

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.

(2) Draw neat and labelled diagram wherever necessary.

1. EITHER

(A) Explain Cartesian products of sets with suitable example. 5

(B) Let $A = \{a, b, c, d\}$ and let R be a relation on A that has matrix : 5

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

Compute the diagram, and list indegrees and outdegrees of all vertices.

OR(C) Let R and S be relation from A to B . Then prove that if $R(a) = S(a)$, for all a in A , then $R = S$. 5(D) Prove that $A - (A \cap B) = A - B$ for the sets A and B . 5**2. EITHER**(A) Prove by Mathematical Induction $1 + 2 + 3 + \dots + n = n(n+1)/2$. 5

(B) Explain Pigeon-hole principle. 5

OR

(C) Find an explicit formula for the sequence defined by : 5

$$C_n = 6C_{n-1} + 7C_{n-2} = 0 \text{ with initial condition } C_0 = 2, C_1 = 1.$$

(D) What do you mean by function ? What are the restrictions of the functions ? Also explain the composite function. 5

3. EITHER

(A) Draw the Hasse diagram for : 5

$$D_{24} = \{1, 2, 3, 4, 6, 8, 12, 24\}.$$

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

OR

(C) For Boolean polynomial $p(x, y, z) = (x \cap y) \vee (y \cap z')$. Construct the truth table and show the polynomial by logic diagram. 5

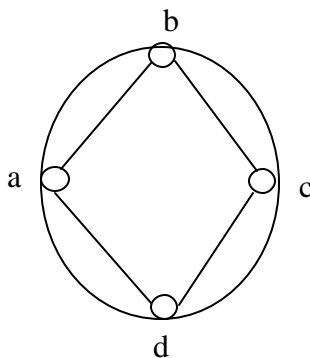
(D) Let $(G, *)$ and $(G', *')$ be two groups and let $f : G \rightarrow G'$ be a homomorphism, then prove that if e is the identity in G and e' is the identity in G' , then $f(e) = e'$. 5

4. **EITHER**

(A) Define the following : 5

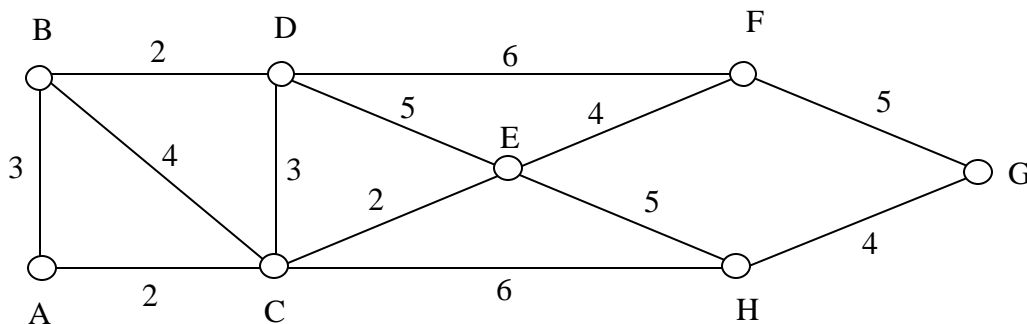
- (i) Graph
- (ii) Degree of a vertex
- (iii) Isolated vertex
- (iv) Loop
- (v) Pendent vertex.

(B) Define subgraph. Find subgraph with three vertices for the following graph : 5



OR

(C) Find a Hamiltonian circuit for the graph given below : 5



(D) Define tree and construct the tree of the algebraic expression : 5

$$(5 + (6 - 2)) - (x - (y - 4)).$$

5. Attempt **all** :

(A) What are the properties of binary relation ? Explain. 2½

(B) Let $A = B = \mathbb{Z}$ and C be the set of even integers.

Let $f : A \rightarrow B$ and $g : B \rightarrow C$ be defined by

$f(a) = a + 1$, $g(b) = 2b$. Find $g \circ f$. 2½

(C) Define :

(i) Distributive Lattice

(ii) Complemented Lattice 2½

(D) Explain :

(i) Trees

(ii) Labelled trees. 2½