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

APPLIED MATHEMATICS—II

Paper—VI

Time : Three Hours] [Maximum Marks : 50

Note :— (1) **All** questions are compulsory and carry equal marks.
(2) Assume the data wherever necessary.
(3) Draw neat and labelled diagrams wherever necessary.

EITHER

1. (a) Define the power set and also give the power set of the following :
   (i) $A = \{\phi, 1\}$
   (ii) $B = \{a, b, c\}$. 5
   (b) Prove that $A - (A - B) \subseteq B$, where A and B are sets. 5

OR

   (c) Explain the following terms and also draw the Venn diagram for it :
   (i) Set difference
   (ii) Symmetric difference. 5
   (d) Let $A = \{1, 2, 3, 4\}$ and R be a relation on set A.
   $R = \{(1, 2), (4, 3), (2, 2), (2, 1), (3, 1)\}$.
   Check whether R is transitive or not ? 5

EITHER

2. (a) Prove by Mathematical Induction :
   $1 + 2 + 3 + ... + n = n (n + 1)/2$. 5
   (b) What do you mean by function ? What restrictions and extension of function ? Also explain composite function. 5

OR

   (c) Explain Pigeon-hole principle. 5
   (d) Find an explicit formula for the sequence defined by $C_n = 3C_{n-1} - 2C_{n-2}$ with initial conditions $C_1 = 5$ and $C_2 = 3$. 5

EITHER

3. (a) Let T be the set of all even integers. Show that the semigroups (Z, +) and (T, +) are isomorphic. 5
   (b) Let G be the set of all non zero real numbers and let $a * b = \frac{ab}{2}$. Show that (G, *) is an abelian group. 5

OR

   (c) Let L be a bounded distributive lattice. Prove that if complement of $a \in L$ exists, then it is unique. 5
   (d) For Boolean Polynomial, $P(x, y, z) = (x \wedge y) \vee (y \wedge z')$. Construct the truth table and show the polynomial by logic diagram. 5

EITHER

4. (a) Let A = {a, b, c, d}. Let R be a relation on set A; that has 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 the indegree and outdegree of all vertices. 5

(b) Explain the following :

(i) Labelled tree

(ii) Undirected tree. 5

OR

(c) Let number of edges of Graph G be m, then prove that G has a Hamiltonian circuit, if $m \geq 1/2 (n^2 - 3n + 6)$, where n is the number of vertices. 5

(d) What do you mean by Graph ? Explain the Euler Graph, Euler Path and Euler Circuit. 5

5. Attempt **all** :

(a) What are the properties of Binary relation ? Explain. 2½

(b) How many words can be made by using the letters of the word "BANANA" taken all at a time ? 2½

(c) Define :

(i) Distributive lattice

(ii) Complemented lattice. 2½

(d) With the help of graph, show :

(i) Vertex set

(ii) Edge set

(iii) Loop

(iv) Pendent vertex

(v) Isolated vertex. 2½