



VIT

Vellore Institute of Technology

REG.NO.:

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
WINTER SEMESTER 2024-2025

SLOT: D1



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Programme Name & Branch : MIC/MID
Course Code and Course Name : CSI2003 - Advanced Algorithms
Faculty Name(s) : Prof. Nivitha, Prof. Sunija, Prof. Sriyani, Prof. Kovendan,
Prof. Muthunagai

Class Number(s) : VL2024250501998, 1989, 2005, 3158 1994

Date of Examination : 19-03-2025

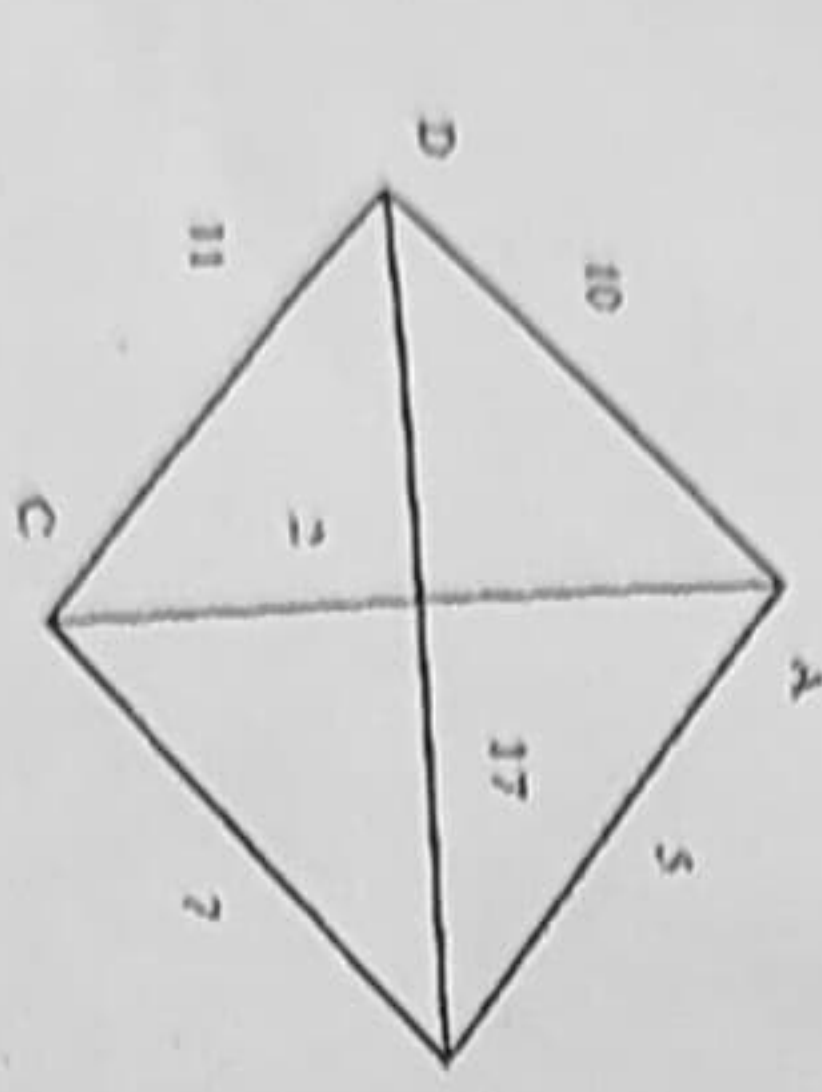
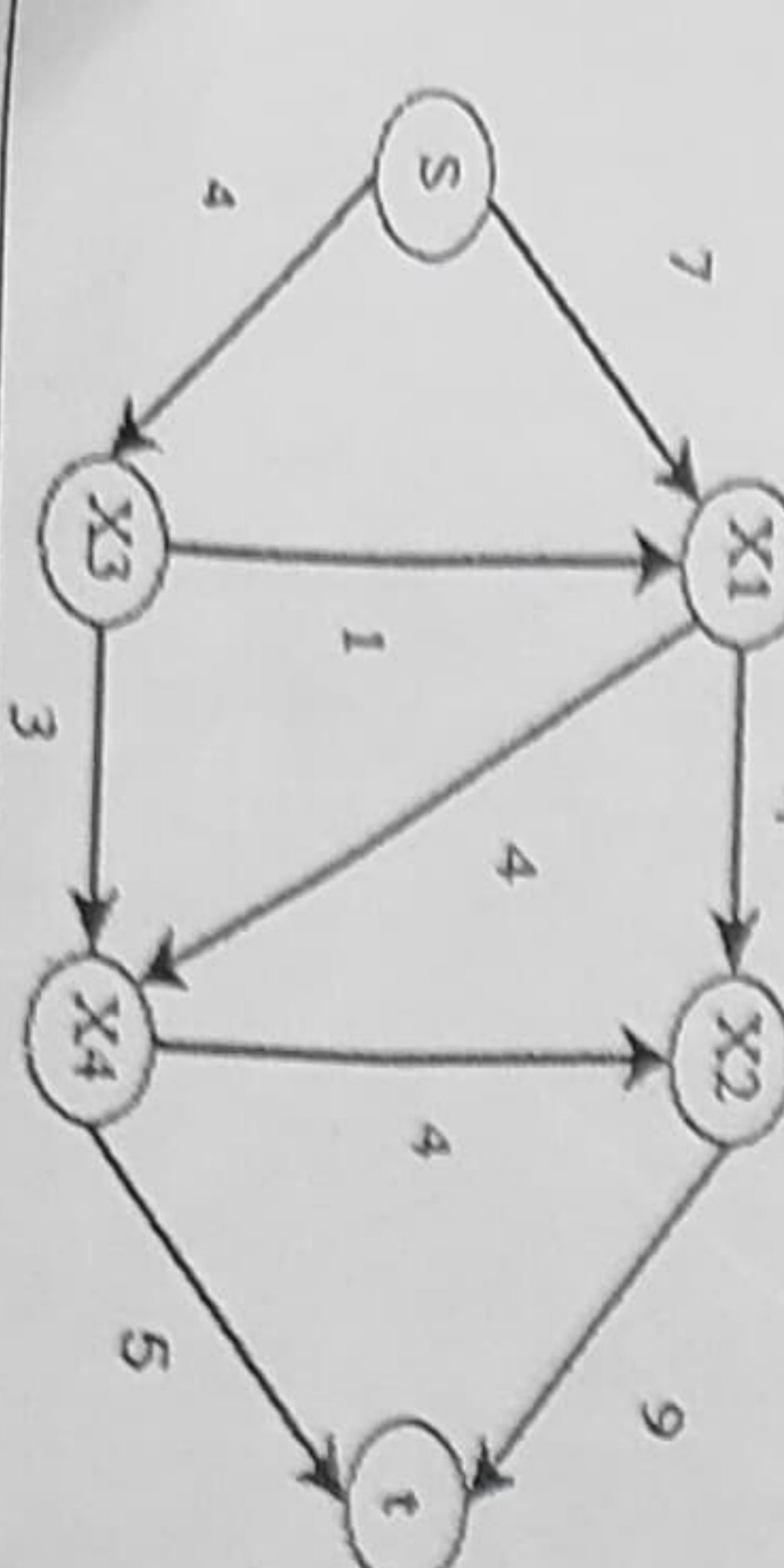
Exam Duration : 90 minutes

