BCA–02

June – Examination 2024

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=20

(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 = $\{x : x$ is an odd month of the year$\}$

   (ii) Define union of two sets.

(ii) EBCDIC

(iii) UNICODE

(iv) BCD
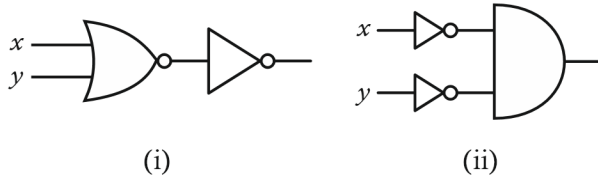
11. If A, B and C are any sets then prove that :

    (i) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

    (ii) $A \cup (B \cup C) = (A \cap B) \cup (A \cap C)$

12. (a) Prove that finite commutative ring without zero divisors is a field.

    (b) State and prove Lagrange's theorem for subgroups.

13. (a) Show that the logic circuits (i) and (ii) shown in figures are equivalent.

        (i)   (ii)

    (b) Prove that :

    $$p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \vee r)$$

(iii) Define decimal number system.

(iv) Write the negation of the following statement :

    p :   February month has 31 days

(v) Define Monoid.

(vi) Define identity element for operation * in a set.

(vii) Define equivalence relation.

(viii) Define Integral domain.

(ix) Define Boolean Algebra.

(x) Draw an exclusive OR gate (XOR gate).

<div align="center">

Section–B   **4×10=40**

(Short Answer Type Questions)

</div>

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

2. A survey shows that 63% of Indians like cheese where 76% like apples. If x% of Indian like both cheese and apples find the value of x.

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) $(156)_8 = (?)_{10}$

    (ii) $(296)_{10} = (?)_2$

    (iii) $(5C5)_{16} = (?)_2$

    (iv) $(10111010001)_2 = (?)_{16}$

5. Using truth table, prove that :
$$p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$$

6. Prove that dual of a poset is again a poset.

7. Prove that set G = (1, ω, ω^2} is cyclic group for multiplication of complex numbers where 1, ω, ω^2 are cube roots of unity.

8. Prove that intersection of two normal subgroups of a group is a normal subgroup of that group.

9. Prove that an Boolean Algebra does not has exactly 3 distinct elements.

<div align="center">

Section–C   **2×20=40**

(Long Answer Type Questions)

</div>

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

10. Write short notes on the following computer codes :

    (i)   ASCII