

**December - Examination 2025****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. Use of calculator is allowed in this paper.

**Section-A****10×2=20****(Very Short Answer Type Questions)**

**Note :-** Section 'A' contains 10 Very Short Answer Type Questions. Examinees have to attempt all questions. Each question is of **2** marks and maximum word limit is **30** words.

1. (i) Express the following set in Roster method :  
 $A = \{x : x \text{ is an even month of the year}\}.$
- (ii) Define Identity Relation.
- (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 cyclic group.
- (vii) Define Boolean lattice.
- (viii) Define order of an element in a group.
- (ix) Draw a NAND gate.
- (x) Draw an exclusive OR gate (XOR gate).

**Section-B****4×10=40****(Short Answer Type Questions)**

**Note :-** Section 'B' contains **8** Short Answer Type Questions. Examinees will have to answer **any four (4)** questions. Each question is of **10** marks. Examinees have to delimit each answer in maximum **200** words.

2. In a village of 2000 families, it was found that 800 families read Times of India, 400 families read Hindustan Times and 200 families read other newspaper. 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 newspapers. Find the number of families which read-
  - (i) Only Times of India
  - (ii) Only Hindustan Times
  - (iii) No Newspaper

3. Show that if R is an equivalence relation, then  $R^{-1}$  is also equivalence relation.
4. Solve :
  - (i)  $(25.625)_{10} = (?)_2$
  - (ii)  $(1010.011)_2 = (?)_{10}$
5. Solve :
  - (i)  $(00101001)_2 \times (00000110)_2 = (?)_2$
  - (ii)  $(10000111)_2 \times (00000101)_2 = (?)_2$
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 intersection of 2 normal subgroups of a group is a normal subgroup of that group.
9. Prove that a non-zero finite integral domain is a field.

### Section-C

**2×20=40**

#### (Long Answer Type Questions)

**Note :-** Section 'C' contains 4 Long Answer Type Questions. Examinees will have to answer **any two (2)** questions. Each question is of **20** marks. Examinees have to delimit each answer in maximum **500** words.

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. Write a short note on following computer codes.
  - (i) ASCII      (ii) EBCDIC      (iii) UNICODE      (iv) BCD
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

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