Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

MCA- Ist SEMESTER–EXAMINATION – MAY/JUNE - 2012

Subject code: 610003 **Date: 31/05/2012**

Subject Name: Discrete Mathematics for computer Science (DMCS)

Time: 02:30 pm – 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.**

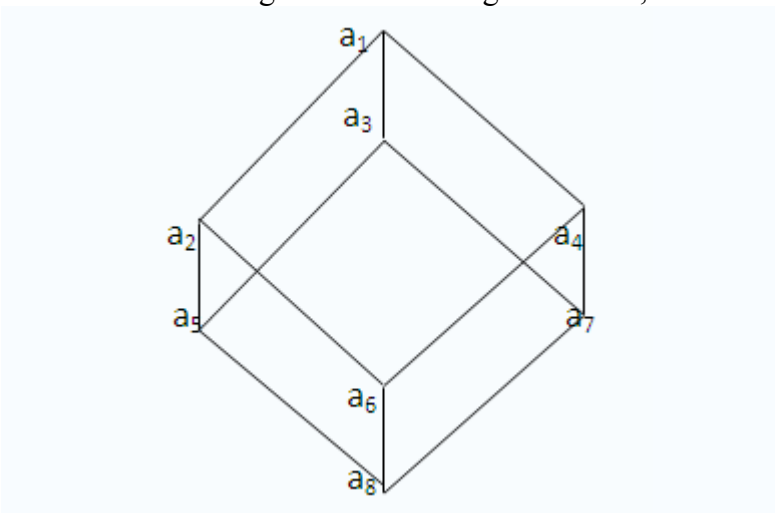
Q.1 **(a)** Express the following using predicates, quantifiers, and logical connectives. Also verify the validity of the consequence. Everyone who has green eyes is not to be trusted. Bill has green eyes. Therefore Bill is not to be trusted. **07**

(b) 1. If it snows, then the streets become slippery. If the streets become slippery, then accidents do not happen. Therefore, it does not snow. **04**

2. Prove by using Indirect method that if n^2+3 is odd then n is even. **03**

Q.2 **(a)** Define Partial order relation. Prove that "Less than or equal to"($\leq$) is partial ordering relation. **07**

(b) Let <L, $\leq$ > be a lattice. In which L= $\{a_1, a_2, a_3, \ldots, a_8\}$ and $S_1=\{a_1,a_2,a_4,a_6\}$ $S_2=\{a_3,a_5,a_7,a_8\}$ $S_3=\{a_1,a_2,a_4,a_8\}$ are subset of L. The diagram of lattice is given below, **07**



Using the diagram prepare table for * and $\oplus$ in S_1 ,S_2 ,S_3 .Show that S_1 ,S_2 are sub lattice but S_3 is not sub lattice.

OR

(b) Define "Composite relation" and "Converse of a relation". Find the relation matrix M_R of a relation R={<a,a>,<a,c>,<b,a>,<b,b>,<c,a>,<c,b>,<c,c>} on the set {a, b, c}, find the relation matrices of $\sim M_R$ (Converse of a R),$M_R^2 = M_R \circ M_R$ and $M_R \circ \sim M_R$. **07**

Q.3 **(a)** Define (1) Boolean Algebra (2) Sub- Boolean Algebra (3) Join-irreducible (4) Boolean function (5) Minterm (6) Boolean Expression (7) Maxterm **07**

(b) Write the following Boolean expression in an equivalent sum of product canonical form in three variables x, y and z (1) x * y (2) x ⊕ y (3) (x ⊕ y)' * z **07**

OR

Q.3 **(a)** Use Karnaugh map method to minimize the following Boolean expression **07**

(1) f (a, b, c) = Σ (0, 2, 5, 6)

(2) f (a, b, c, d) = Σ (0, 2, 6, 7, 8, 9, 13, 15)

(b) Minimize the following function by Quine-Mc Cluskey's method. **07**

(1) f (a, b, c, d) = Σ (0, 1, 2, 3, 4, 6, 7, 8, 9, 11, 15)

(2) f (a, b, c) = Σ (0, 2, 3, 7)

Q.4 **(a)** Define Group with illustration and prove that Identity and Inverse of the group <G, *> is unique. **07**

(b) (1) A subset S ≠ϕ of G is Subgroup of <G, *> iff for any pair of elements a, b ∈ S, a * b^{-1} ∈ S **04**

(2) Define permutation Group. If group <G, *> is abelian then show that $(a * b)^n = a^n * b^n$. **03**

OR

Q.4 **(a)** Define the dihedral group <D_4, *> and gives its composition table. **07**

(b) (a) Show that the kernel of a homomorphism g from a group <G, *> to <H, Δ> is a subgroup of <G, *>. **04**

(b) Prove that Intersection of two Normal subgroup of a group <G, *> is again a Normal Subgroup. **03**

Q.5 **(a)** Define a directed tree. Draw the graph of the tree represented by (a(b((c)(d))(e(f((g)(h((i)(j)))(k))) **07**

(b) 1. Define Path, Out degree, Strongly connected graph. **03**

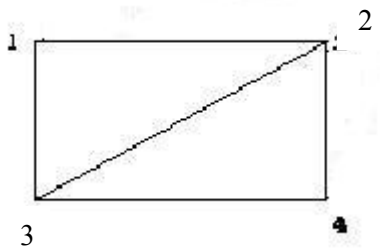
2. Define Isomorphic graph. Give at least two example of it. **04**

OR

Q.5 **(a)** Define a Binary tree. Draw the graph of the tree represented by (a(b(d(e))(c(f)))(g(h(k)(i(j(l(m))))))) **07**

(b) 1. Define Null graph, Weighted graph, Isolated Node. **03**

2. Define Adjacency matrix of the graph. Find the adjacency matrix, degree of vertex of the following graph . **04**



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