

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURAJADA VIZINAGARAM**  
**II B. Tech I Semester Regular/Supply Examinations, November – 2025**  
**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**  
**(CSE)**

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part A, Part B.*  
*Part A is compulsory, Answer all questions.*  
*In Part B, Answer any one question from each unit.*

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**PART-A****(20 Marks)**

1. a) Prove that  $(P \vee Q) \vee (P \leftrightarrow Q)$  is tautology. [2]
- b) Prove that  $(P \vee Q) \wedge (P \leftrightarrow Q)$  is contradiction. [2]
- c) Explain Equivalence relation. [2]
- d) Define the following terms (i) Commutative Group (ii) Sub Group [2]
- e) State Fermat's theorem. [2]
- f) State Division theorem. [2]
- g) Find the first five terms of the sequence define by the following recurrence relation and initial condition  $a_n = a_{n-1}^2$  and  $a_1 = 2$ . [2]
- h) What are second order linear homogeneous recurrence relations? [2]
- i) What is the chromatic number of the  $C_n$ . [2]
- j) What is Planar Graph? [2]

**PART-B**  
**UNIT-1**

**(50 Marks)**

2. a) "If there was a ball game, then travelling was difficult. If they arrived on time, then travelling was no difficult. They arrived on time. Therefore, there was no ball game." Show that these statements constitute a valid argument. [5]
- b) Obtain the conjunctive normal form of the formula  $(\sim P \vee \sim Q) \rightarrow (P \leftrightarrow \sim Q)$  [5]

**OR**

3. a) Symbolize the expressions [5]
  - i) All the world loves a lover
  - ii) All men are giants.
- b) Express  $P \uparrow Q$  in terms of  $\downarrow$  only. [5]

**UNIT 2**

4. a) Show that  $R \cap S$  is symmetric if  $R$  and  $S$  are symmetric on a set  $A$ . [5]
- b) Draw Hasse diagram representing the partial ordering on  $\{(a, b) : a \mid b\}$  on  $\{1, 2, 3, 4, 6, 12, 24, 36, 48\}$ . [5]

**OR**

5. a) Determine whether the binary  $*$  defined as commutative and whether it is associative on the set  $Z$  where  $a * b = a - b$ . [5]
- b) Prove that  $A = (A \cap B) \cup (A - B)$  for any two sets  $A$  and  $B$ . [5]

**UNIT 3**

6. a) In how many ways can 23 different books be given to 5 students so that 2 of the students will have books each and other 3 will have 5 books each? [5]
- b) What is the coefficient of  $x^3 y^7$  in  $(x + y)^{10}$ . [5]

**OR**

7. a) How many ways can the letters of the word ALGORITHM be arranged in a [5]

row if A and L must remain together as a unit.

- b) In how many ways can 14 people be distributed into 6 teams where in some order 2 teams have 3 each and 4 teams have 2 members each. [5]

**UNIT 4**

8. a) What are second order linear homogeneous recurrence relations? Give the general solution for them. [5]

- b) Solve  $a_n + 7a_{n-1} + 8a_{n-2} = 0$  for  $n \geq 2$ ,  $a_0 = 1$ ,  $a_1 = -2$  using generating functions. [5]

**OR**

9. a) Solve the recurrence relation of Fibonacci series with  $F_0 = 1, F_1 = 1$  [5]

- b) Solve  $na_n + (n-1)a_{n-1} = 2^n$  where  $a_0 = 1$ . [5]

**UNIT 5**

10. a) Draw the binary tree whose level order indices are  $\{1, 2, 4, 5, 8, 10, 11, 20\}$  [5]

- b) Explain the Prim's algorithm for finding Minimal Cost Spanning Tree with an example. [5]

**OR**

11. a) What are the rules for constructing a Hamiltonian path and Hamiltonian cycle? [5]

- b) Find whether  $K_{3,3}$  is planar or not. [5]

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