Total No. of Questions : 8]

SEAT No. :

P-7621

[Total No. of Pages : 3

[6180]-141

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, Q7or 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]**

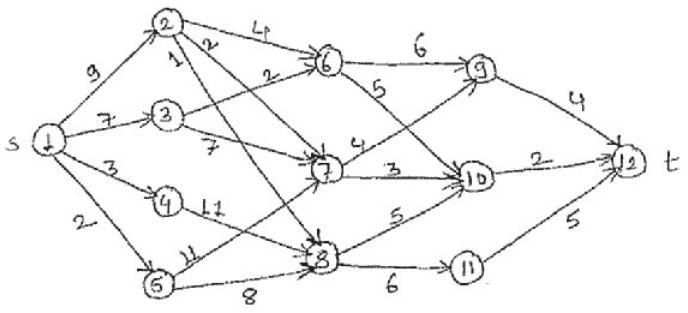
b) Explain the Bellman-Ford algorithm for finding the shortest paths in a weighted directed graph. Discuss the problem it solves, its applications, and its time complexity. **[8]**

OR

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

$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

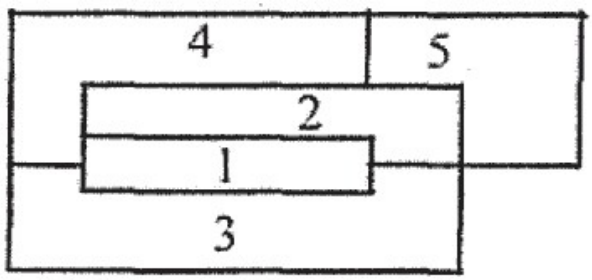
b) Find the minimum cost path from source s to sink t of the following multistage graph. **[8]**



P.T.O.

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 × 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]**

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

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 in 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]**