

T.E. (Information Technology)

DESIGN & ANALYSIS OF ALGORITHMS

(2019 Pattern) (Semester - I) (314445A) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70]

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Discuss the dynamic programming approach to solving the coin change-making problem. Explain how the problem can be formulated as a dynamic programming task and provide a step-by-step explanation of the algorithm. [10]

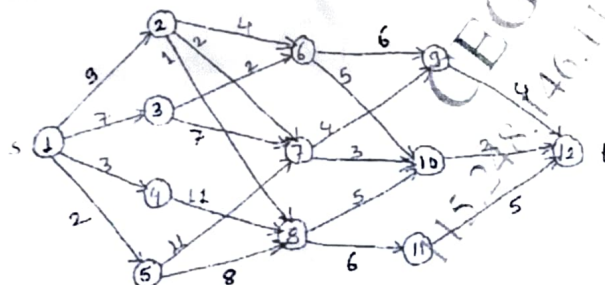
b) Explain the Bellman-Ford algorithm for finding the shortest paths in a weighted directed graph. Discuss the problem it solves, its applications, and its time complexity. [8]

OR

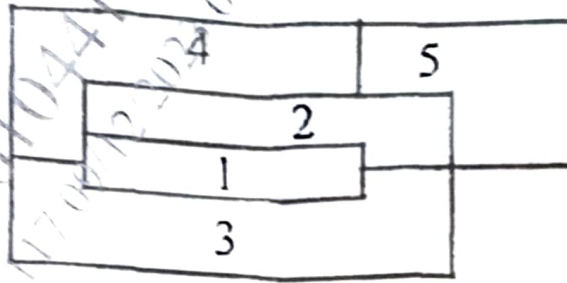
Q2) a) Solve the TSP problem using Dynamic Programming. [10]

0	10	15	20
5	0	9	10
6	13	0	12
8	8	9	0

b) Find the minimum cost path from source s to sink t of the following multistage graph. [8]



- Q3) a) Write recursive and iterative algorithm for backtracking method. [8]
- b) Construct planar graph for following map. Explain how to find m - colouring of this planar graph by using m-colouring Backtracking algorithm. [9]



OR

- Q4) a) Define the n-Queen problem and its objective. Explain the rules and constraints associated with placing n queens on an $n \times n$ chessboard without attacking each other. [8]
- b) Discuss how the backtracking algorithm can be applied to solve the sum of subsets problem. Explain the decision space exploration process with some examples. [9]
- Q5) Construct the solution of following Travelling Salesperson problem using Branch and Bound. [18]

∞	20	30	10	11
15	∞	16	4	2
3	5	∞	2	4
19	6	18	∞	3
16	4	7	16	∞

OR

- Q6) a) Write an algorithm for FIFO branch and bound. [9]
- b) Explain FIFO branch and bound method of problem solving. Explain its advantages and limitations. [9]

- Q7) a) Prove that Satisfiability problem is NP complete. [8]
- b) Discuss the proof for the NP-completeness of the Vertex Cover problem. [9]

OR

- Q8) a) Define the complexity classes P, NP, NP-complete, and NP-hard. Explain the relationships between these classes and their significance in computational complexity theory. [9]
- b) Prove that clique problem is NP complete. [8]

