Bachelor of Science (B.Sc.) (I.T.) Semester-II Examination

APPLIED MATHEMATICS—II

Paper—VI

Time : Three Hours] [Maximum Marks : 50

N.B. :— (1) **ALL** questions are compulsory and carry equal marks.

(2) Draw neat and labelled diagrams wherever necessary.

EITHER

1. (A) Explain operation on sets using Venn diagrams. 5

(B) What is equivalence relation ? Let A = {1, 2, 3, 4} and consider the partition P = {{1, 2, 3}, {4}} of A. Find the equivalence relation R on A determined by P. 5

OR

(C) Let A = {a, b, c, d, e} and R = {(a, a), (a, b), (b, c), (c, e), (c, d), (d, e)} compute (a) R^2 and (b) R^∞. 5

(D) Let A = {1, 2, 3} and consider two relations :

R = {(1, 1), (1, 2), (1, 3), (2, 2), (3, 3)} and

S = {(1, 1), (1, 2), (2, 2), (3, 2), (3, 3)} then find R^{-1}, $\overline{R}, R \cap S$ and $R \cup S$. 5

EITHER

2. (A) How many different eight-card hands with five red cards and three black cards can be dealt from a pack of 52 cards ? 5

(B) Define recurrence relation. Backtrack to find an explicit formula for the sequence defined by $a_n = a_{n-1} + 3$ with $a_1 = 2$. 5

OR

(C) State and prove the Pigeonhole principle. 5

(D) Prove the statement is true by using mathematical induction :

$$5 + 10 + 15 + \ldots\ldots.. + 5n = \frac{5n(n+1)}{2}.$$ 5

EITHER

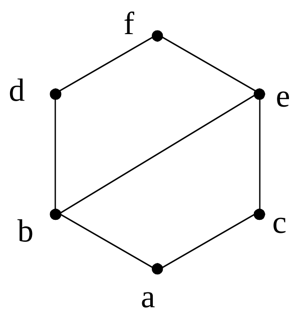
3. (A) Define semigroup, monoid, isomorphism and homomorphism. 5

(B) Let L be a bounded distributive lattice. Prove that if complement of a ∈ L exists, then it is unique. 5

OR

(C) Prove that—Let G be a group. Each element a in G has only one inverse in G. 5

(D) Determine whether the poset is a boolean algebra. Explain. 5



EITHER

4. (A) Define graph, discrete graph, complete graph, regular graph and linear graph. 5

(B) Prove that if (T, V_o) be a rooted tree, then :

(a) There are no cycles in T

(b) V_o is the only root of T. 5

OR

(C) Prove that if a graph G has more than two vertices of odd degree, then there can be no ruler path in G. 5

(D) Let the number of edges of G be m. Then G has a Hamiltonian circuit if $m \geq \frac{1}{2}(n^2 - 3n + 6)$, where n is the number of vertices. 5

5. (A) If A = {3, 7, 2} find P(A) and | P(A) |. 2½

(B) How many different permutations of the letters in the word MADAM are there ? 2½

(C) Define lattice, distributive lattice and complemented lattice. 2½

(D) Prove that a tree with n vertices has n – 1 edges. 2½