Ro11 No.........................

MCA/D-14 10368

DISCRETE MATHEMATICAL STRUCTURES

Paper—MCA-103

Time Allowed : 3 Hours] [Maximum Marks : 80

Note : Attempt five questions in all, selecting at least one question from each Unit. Question No. 1 is compulsory.

Compulsory Question

1. Write short notes on the following :

(a) Prove that subgroup of an abelian group is normal.

(b) Find the order of each element of the group (Z_6, t_6).

(c) Consider the language L = la, b, c] over A = (a, b, Find L^3.

(d) What is a Regular Graph?

(e) Define Partial ordering with suitable example.

(f) What is Switching Circuit?

(g) Explain briefly the concept of Irreducible Polynomial.

(h) Prove that the Polynomial x 4 + x + 1 is redouble over (z3, x3 , td. 3x8=24

UNIT-I

2. (a) Let (S_3, O) be a permutation group over A = (1, 2, 3). Find all the Subgroups of (S3, 0) and their generators. 7

(b) Consider H and K be groups. Then define the direct group product G = H*K of H and K. What is the identity element and order of G = H*K? 7

3. (a) Define Finite State Machines. Describe state table and state diagram of a 'finite, state machine. 7

(b) What is Language? Briefly, explain the concept of Regular Languages. 7

UNIT-II

4. (a) What is a Graph? If a Graph contains two distinct paths from vertex ti to vertex v, prove that G has a cycle. 7

(b) Define Adjacency matrix. Write an algorithm for determining cycle in a Graph. 7

5. (a) What is a Tree? Consider the algebraic expression E = (2x y) (5a b)°. Draw the tree T which corresponds to the expression E. 7

(b) Whit is a Weighted Graph? Write an algorithm to find shortest path from the node a .to node z in a Weighted Graph. 7

UNIT—III

6. Consider Boolean expression E = xz' + y'z + xye, then simplify E algebraically. Also draw the circuit diagram and _switching circuits for E and the simplified E. 14

7. (a) Elaborate various laws of Boolean algebra. Write dual of (a,+ b) (b.+ c) = ac + b. 7

(b) Describe the usage of Logic gates and circuits with examples: 7

UNLT—IV

8. Define Field and Splitting Field. Find splitting field of $x3 + x + 1$ over $(z\ 2\ ,\ t\ 2,\ x2)$. 14

9. (a) Prove that the set R. of real numbers form a field with respect to the usual operations of addition and multiplication. 7

(b) Define Integral domain. Show that a finite integral domain is a field. 7