Bachelor of Science (B.Sc.) (I.T.) Semester–II (C.B.S.) Examination

APPLIED MATHEMATICS–II

Paper—VI

Time : Three Hours] [Maximum Marks : 50

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

(2) Assume suitable data wherever necessary.

EITHER

1. (A) Prove that

$$A - B = A \cap \overline{B}$$

for the set A and B. 5

(B) Let A = {a, b, c, d} and let R be the relation on A that has the matrix

$$M_R = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

Construct the diagraph of R and list in-degrees and out–degrees of all vertices. 5

OR

(C) Show that

$$\overline{A \cup B} = \overline{A} \cap \overline{B}$$

for the set A and B. 5

(D) Define :

(i) Partial order relations

(ii) Equivalence relations. 5

EITHER

2. (A) Using mathematical induction, prove that

$1 + 2^n < 3^n$, $n \geq 2$. 5

(B) Write the permutation

$$P = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 3 & 4 & 6 & 5 & 2 & 1 & 8 & 7 \end{pmatrix}$$

of the set A = {1, 2, 3, 4, 5, 6, 7, 8} as a product of disjoint cycles. 5

OR

(C) Use backtrack to find explicit formula for the sequence defined by recurrence relation $b_n = 2b_{n-1} + 1$ with the initial condition $b_1 = 7$. 5

(D) Prove that :

If $A = (a_1, a_2, \ldots, a_n)$ is finite set with n elements, $n \geq 2$ then there are $\frac{n!}{2}$ even permutations and $\frac{n!}{2}$ odd permutations. 5

EITHER

3. (A) Let L be a distributive lattice. Show that if there exists an a with $a \wedge x = a \wedge y$ and $aVx = aVy$, then $x = y$. 5

(B) Prove that if H and K are two normal subgroups of group G, then $H \cap K$ is normal subgroup of G. 5

OR

(C) Define the following :

(i) Binary operation

(ii) Semigroup

(iii) Monoid

(iv) Isomorphism. 5

(D) Let L be a bounded distributive lattice. Show that if a complement exists then it is unique. 5

EITHER

4. (A) Define :

(i) Graph

(ii) Connected graph

(iii) Digraph

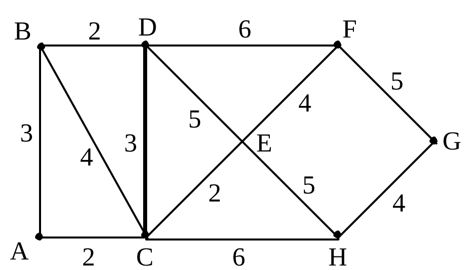
(iv) Complete graph. 5

(B) Prove that :

A tree with n vertices has $n - 1$ edges. 5

OR

(C) Find the Hamiltonian circuit for the graph



5

(D) Show that if a graph G has more than two vertices of odd degree then there can bo no Euler path in G. 5

5. Attempt **all** :

(A) Define :

(i) Power set

(ii) Symmetric difference. 2½

(B) Let A = {1, 2, 3, 4, 5, 6}

Compute : $(4, 1, 3, 5) \circ (5, 6, 3)$ 2½

(C) Let G be a group and let a, b and c be elements of G. Then prove that ab = ac implies that b = c. 2½

(D) Let (T, V_0) be a rooted tree. Prove that there are no cycles in tree T. 2½