

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

SLOT: A2+TA2

Programme Name & Branch : B.Tech Computer Science and Engg
 Course Code and Course Name : BCSE204L (Design and Analysis of Algorithms)
 Faculty Name(s) : ALL
 Class Number(s) : ALL
 Date of Examination : 16-03-2025
 Exam Duration : 90 minutes

Maximum Marks: 50

General instruction(s):

- 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
 CO2 - Demonstrate the major algorithm design paradigms.
 CO3 - Explain major graph algorithms, string matching and geometric algorithms along with their analysis

Q. No	Question	M	CO	BL															
1.	<p>Consider the following items that can be added to the knapsack with a capacity of 16 kgs. Solve and obtain the optimal solution using the branch-and-bound FIFO method. Use variable and fixed representation to create the state space tree and differentiate between the representations.</p> <p>Note: Variable representation refers to the binary variables (0 or 1) that determine whether an item is included or excluded from the knapsack, while fixed representation refers to the predetermined, unchanging data associated with each item, such as its weight and value.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 2px;">Item</th> <th style="padding: 2px;">I1</th> <th style="padding: 2px;">I2</th> <th style="padding: 2px;">I3</th> <th style="padding: 2px;">I4</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">Profit</td> <td style="padding: 2px;">\$40</td> <td style="padding: 2px;">\$30</td> <td style="padding: 2px;">\$50</td> <td style="padding: 2px;">\$10</td> </tr> <tr> <td style="padding: 2px;">Weight (in kg)</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">10</td> <td style="padding: 2px;">5</td> </tr> </tbody> </table>	Item	I1	I2	I3	I4	Profit	\$40	\$30	\$50	\$10	Weight (in kg)	2	5	10	5	10	2	3
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Profit	\$40	\$30	\$50	\$10															
Weight (in kg)	2	5	10	5															
2.	<p>Consider the following gene sequence:</p> <p style="text-align: center;"> ^{1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20} AGCTTAGCTGAGCTAGCTAGCTGAGCTGCTAG </p> <p>where Adenine (A), Cytosine (C), Guanine (G), and Thymine (T) are the four bases in DNA. During analysis, assume that the following pattern often occurs: GCTAG (in HIV disease) and GAGCTG (in lung cancer disease) in the sequence. Identify the disease sequence that occurs more frequently by using the KMP string matching technique. Make the LPS table for the two patterns that are being considered. Give the steps for building the table.</p>	10	3	3															
3.	<p>Given a weighted directed graph, apply the Floyd-Warshall algorithm to compute the shortest paths between all pairs of nodes. After obtaining the distance matrix, construct the predecessor matrix to store the intermediate nodes along the shortest paths.</p>	10	3	3															



VIT

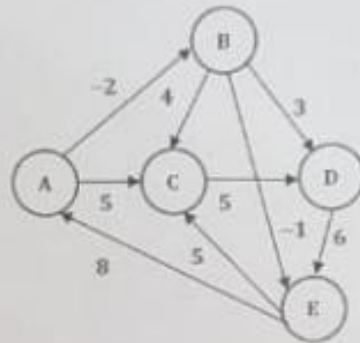
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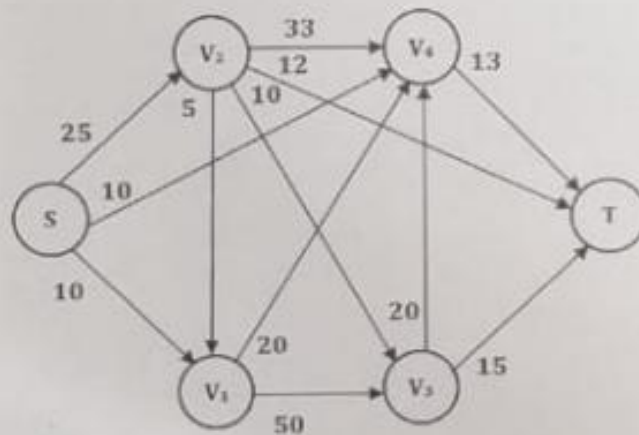
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Using this predecessor matrix, determine the paths for the following node pairs:
a) From node A to node D b) From node D to node B



4. For the given graph that represents a water treatment plant with various stations, calculate the total network flow of the plant using the Ford Fulkerson algorithm. For every augmenting path selected, the residual graph must be clearly drawn.



5. From the given set of points, $\{(6, 1), (3, 3), (7, 5), (1, 2), (0, 5)\}$, create possible line segments so that the points are not repeated. Calculate $d_1, d_2, d_3,$ and d_4 for the created line segments and check according to SEGMENT_INTERSECT procedure if they straddle each other or are collinear. Every step in the intersection process shall be shown.