Maximum Marks: 50

General Instructions:

Answer All Questions

- M - Max mark, CO - Course Outcome, BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes (Type the CO statements covered in this question paper. Use the CO number as per the syllabus copy)
- CO1: Familiarize students with different algorithmic techniques
- CO2: Apply advanced methods of designing and analyzing algorithms
- CO4: Understand different classes of problems concerning their computation difficulties.

Qn. No	Question	M	CO	BL
1.	Apply the branch and bound algorithm to find the shortest tour a salesperson has to take from vertex A and to return back to the starting point. 	10	CO1	BL3
2.	In the visualization with water pipes, the problem can be formulated in the following way: How much water can we push through the pipes from the source to the sink? The following image shows the maximum flow possible through the pipes in the flow network. Apply Edmond karp algorithm to determine the maximum flow of the network. 	10	CO2	BL3

3.	Given the following Boolean formula of a 3- CNF-SAT, perform the reduction steps of NP complete to Clique to prove the satisfiability of 3 - CNF-SAT. (Show the step by step procedure). $(\neg x1 \vee x2 \vee x3) \wedge (x1 \vee \neg x2 \vee x4) \wedge (x3 \vee x4 \vee \neg x5) \wedge (x2 \vee \neg x3 \vee x5)$	10	CO4
4.	Using the Miller-Rabin primality test, determine whether the number 97 is prime. Perform the test with any two random numbers of your choice, and explain the reasoning for each step. Based on the results, conclude whether the number is prime or composite.	10	CO4
5.	a. Explain the relationships between the P, NP, NP-complete, and NP-hard problems. b. Why is randomized QuickSort preferred over deterministic QuickSort? How does randomization help prevent the worst-case time complexity? Explain the impact of pivot selection on QuickSort's efficiency and how randomizing the pivot improves its average-case performance	4+6	CO