PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – MAY/JUNE 2025

Date: 06-06-2025   **Time:** 01:00 pm – 04:00 pm

School: SOCSE	**Program:** B Tech - CAI/CBC/CBD/CCS/CDV/CIT/COM/ CSD/CSE/CSG/CSI/CSN/ISE/IST
Course Code: CSE2007	**Course Name:** Design And Analysis of Algorithms
Semester: IV	**Max Marks**: 100 **Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	16	16	22	24	22

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.   **10Q x 2M=20M**

1.	Define an algorithm.	2 Marks	L1	CO1
2.	Define Big-Theta Notation.	2 Marks	L1	CO1
3.	List any two features of an algorithm.	2 Marks	L1	CO1
4.	Identify the best case and worst-case time complexities of Sequential Search?	2 Marks	L1	CO2
5.	Reproduce the time complexity for a brute force string pattern matching algorithm	2 Marks	L1	CO2
6.	Define the Brute Force algorithmic approach.	2 Marks	L1	CO2
7.	List the average and worst-case time complexities of Merge sort and Quick sort.	2 Marks	L1	CO3
8.	Define minimal spanning tree.	2 Marks	L1	CO4
9.	Reproduce the main idea of dynamic programming.	2 Marks	L1	CO4

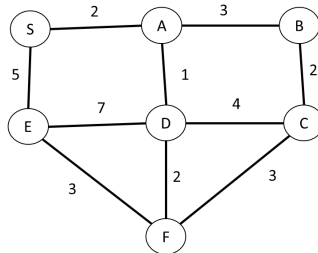| 10.	Define NP-Complete.	2 Marks	L1	CO5

Part B

Answer the Questions.   **Total Marks 80M**

11.	a.	Explain the different types of asymptotic notations with neat, appropriate diagrams.	10 Marks	L2	CO 1
	b.	Show how the Brute Force approach can be used to solve the Selection sort problem for the array [8, 5, 1, 6, 2, 4]. Provide an algorithm and determine its time complexity.	10 Marks	L3	CO 2
		Or			
12.	a.	Explain the concepts of best-case, worst-case and average case complexity with the help of Sequential Search.	10 Marks	L2	CO 1
	b.	Illustrate string pattern matching algorithm using brute force technique for the text = "abracadabra", and pattern = "abc". Write an algorithm and show the analysis.	10 Marks	L3	CO 2

13.	a.	Illustrate the Insertion sort algorithm using the array [10, 2, 5, 3, 9, 4, 11, 6, 8, 12, 7, 1]. Write an algorithm for insertion sort. Derive the recurrence relation for Insertion Sort and solve it for worst case. Give an example for worst case.	20 Marks	L3	CO 3
		Or			
14.	a.	Illustrate the quick sort algorithm using the array [2, 5, 3, 4, 6, 8, 7, 1] assuming that pivot is chosen as the first element in the array. Write an algorithm for both quicksort and partition. Derive the recurrence relation for Quick Sort for best case and worst case.	20 Marks	L3	CO 3

15.	a.	Illustrate the Dynamic Programming method for the 0/1 knap sack problem	20 Marks	L3	CO 4

Item	lg	samsung	vivo	Redmi
Weight	1	2	1	3
Price	8	9	10	11

		Write the algorithm and show the working for the above list of items, assuming a bag of capacity 5. If the capacity of the bag was only 3, determine which items would be selected.			

<div align="center">Or</div>

16.	a.	 For the graph given above, demonstrate the working of Prim's algorithm and Kruskal's algorithm. Write the Prim's algorithm. Demonstrate the algorithm, assuming that adjacency matrix was used for implementation.	20 Marks	L3	CO 4

17.	a.	Explain Backtracking method. Demonstrate how the strategy works for sum of subsets for A = {5, 6, 10, 11, 16}, d = 21. Show the state-space tree.	20 Marks	L3	CO 5

<div align="center">Or</div>

18.	a.	Explain branch-and-bound method. Consider the following price chart for travelling between cities.	20 Marks	L3	CO 5

	A	B	C	D
A	0	2	3	4
B	2	0	1	3
C	3	1	0	2
D	4	3	2	0

Show how lower bound is calculated.

Demonstrate the branch and bound method for solving Travelling salesman problem using the above data. Show the state-space tree.