BCA–02

December – Examination 2022

BCA (Part-I) Examination

Discrete Mathematics

Paper : BCA-02

Time : 3 Hours] [*Maximum Marks : 70*

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   2×7=14

(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 a prime number between 21 to 40$\}$

---

10. (a) For any sets A, B and C prove that :

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

    (b) Prove that in a group order of an element and order of its inverse are equal.

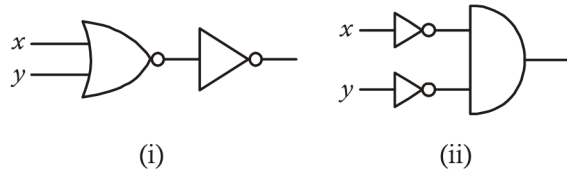11. Prove that the following propositions are tautology :

    (i) $p \vee \sim (p \wedge q)$

    (ii) $((p \vee q) \wedge \sim p) \to q$

    (iii) $((p \to q) \wedge (q \to p)) \to (p \leftrightarrow q)$

    (iv) $((p \to q) \wedge (q \to r)) \to (p \to r)$

12. (a) Show that the logic circuits (i) and (ii) shown in figure are equivalent :

    (i)   (ii)

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

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

(ii) Define Octal Number System.

(iii) Write the negation of the following statement :

p:January is coldest month in India.

(iv) Define Poset.

(v) Define inverse of an element for operation* in a set.

(vi) Prove that If R is a ring with unity, then unity is unique.

(vii) Write idempotent law for Boolean Algebra.

Section–B   4×7=28

(Short Answer Type Questions)

Note :– Answer any *four* questions. Each answer should not exceed **200** words. Each question carries 7 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. If R is relation on set of integers defined by $a\mathrm{R}b \Leftrightarrow (a - b)$ is an even integer, then prove that R is equivalence relation.

4. Solve :

(i) $(25.625)_{10} = (?)_2$

(ii) $(1010.011)_2 = (?)_{10}$

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

6. Prove that a group of order less than 5 is Abelian.

7. Prove that a non-zero finite integral domain is a field.

8. Construct truth table of :

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

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

Section–C   2×14=28

(Long Answer Type Questions)

Note :– Answer any *two* questions. You have to delimit your each answer maximum up to **500** words. Each question carries 14 marks.