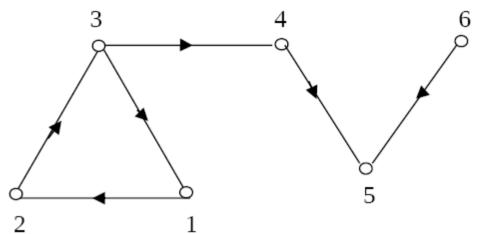
## **GUJARAT TECHNOLOGICAL UNIVERSITY** MCA Integrated- SEMESTER II • EXAMINATION – WINTER 2016

| J   |              |  | 0/12/2016 |  |
|---|--------------|--|-----------|--|
| Subject Name: Discrete Mathematics For Computer Science<br>Time:10:30a.m. To 01:00p.m Total Marks:<br>Instructions: |              |  |           |  |
| п   | isti uč      | <ol> <li>Attempt all questions.</li> <li>Make suitable assumptions wherever necessary.</li> <li>Figures to the right indicate full marks.</li> </ol>   |           |  |
| Q.1   | (a)          | Define "Boolean expression".<br>Show that $[a * (b' \oplus c)]' * [b' \oplus (a * c')']' = a * b * c'$   | 07        |  |
|   | (b)          | Define "Symmetric Boolean expression".<br>Determine whether the following functions are symmetric or not:<br>(i) a'bc' + a'c'd + a'bcd + abc'd   | 07        |  |
| Q.2   | (a)          | <ul> <li>(ii) abc' + ab'c + a'bc + ab'c' + a'bc' + a'b'c</li> <li>With proper justification give an example of</li> <li>i) A bounded lattice which is complemented but not distributive.</li> <li>ii) A bounded lattice which is distributive but not complemented.</li> <li>iii) A bounded lattice which is neither distributive nor complemented.</li> <li>iv) A bounded lattice which is both distributive and complemented.</li> </ul> | 07        |  |
|   | ( <b>b</b> ) | Draw Hasse Diagram for poset: < S60 , D >; where aDb means a divides b. Write cover of each elements of S60 <b>OR</b>  | 07        |  |
|   | <b>(b)</b>   | Define Direct Product of lattices and Draw Hasse Diagrams of $\langle S,D \rangle$ , $\langle L,D \rangle$ and $\langle S \times L,D \rangle$ for S={1,3,6} and L={1,2,4}  | 07        |  |
| Q.3   | (a)          | Use Karnaugh map method to minimize the following Boolean expression<br>(1) f (x,y,z,w) = $\Sigma$ (0, 1,2,3,13,15)<br>(2) f (x,y,z,w) = $\Sigma$ (0, 1,2,3,6,7,13,14)   | 07        |  |
|   | (b)          | Minimize the following function by Quine-Mc Cluskey's method.<br>f (a, b, c, d) = $\Sigma$ (4,8,9,10,11,12,14,15)  | 07        |  |
| Q.3   | (a)          | <b>OR</b><br>In any Boolean Algebra, show that $a = b \leftrightarrow ab' + a'b = 0$   | 07        |  |
| Q.0   |              |  | 07<br>07  |  |
|   | (0)          | Draw Hasse diagram and find cover of each element of $< L^2$ , $\le >$ ,<br>where $\le$ means (a, b) R (c, d) iff a $\le$ c and b $\le$ d. L2 means L x L. L={0,1}.  | 07        |  |
| Q.4   | (a)          | (i) Define a subgroup of a group. Write all the subgroups of $\langle Z_6, +_6 \rangle$ . What is the relation between order of a subgroup and order of a finite group?  | 03        |  |
|   |              | (ii) State Lagrange's Theorem.   | 02        |  |
|   | (b)          | (iii) Define Subgroup and Group Homomorphism.<br>Define Cyclic group. Prove that $\langle Z4, +4 \rangle$ is isomorphic to $\langle Z5, *5 \rangle$ where $Z5^* = Z5$ -[0].  | 02<br>07  |  |
| 0.4   | (a)          | OR   | 04        |  |
| Q.4   | (a)          | <ul> <li>(i)Define Left Coset and Right Coset.Let H= {0,3,6} in Z<sub>9</sub> under addition.<br/>Find left cosets in Z<sub>9</sub>.</li> <li>(ii) Define: Normal-Subgroup. Let <z6, +6=""> be the group and H = {0, 3} be the</z6,></li> </ul>  | 04<br>03  |  |
| Q.5   | (b)<br>(a)   | <ul><li>subgroup of Z6.</li><li>Give an example of Group which is non abelian.</li><li>1. Define weakly connected, unilaterally connected and strongly connected graphs.</li><li>2. Define weak, unilateral and strong components. Find the strong, unilateral and weak components for the following digraph.</li></ul>  | 07<br>07  |  |



(b) (I) Define (i) A directed tree (ii) A Binary tree (iii) A complete -ary tree.
 (II) Show that in a complete binary tree the total number of edges is given by 2(n<sub>i</sub>-1)
 04 Where is n<sub>i</sub> the number of terminal nodes.

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- Q.5 (a) Give three other representations of tree expressed by (v0(v1(v2)(v3)(v4))(v5(v6)(v7)(v8)(v9))(v10(v11)(v12)))
  - Obtain binary tree corresponding to it.
    (b) Define Graph, Directed edge of graph, Diagraph, Mixed graph, In degree of a node, Cycle and Length of a path with suitable example.
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