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**B.C.A. Examination, 2023**

**(II Semester)**

**Paper-V**

**Discrete Mathematics**

*Time : Three Hours ] [Maximum Marks : 75*

**Note :** Attempt any **five** questions. Each questions carry equal marks.

1. (a) What is Cardinal number. Explain with suitable example.  
(b) Prove that
  - (i)  $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$
  - (ii)  $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
2. (a) Explain the symmetric difference?  
If  $X = \{-2, 0, 1, 2\}$  and  $Y = \{1, 2, 3, 4\}$   
then find  
 $X \oplus Y$  and  $X - Y$   
(b) Prove that the following with logic

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**P.T.O.**

(2)

method-

$$(i) \quad \overline{(A \cup B)} = \bar{A} \cap \bar{B}$$

$$(ii) \quad \overline{(A \cap B)} = \bar{A} \cup \bar{B}$$

3. (a) Explain the Cartesian Product with suitable example.
- (b) Given
- $$A = \{1, 2\}$$
- $$B = \{x, y, z\} \text{ and } C = \{3, 4\}$$
- Find  $A \times B \times C$  and  $A \times C \times B$
4. (a) Explain the power set? List all the members of the power set of each of the following sets :
- (i)  $A = \{a, b, 2, 3\}$
- (ii)  $B = \{\text{cat, dog, mouse}\}$
- (b) Explain the various types of relation with suitable example.
5. (a) Explain Group and Sub Group with suitable example.

(4)

8. (a) What is tree? Explain the properties of tree.  
(b) Explain the spanning and minimum spanning tree with suitable example.
9. (a) Explain flows, cut in a Network, and Augmenting path with example.  
(b) Explain ford and fulkerson algorithm.
10. Write short note on (Any **three**)
  - (a) Shortest Path Problem
  - (b) Hamiltonian Graph
  - (c) Traveling Salesman Problem
  - (d) Predicate calculus.