Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA Integrated- SEMESTER II • EXAMINATION – WINTER 2014

Subject Code: 4420601 Date: 29/11/2014

Subject Name: Discrete Mathematics for Computer Science

Time:10:30a.m. To 01:00p.m 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)** Define following: **07**

(1) Poset
(2)Chain
(3)Lattice
(4) Sub lattices
(5) Boolean Algebra
(6) Complemented Lattices
(7) Join- irreducible atoms

(b) Is every poset a lattice? Justify. Draw Hasse diagrams of following. **07**
(a)A={a} (b) A={a,b} (c) A={a,b,c}

Q.2 **(a)** With proper justification give an example of **07**
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

(b) Define Sub Boolean Algebra. State the necessary and sufficient condition for a subset becomes sub-algebra. Find all sub Boolean algebra of $<S_{110}, D>$. **07**

OR

(b) Show that D(30) is a Boolean algebra. Hence find all the atoms in D(30). **07**

Q.3 **(a)** Use the K-map representation to find a minimal sum-of-products expression for the following function: **07**
i) $f(w,x,y,z) = \Sigma(0,1,2,3,6,7,13,14)$
ii) $f(w,x,y,z) = \Sigma(0,1,2,3,13,15)$

(b) Use the Quine-McCluskey representation to find a minimal SOP expression: **07**
$f(a,b,c,d) = \Sigma(0,2,4,6,8,10,12,14)$

OR

Q.3 **(a)** In any Boolean Algebra, show that $a = b \leftrightarrow ab' + a'b = 0$ **07**

(b) Show that the lattice <Sn, D> for n = 100 is isomorphic to the direct product of lattices for n = 4 and n = 25. **07**

Q.4 **(a)** (i) Define group with example. Give an example of non-abelian group. **03**
(ii)Define Subgroup and Group Homomorphism **02**
(iii)State the Lagrange's Theorem **02**

(b) Define Cyclic group. Find generators of $< Z_{10}, +_{10} >$. Also find its subgroups. **07**

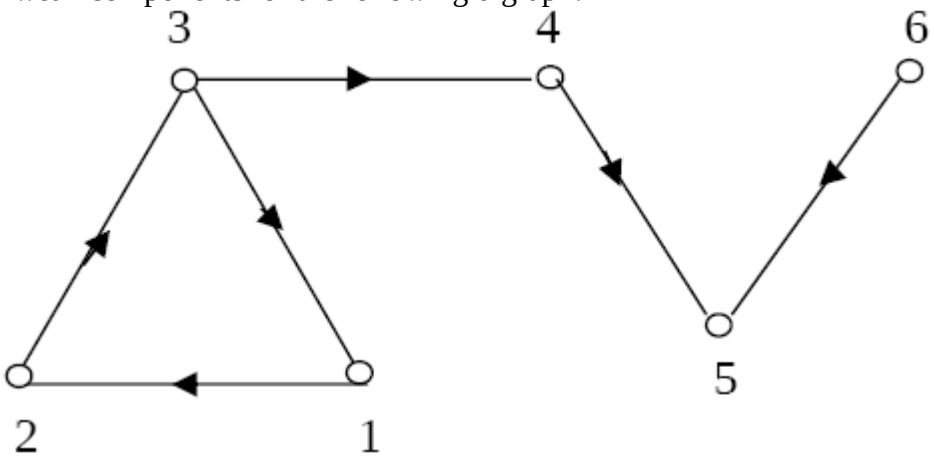
OR

Q.4 **(a)** (i)Define Left Coset and Right Coset.Let H={[0][3]} in Z_6 under addition. Find left cosets in $<Z_6, +_6>$. **04**

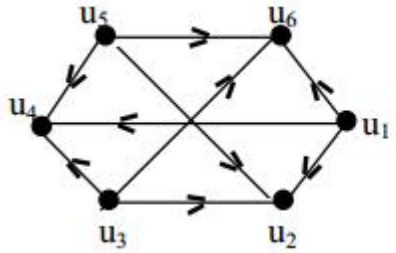
(ii)What is ring in Group theory? **03**

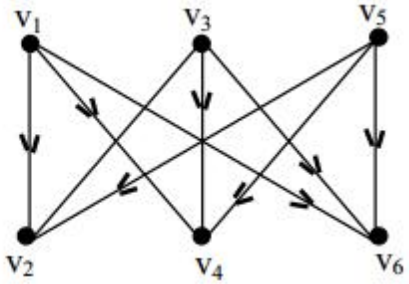
(b) Define Cyclic group. Prove that <Z4, +4> is isomorphic to < Z5, *5> where Z5* = Z5-[0]. **07**

Q.5 **(a)** 1. Define weakly connected, unilaterally connected and strongly connected graphs. **07**
2. Define weak, unilateral and strong components. Find the strong, unilateral and weak components for the following digraph.



(b) Define isomorphic graphs. State whether the following digraphs are Isomorphic or not. Justify your answer. **07**





OR

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) Define a directed tree. Show by means of an example that a simple digraph in which exactly one node has indegree 0 and every other node has indegree 1 is not necessarily a directed tree. **07**

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