Roll No. ....

Subject Code—6802

M.C.A. (Second Year) EXAMINATION

(5 Years Integrated Course)

(Main Batch 2009)

MATHEMATICS–II

MCA-205

Discrete Mathematical Structures

Time : 3 Hours *Maximum Marks : 70*

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

1. (a) Show that the set of all matrices of the form $\begin{bmatrix} x & x \\ x & x \end{bmatrix}$, where x is non-zero real number is a group under matrix multiplication.

(b) Define Permutation group and cyclic permutation with example. Prove that every permutation on n symbols can be written as product of its cyclic permutations.

(c) Prove that intersection of two subgroups of a group G is again a subgroup of G.

2. (a) Show that a subgroup H of a group G is normal if and only if $g^{-1}hg \in H$ for every $h \in H, g \in G$.

(b) Using algebraic structure, find remainder when 3^{200} is divided by 7.

(c) Write a short note on error correcting codes.

3. (a) Show that a simple graph with m vertices and r components can have at most $(m-r)(m-r+1)/2$ edges.

(b) Explain the following with examples :

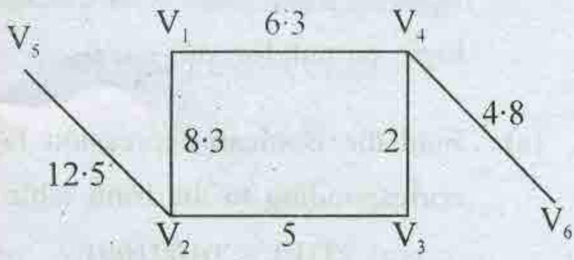
(i) Incidence matrix

(ii) Adjacency matrix

(iii) Path and Circuit.

4. (a) Show that a tree T with n vertices has exactly $(n-1)$ edges.

(b) Apply prisms algorithm to the following graph :



5. (a) If $(L_1, \leq)$ and $(L_2, \leq)$ are lattices, then $(L_1, \dot{\leq})$ is a Lattice, where $L = L_1 \times L_2$ and the partial order $\leq$ of L is the product partial order.

(b) Let $L_1\{1, 2\}$ and $L_2\{1, 3\}$ be the chains of divisors of 2 and 3 with partial order of divisibility. Then give the Hass diagram of chain L_1, chain L_2 and lattice $L_1 \times L_2$.

(c) Let $(L_1, \leq)$ be a lattice and let $a, b, c \in L$. Then show that :

$$a \vee (b \vee c) = (a \vee b) \vee c.$$

6. (a) Let a be any element of a Boolean algebra B. Then, show that the complement of a is unique.

(b) Describe logic gates and give different types of logic gates with example. Draw logic circuit for $ab' + a'b$.

7. (a) Find the Boolean expression E (x, y, z) corresponding to the truth table :

$$T(E) = 01001001$$

(b) Define integral domain. Show that the set of integers is an integral domain under ordinary addition and multiplication.

8. (a) Find out the splitting field of the polynomial :

$$x^3 - 2.$$

(b) Show that a polynomial of degree n over a field can have at most n roots in any expression field.