![Darshan University Logo] **Darshan Institute of Engineering & Technology**
B.Tech. | Sem-4 | Summer-2025

Course Code	: 2101CS401	**Date**	: 10-04-2025
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)**	What is an algorithm? Why analysis of algorithm is required?	**4**
	(B)	Define: Finite Set, Relation and Function	**3**

OR

Define Big-oh and Theta notations with graph.

	(C)	Explain Bubble 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)**	Demonstrate binary search algorithm and find the element x=12 in the given array. 2, 5, 8, 12, 16, 23, 38, 56, 72, 91	**4**
	(B)	Solve given recurrence using Master's method. $T(n) = 2T\left(n/2\right) + n$	**3**

OR

Solve given recurrence using Master's method. $T(n) = 2T\left(n/2\right) + 1$

	(C)	Explain merge sort algorithm with suitable example.	**7**

OR

Explain quick sort algorithm with suitable example.

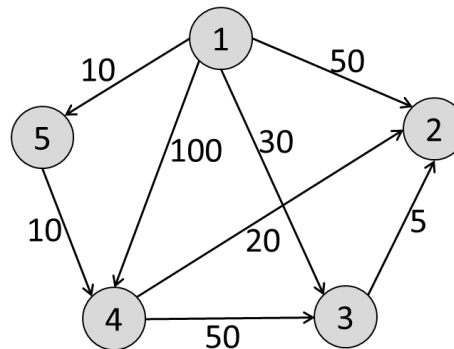|			
Q.3	**(A)**	Explain in brief characteristics of greedy algorithms.	**4**
	(B)	Solve Minimum Spanning Tree for the given graph using Prim's Algorithm.	**3**
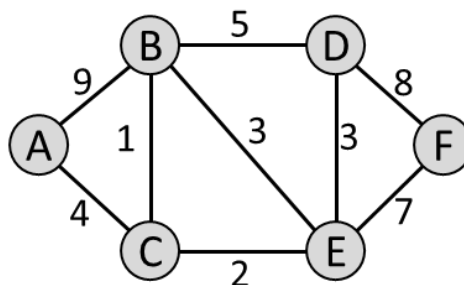
OR

Solve Minimum Spanning Tree for the given graph using Krushkal's Algorithm.
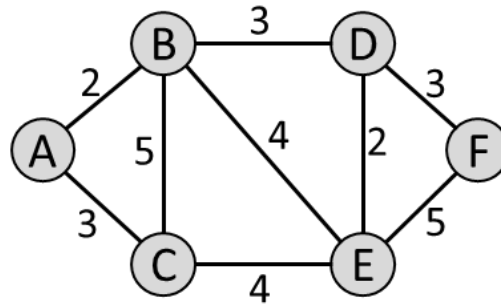
(C) Find shortest path using Dijkastra algorithm for the following graph. **7**

OR

Find an optimal Huffman code and draw Huffman tree for the given set of frequency. **A : 1, B : 1, C : 2, D : 3, E : 5, F : 8, G : 13, H : 21**

Q.4 **(A)** Compare Greedy Method with Dynamic Programming Method. **4**

(B) Find out Longest Common Subsequence for A= {K, A, N, D, L, A, P} and B= {A, N, D, L} using dynamic programming. **3**

OR

Find out Longest Common Subsequence for A= {A, C, A, B, A, C, A} and B= {B, A, C, A, C} using dynamic programming.

(C) Justify optimal substructure for make change problem. Consider an instance of such a problem with coins 1, 4 and 6 units. Illustrate its solutions using dynamic programming approach involving a payment of 8 units or less. **7**

OR

Evaluate following knapsack problem using dynamic programming algorithm with given capacity W=5, Weight and Value are as: (2,12), (1,10), (3,20), (2,15)

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**
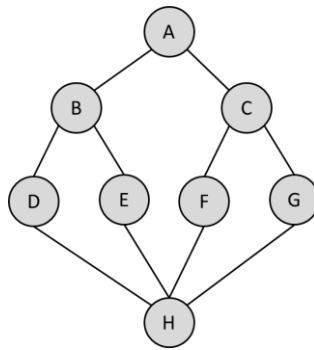
OR

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

(C) With modulo q=13, how many spurious hits does the Rabin-Karp matcher **7** encounter in the text T = 2359023141526739921 when looking for the pattern P = 31?

OR

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

***