

**BACHELOR OF TECHNOLOGY (CBCS - 2023)**  
**B. Tech. Sem-II COMPUTER SCIENCE & ENGINEERING : WINTER : 2024**  
**SUBJECT: DISCRETE MATHEMATICAL STRUCTURES**

Day : Tuesday  
Date : 26/11/2024

W-27696-2024

Time : 10:00 AM-01:00 PM  
Max. Marks : 60

**N.B.**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate **FULL** marks.
- 3) Assume suitable data **WHEREVER** necessary.
- 4) Draw neat diagrams **WHEREVER** necessary.

**Q.1** Define the following properties of propositions along with suitable examples: (10)  
i) Tautology                      ii) Contradiction                      iii) Contingency  
iv) Satisfiability                      v) Valid                      vi) Invalid

**OR**

**Q.1** Explain Resolution principle with suitable example in detail. (10)

**Q.2** Solve the following Equation using Chinese Remainder theorem (CRT) and check (10)  
whether they are congruent  
 $X \equiv 5 \pmod{3}$                        $X \equiv 2 \pmod{5}$                        $X \equiv 1 \pmod{11}$

**OR**

**Q.2** What is prime Number? Enlist all the properties of prime Numbers along with (10)  
suitable examples.

**Q.3** Enlist various types of functions .What is composition of function? Explain with (10)  
suitable example.

**OR**

**Q.3** Explain what is Relation Matrix and diagraph for  $A = \{ 1, 2, 3, 4 \}$  and (10)  
 $R = \{ a \leq b, a, b \in R^3 \}$ , draw a diagraph for relation R. Also derive the relation matrix  
 $M(R)$ . What properties does given R consists of?

**Q.4** Explain Rings and group codes with suitable examples. Also explain (10)  
Homomorphism, Auto-morphism and Isomorphism of group.

**OR**

**Q.4** What is Algebraic structure? Explain different properties of Binary operations of (10)  
Algebraic structure with suitable examples.

**Q.5** Solve the following Recurrence relation with characteristics root method. (10)  
 $a_n = 2a_{n-1} + a_{n-2} = 0$  where  $(a_0 = 2, a_1 = 5)$ .

**OR**

**Q.5** Explain Combinatorics and basic counting principle. Also explain sum rule and (10)  
product rule with suitable example.

**Q.6** Explain Isomorphism of graph with suitable example. Also explain Bipartite graphs. (10)

**OR**

**Q.6** Explain various types of graphs along with suitable diagrams. (10)

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