

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Design and Analysis of Algorithms

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the following problem types:
 - i) Searching
 - ii) Sorting
 - iii) Combination problems

(08 Marks)
- b. Write an algorithm to find uniqueness of elements in an array and give the mathematical analysis of this non-recursive algorithm with steps. (08 Marks)
- c. Distinguish between the two common ways to represent a graph. (04 Marks)

OR

- 2 a. Give the mathematical analysis of non-recursive matrix multiplication algorithm. (08 Marks)
- b. Discuss about important problem types and fundamental data structures. (08 Marks)
- c. Explain Big-0, Big-Ω, Big-θ notations. (04 Marks)

Module-2

- 3 a. Write the control abstraction for divide and conquer technique. (10 Marks)
- b. Design merge sort algorithm. Write a descriptive note on its best time complexity. (10 Marks)

OR

- 4 a. Apply quick sort algorithm to sort the list E, X, A, M, P, L, E in alphabetical order. Draw the recursive calls made. (08 Marks)
- b. Define topological sorting. Illustrate the topological sorting using DFS method for the following graph. (08 Marks)

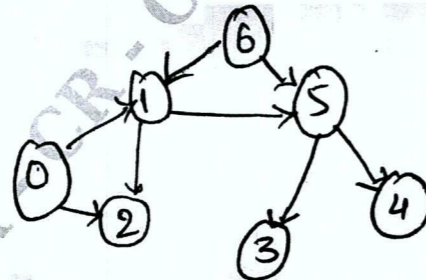


Fig.Q.4(b)

- c. List out the advantages of divide and conquer approach. (04 Marks)

Module-3

- 5 a. Solve the following instance of greedy knapsack problem when $n = 4$, $m = 10$, $p = (40, 42, 25, 12)$ and $w = (4, 7, 5, 3)$. (08 Marks)
- b. Write an algorithm to find single source shortest path for a graph G whose edge weights are positive. (08 Marks)
- c. Sort 2, 9, 8, 3, 4, 6, 5 using heap sort. (04 Marks)

OR

- 6 a. Obtain the Huffman tree and code for the following data:

Characters	Frequencies
a	10
e	15
i	13
O	4
U	5
S	18
l	2

(10 Marks)

- b. Apply Prim's and Kruskal's algorithm to find minimal cost spanning tree for the graph give below, (10 Marks)

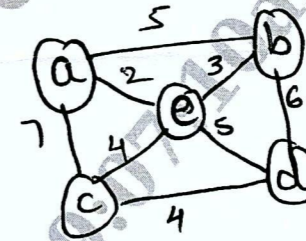


Fig.Q.6(b)

Module-4

- 7 a. Explain multistage graph with an example. Write backward multistage graph algorithm followed by C-program. (10 Marks)
- b. Define transitive closure. Write Warshall's algorithm to compute transitive closure. Mention its advantages and disadvantages with its time efficiency. (10 Marks)

OR

- 8 a. For the given graph, obtain optimal tour cost using dynamic programming

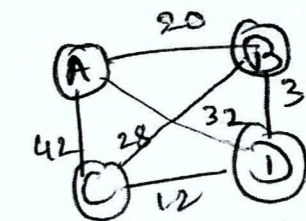


Fig.Q.8(a)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- b. Construct optimal binary search tree for the following set of values:

Keys	P	Q	R	S
Probability	0.1	0.2	0.3	0.4

(10 Marks)

Module-5

- 9 a. Write a short note on the following:

- i) N-Queens problem
ii) 0/1 knapsack

(10 Marks)

- b. Explain NP-complete and NP-hard problems with an example.

(10 Marks)

OR

- 10 a. Explain LC branch and bound concept for knapsack problem.

(10 Marks)

- b. Solve assignment problem for the following job assignment and obtain optimal solution using branch and bound technique:

	Job 1	Job 2	Job 3	Job 4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4

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(10 Marks)
