a Boolean algebra.
- Q.4 (a) What do you mean by "Group" "Abelian group" "Normal subgroup"? Determine all the 07 subgroup of the symmetric group $\langle S_3, \rangle \rangle$. Is this group normal? Justify your answer.
 - (b) What do you mean by "Cyclic group"? Is $\langle z_8, +_8 \rangle$ a cyclic group? If yes, find its **07** generators.

OR

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- Q.4 (a) What do you mean by Sub- group? Find all the subgroup of following: (i) <Z₁₂,+₁₂> (ii) <Z₅,+₅>
 - (b) Use the Karnaugh map representation to find a minimal sum-of-product expression of 07 each of the following function:
 - (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 07 1(i),(ii) are isomorphic.





Figure-1(ii)

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

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