Total No. of Questions : 8]

SEAT No. :

PC1805

[Total No. of Pages : 2

[6353]-124

T.E. (Information Technology)

DESIGN & ANALYSIS OF ALGORITHMS

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, jf necessary.***

Q1) a) Consider an instance of a Coin change-making problem, with coins 1, 4 and 6 units. Illustrate its solutions using dynamic programming approach involving a payment of 8 units. **[9]**

b) Write an algorithm for 0/1 knapsack problem using dynamic programming. **[9]**

OR

Q2) 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. **[9]**

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. **[9]**

Q3) a) State the principal of backtracking and write backtracking algorithm for N-Queen problem. **[8]**

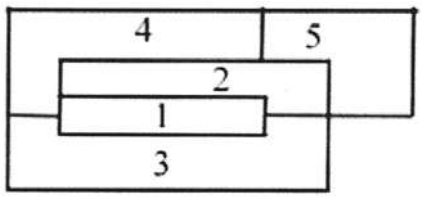
b) Let W = {5, 7, 10, 12, 15, 18, 20} and M = 35. Find all possible subsets of W that sum to M. Construct the portion of state space tree. **[9]**

OR

P.T.O.

Q4) 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]**



Q5) a) Solve the following instance of 0/1 knapsack problem by FIFO branch and bound approach. N = 4, $(p_1, p_2, p_3, p_4) = (10, 10, 12, 18)$ $(w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$ and M = 15. **[10]**

b) Write the control abstraction for least cost search. **[8]**

OR

Q6) Construct the solution of following Travelling Salesperson problem using Branch and Bound. **[18]**

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

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) Explain deterministic and non-deterministic algorithm with example. **[8]**

b) When do you claim that algorithm is polynomial time algorithm? Explain with an example. **[9]**

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