Enrollment No.: _____

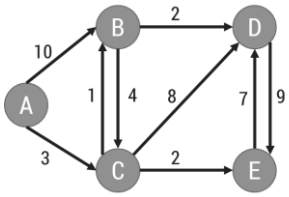
Darshan UNIVERSITY
योगः कर्मसु कौशलम्

Darshan Institute of Engineering & Technology
B.Tech. | Sem-4 | Summer-2023

Course Code	:	2101CS401	**Date**	:	10-04-2023
Course Name	:	Design and Analysis of Algorithm	**Duration**	:	150 Minutes
			Total Marks	:	70

Instructions:
1. Attempt all the questions.
2. Figures to the right indicates maximum marks.
3. Make suitable assumptions wherever necessary.

Q.1	**(A)**	Apply counting sort for the numbers <4, 1, 3, 1, 3> to sort in ascending order.	**4**
	(B)	Define Algorithm. Discuss key characteristics of algorithm.	**3**
		OR	
		Define Big-oh and Theta notations with graph.	
	(C)	Explain Selection Sort Algorithm and give its best case, worst case and average case complexity with suitable example.	**7**
		OR	
		Arrange the given data into ascending order using heap sort. 34, 12, 42, 96, 56, 11, 78	
Q.2	**(A)**	What is Divide and Conquer Technique? Give the use of it for Binary Searching Method. Also give its Time Complexity.	**4**
	(B)	Explain master theorem and find the recurrence for the equation: $T(n)= 9T(n/3) + n$	**3**
		OR	
		Find the recurrence equation $T(n)=T(n-1)+n$ using substitution method.	
	(C)	Write quick sort algorithm and apply on array A = {2,7,3,5,1,9,4,8}. What is time complexity of quick sort in best case, average case and worst case?	**7**
		OR	
		Write merge sort algorithm and apply on array A = {2,7,3,5,1,9,4,8}. What is time complexity of merge sort in best case, average case and worst case?	
Q.3	**(A)**	Write krushkal's algorithm for minimum spanning tree.	**4**
	(B)	Explain the general characteristics of Greedy algorithm?	**3**
		OR	
		Solve the given Knapsack Problem using greedy method. Number of items = 7, capacity W = 15, weight = {2, 3, 5, 7, 1, 4, 1} and profit = {10, 5, 15, 7, 6, 18, 3}.	
	(C)	Find an optimal Huffman code for the given set of frequency. A:9, B:5, D:3, E:7, F:3, H:1, K:1, N:4, R:5, T:2, U:1, V:1	**7**
		OR	
		Write Dijkstra's algorithm and find shorted distance of from node A to E.	



Q.4 **(A)** Write a sequence of four steps for generalized solution for Dynamic programing. **4**

(B) Find Longest Common Subsequence of two strings. **3**
S1:{N,E,E,L,A,M}, S2:{E,N,G,I,N,E,E,R,I,N,G}.

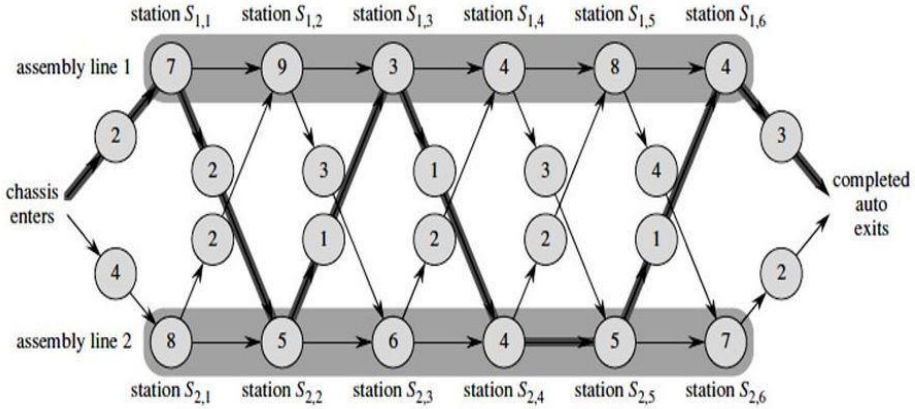
OR

Generate only solution table for Making Change problem using Dynamic Programming. (denominations: d1=1, d2=4, d3=6, change of Rs. 8).

(C) Write equation for Matrix Chain Multiplication using Dynamic programming. Evaluate the optimal sequence for: A1 [5 × 4], A2 [4 × 6], A3 [6 × 2], and A4 [2 × 7]. **7**

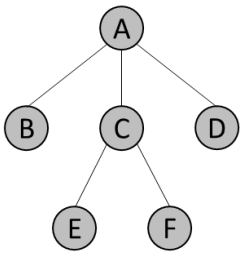
OR

Evaluate the following assembly line scheduling using dynamic programming.



Q.5 **(A)** Explain P, NP, NP complete and NP-Hard problems. **4**

(B) Use DFS algorithm to traverse for following graph using DFS. **3**



OR

Define: Directed Graph, Articulation Point, and Finite Automata.

(C) With modulo q=13, how many spurious hits does the Rabin-Karp matcher encounter in the text T = 2359023141526739921 when looking for the pattern P = 31415? **7**

OR

Explain Backtracking Method. What is N-Queens Problem? Write an algorithm for 4-Queens Problem using Backtracking Method.

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