

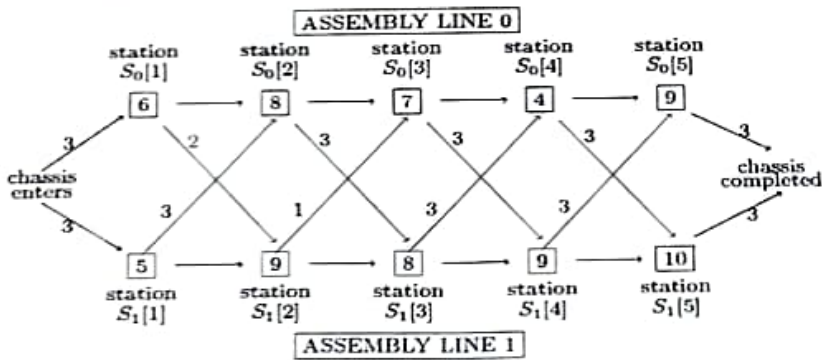
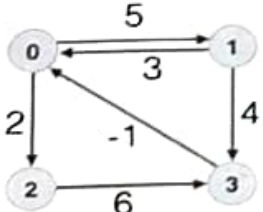


SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
WINTER SEMESTER 2024-2025

Programme Name & Branch : B. Tech CSE and Business Systems
Course Code and Course Name : CBS3003, Design and Analysis of Algorithms
Faculty Name(s) : Dr. Lakshmanan K, Dr. Mukku Nisanth Kartheek
Class Number(s) : VL2024250505159, VL2024250505160
Date of Examination : 20-03-2025, FN
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
 2. Identify suitable algorithmic paradigm for solving the given problem.
 3. Understand and apply various graph-based algorithms
 4. Understand the classes of complexity

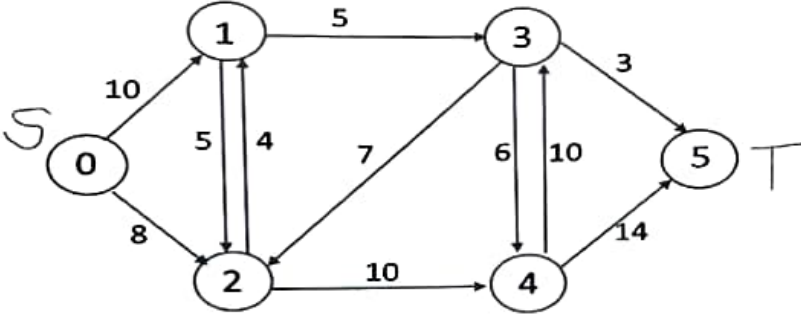
Q. No	Question	M	CO	BL
1.	Solve the Assembly line scheduling for the below problem using dynamic programming. Identify which stations are picked up from which assembly line.  The diagram shows two assembly lines, ASSEMBLY LINE 0 and ASSEMBLY LINE 1. Line 0 has stations S₀[1] to S₀[5] with times 6, 8, 7, 4, 9. Line 1 has stations S₁[1] to S₁[5] with times 5, 9, 8, 9, 10. Transitions between lines are labeled with times: (S₀[1], S₁[1])=3, (S₀[2], S₁[2])=2, (S₀[3], S₁[3])=3, (S₀[4], S₁[4])=3, (S₀[5], S₁[5])=3. Internal transitions are: S₀[1]→S₀[2]=3, S₀[2]→S₀[3]=3, S₀[3]→S₀[4]=3, S₀[4]→S₀[5]=3, S₁[1]→S₁[2]=3, S₁[2]→S₁[3]=1, S₁[3]→S₁[4]=3, S₁[4]→S₁[5]=3. Chassis enters at S₀[1] and is completed at S₁[5].	10	2	3
2.	A rod of length 8 is to be cut into small pieces for selling. The array A = {3, 6, 8, 9, 10, 18, 20, 22} of prices p_i (1 ≤ i ≤ 8) represents the selling price of a piece of length i (in the given order). What kind of cutting the rod will yield the maximum revenue. Identify a solution through dynamic programming approach. Is there a unique cutting that yield the maximum revenue for this problem?	10	2	4
3.	a) For the below given graph, find the all pair shortest path using Floyd-Warshall algorithm. For vertex 3, identify the shortest distance to all other vertices.  The graph has 4 vertices (0, 1, 2, 3). Edges and weights: (0,1)=5, (1,0)=3, (0,2)=2, (2,0)=2, (2,3)=6, (3,2)=6, (1,3)=4, (3,1)=4, (0,3)=-1.	8	3	4

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

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SLOT: E2

	b) To find the all pairs shortest path, one can also apply Dijkstra's algorithm for n times (each time change the source vertex) to the given graph with n vertices. Still, why Floyd-Warshall algorithm is preferred. Justify with 2 crucial points with each point not more than 2-3 lines.	2		
4.	For the below network flow problem, find the maximum flow that is possible from source vertex (S) to terminal vertex (T) using Edmond-Karp method. 	10	3	3
5.	a) You are given set of 3 CNF-SAT formulas and asked to prove that it is in class NP. What you can do to prove the statement?	2	4	4
	b) Consider the following SAT formula. This formula is a part of a bigger SAT formula that was obtained after the process of binary parse tree. Only for the below formula construct the corresponding 3-CNF-SAT formula as per the standard books discuss. For the truth-assignment, $y_2 = 1 = y_4$ and $y_3 = 0 = y_5$, discuss whether the below formula and your constructed 3 CNF SAT formula both satisfiable? ~ is a negation operator and y_i are Boolean variables takes 0 or 1. $SAT\ formula = (y_2 \leftrightarrow (y_3 \vee y_4)) \wedge (y_4 \leftrightarrow \sim y_5)$	8		
