Roll No. .....

Subject Code—2079

M.C.A. (Second Year) EXAMINATION

(5 Years Integrated Course)

MATHEMATICS–II

MCA-205

Discrete Mathematical Structures

Time : 3 *Hours* *Maximum Marks :* 100

Note : Attempt any *Five* questions. All questions carry equal marks.

1. (a) Show that the set of all real (2×2) matrix

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}, \quad ad - bc \neq 0$$

is a group under matrix multiplication as binary operation.

10

(b) Define subgroup of a group. Show that a subset H of a group G will be a subgroup of G if and only if $a^{-1} b \in H \; \forall \; a, b \in H$. Also, give an example. **10**

2. (a) Show that a subgroup N of a group G is normal in G if and only if the product of two left coset of N in G is again a left coset in G. **10**

(b) Write notes on the following : **10**

(i) Modular Arithmetic

(ii) Finite State Machine.

3. (a) Show that in a non-directed graph, the number of vertices of odd degree is always even. **10**

(b) Show that the vertex connectivity of a graph G is always less than or equal to the edge connectivity of G, i.e., $k(G) \leq \lambda(G)$. **10**

4. (a) Show that a simple non-directed graph G is a tree if and only if G is connected and has no cycles. **10**

(b) Find the binary tree representation of the expression :

$$(a - b) \times (c + (d \div e))$$

and represent the expression in string form using pre-order traversal. **10**

5. (a) Define the following with an example :

(i) Partially order relation

(ii) Lattice

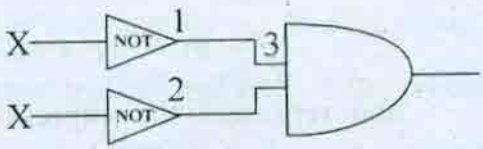
(iii) Hasse Diagram

(iv) Boolean Algebra. **10**

(b) Describe logic with their truth tables. **10**

6. (a) Prove that if we denote $x + y$ when switches are parallel and $x.y$ when switches are in series and x' denoting switch is off, then this switching circuit is a Boolean algebra. **10**

(b) Define Logic gate and different types of logic gates. Find the boolean expression for the output of the given logic circuit. Also draw the truth table for the given logic circuits : **10**



7. Show that, if F is a field then F[x], the set of all polynomials over F forms an integral domain. **20**

8. (a) Find out splitting fields of the polynomial $x^4 + 1$. **10**

(b) Describe the matrix representation of graphs. **10**