VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

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

SLOT: A1 + TA1

Programme Name & Branch	:	B. Tech CSE
Course Code and Course Name	:	BCSE204L / Design and Analysis of Algorithms
Faculty Name(s)	:	ALL
Class Number(s)	:	ALL
Date of Examination	:	16th March, 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 (Type the CO statements covered in this question paper. Use the CO number as per the syllabus copy)
  CO2. Demonstrate the major algorithm design paradigms.
  CO3. Explain major graph algorithms, string matching and geometric algorithms along with their analysis.

<table>
<tr><th>Q.No.</th><th>Question</th><th>M</th><th>CO</th><th>BL</th></tr>
<tr><td>1.</td><td>For the following job assignment problem, apply FIFO Branch and Bound (FIFOBB) and LIFO Branch and Bound (LIFOBB) separately and deduce the corresponding optimal assignments. The objective is to assign a unique pairing between a person and a job, such that the total time taken by all the persons to complete their assigned jobs is minimum. The rows correspond to the time taken by a person for each of the available jobs. Generate separate state space trees for FIFOBB and LIFOBB, devise an appropriate lower bound function and apply it for each of the states in the trees and finally deduce the optimal assignments.
<table>
<tr><th></th><th>Job 1</th><th>Job 2</th><th>Job 3</th><th>Job 4</th></tr>
<tr><td>Person A</td><td>11</td><td>9</td><td>4</td><td>10</td></tr>
<tr><td>Person B</td><td>9</td><td>6</td><td>5</td><td>8</td></tr>
<tr><td>Person C</td><td>10</td><td>7</td><td>3</td><td>10</td></tr>
<tr><td>Person D</td><td>8</td><td>6</td><td>11</td><td>9</td></tr>
</table></td><td>10</td><td>CO2</td><td>BL3</td></tr>
<tr><td>2.</td><td>Apply a string matching algorithm (which applies hashing to reduce the time complexity of operations) to find out the shift locations where the pattern (P) matches with the text (T).
T="ABDEFACEBDE" P="ACE"
Demonstrate the preprocessing operations as well as the actual shifting/matching operations. Deduce the locations of spurious hits (if any) as well as the actual matches. Use q=11 for the modulo operation, and an octal number system to represent the alphabet in both T and P.</td><td>10</td><td>CO3</td><td>BL3</td></tr>
<tr><td>3.</td><td>A network having six nodes (SABCDE), with its set of weighted edges will be provided. The objective is to find the shortest path from S to</td><td>10</td><td>CO3</td><td>BL2</td></tr>
</table>

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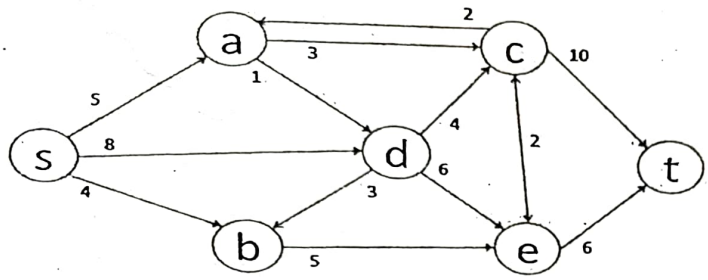
	reach all the other nodes A, B, C, D and E, using an algorithm which can work with negative weighted edges. The solution should disclose the shortest distances from S to all other nodes AND the corresponding paths through which this is possible. Generate the solution by showing all the necessary intermediate steps. The order/sequence of edges and their corresponding weights are : A→B (10), B→C (30), A→C (50), A→D (30), C→D (-100), D→E (20), S→A (5), S→D (30), E→S (30).			
4.	Deduce the maximum flow for the network given below by using an approach which allows an intermediate node to store the excess flow locally.  The flow starts from the source, s, ends in the sink, t, and the values on the edges represent the corresponding edge capacities.	10	CO3	BL3
5.	Starting and end points of six line segments are given below. The objective is to find out if any of the line segments intersect or not by applying an algorithm which sweeps the xy coordinate space from left to right by a vertical line. Execution of the necessary intermediate steps is required. Line segment A (3,4) to (9,5), B (5,9) to (23,9), C (7,9) to (19,15), D (22, 52) to (25,54), E (14,6) to (29,14) F(10,11) to (15,7)	10	CO3	BL3

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