

10. If A, B and C are any sets then prove that :

- (a)  $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$
- (b)  $A \cup (B \cup C) = (A \cap B) \cup (A \cap C)$
- (c)  $(A \cup B)' = A' \cap B'$
- (d)  $(A \cap B)' = A' \cup B'$

11. (a) Find conjunctive normal form (CN.F) of given function :

$$f(x) = [(x_1 + (x'_1 + x'_2)')] \cdot [(x_1 + (x'_2 \cdot x'_3))]$$

(b) Find disjunctive normal form (DN.F) of given function :

$$f(x_1, x_2, x_3) = [x_1 \cdot + (x'_1 \cdot + x_2)'] \cdot [(x_1 \cdot + (x'_2 + x'_2)']$$

12. (a) Prove that a ring is without zero divisors if and only if cancellation law holds good in it.

(b) Prove that set  $G = \{a + b\sqrt{2}; a, b \in \mathbb{Q}\}$  is a commutative group for addition.

13. Explain the following :

- (a) NOT function using NOR gate
- (b) OR function using NAND gate
- (c) AND function using NOR gate
- (d) NOR function using NAND gate

## BCA-02

June – Examination 2023

### BCA (Part-I) Examination

Discrete Mathematics

Paper : BCA-02

Time : 3 Hours ]

[ Maximum Marks : 100

**Note** :- The question paper is divided into three Sections A, B and C. Write answers as per the given instructions. Use of calculator is allowed in this paper.

**Section-A**

**2×10=10**

**(Very Short Answer Type Questions)**

**Note** :- Answer all questions. As per the nature of the question delimit your answer in one word, one sentence or maximum up to **30** words. Each question carries 2 marks.

1. (i) Express the following set in Roster method :  
 $A = \{x : x \text{ is an even month of the year}\}$ .
- (ii) Define symmetric difference of two sets.
- (iii) Define octal number system.

- (iv) Write the negation of the following statement :  
 $p$  : leap year has 365 days.
- (v) Prove that if  $G$  is a group then identity element of  $G$  is unique.
- (vi) Define identity element for operation\* in a set.
- (vii) Define poset.
- (viii) Define order of an element in a group.
- (ix) Define Boolean Algebra.
- (x) Draw an exclusive OR gate(XOR gate).

**Section-B** **4×10=40**

**(Short Answer Type Questions)**

**Note** :- Answer any *four* questions. Each answer should not exceed **200** words. Each question carries 10 marks.

2. In a village of 2000 families it was found the 800 families read Times of India. 400 families read Hindustan Times and 200 families read other news paper. If 100 families read both Times of India and Hindustan Times. 60 families read Hindustan Times and other newspaper and 80 families read Times of India and other newspaper and 40 families read all these news paper. Find the number of family which read :
- (i) Only Times of India
- (ii) Only Hindustan Times
- (iii) No newspaper

3. Prove that relation  $R$  defined on any non-void set  $A$  as  $(a, b) \in R \Leftrightarrow a \geq b$  is partial order relation.
4. Solve :
- (i)  $(4567)_8 = (?)_{10}$
- (ii)  $(957)_{10} = (?)_2$
- (iii)  $(4C5)_{16} = (?)_2$
- (iv)  $(101010010001)_2 = (?)_{16}$
5. Using truth table, prove that :

$$p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$$

6. Prove that dual of a lattice is again a lattice.
7. If in a group each element is inverse of itself then prove that group is an Abelian group.
8. Prove that a non-zero finite integral domain is a field.
9. Prove that an Boolean Algebra does not has exactly 3 distinct elements.

**Section-C** **2×20=40**

**(Long Answer Type Questions)**

**Note** :- Answer any *two* questions. You have to delimit your each answer maximum up to **500** words. Each question carries 20 marks.