

BTCS302N

B.Tech./ B.Tech.+M.B.A./ B.Tech.+M.Tech.(CSE, CSE-MLCC, CSE-MA,
CSE-AIML, CSE-ES, CSE-ICS, CSE-BDCE, CSE-AII, CSE-FSDI, CSE-DSI, IT)

IV/III Semester Examination, June 2025

Analysis and Design of Algorithms

Choice Based Credit System (CBCS)

Time: 3 Hrs.

Maximum Marks: 60

Minimum Pass Marks: 24

- Note: (1) All questions carry equal marks, out of which part 'A' and 'B' carry 3 marks and part 'C' carries 6 marks.
(2) From each question, part 'A' and 'B' are compulsory and part 'C' has internal choice.
(3) Draw neat diagram, wherever necessary.
(4) Assume suitable data wherever necessary.

- Q.1(A)** What are asymptotic notations? Describe commonly used asymptotic notations. Why asymptotic notations are important in analyzing algorithms? **03**
- (B)** Perform step-by-step quicksort on the array [23, 67, 12, 78, 33, 28, 97, 10, 6, 87, 39]. **03**
- (C)** Write an algorithm of binary search with example, also mention it's time complexity. **06**

OR

Explain merge sort algorithm with example, also mention it's time complexity in best, worst and average cases.

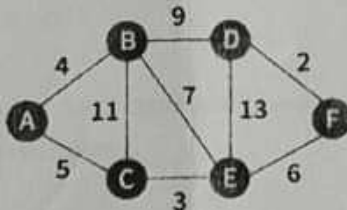
- Q.2(A)** Given the following items with weights and profits, find the maximum profit using the Fractional Knapsack algorithm. Knapsack Capacity = 50. **03**

Item	Weight	Profit
1	10	60
2	20	100
3	30	120

- (B)** Explain the Job Sequencing problem with deadlines. How can it be addressed using the Greedy method? Provide an example to illustrate the solution to the Job Sequencing problem. **03**
- (C)** Write prim's algorithm. Compare it with kruskal's algorithm. Justify its complexity. **06**

OR

Compare Bellman-Ford and Dijkstra's algorithm. Find the shortest path from source vertex A to all other nodes using Dijkstra's Algorithm for the following graph:



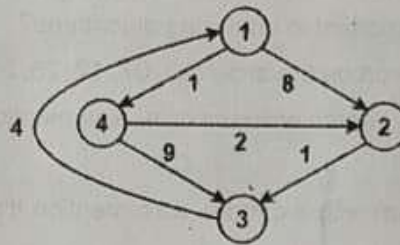
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- Q.3(A)** What is Dynamic Programming? How does it differ from Divide and Conquer and Greedy approach? 03
- (B)** How fractional knapsack differ from 0/1 knapsack? Why 0/1 knapsack can't be solved using greedy approach, explain with example? 03
- (C)** Find optimal binary search tree for the following keys and frequencies using dynamic programming? 06

	1	2	3	4
Keys →	10	20	30	40
Frequency →	4	2	6	3

OR

Find all pair shortest path using Floyd warshall on following graph:



- Q.4(A)** What is Backtracking? Explain its working with an example. How does Backtracking differ from Brute Force? 03
- (B)** Discuss in brief about n-queens problem. 03
- (C)** Explain graph coloring problem with example. Write its algorithm. 06

OR

Given set $S = \{3, 34, 4, 12, 5, 2\}$ and target sum = 9, find subsets whose sum is equal to 9 using Backtracking.

- Q.5(A)** Define NP, P, NP-Hard, and NP-Complete problems with suitable examples. 03
- (B)** Explain Cook's Theorem and its significance in NP-Completeness. 03
- (C)** Explain NP Hard Graph and NP Scheduling Problems. 06

OR

Give an example of a problem in P and a problem in NP, explaining why they belong to these classes.

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