

Total No. of Questions : 10]

SEAT No. :

P1768

[Total No. of Pages : 3

[5460] - 598

T.E. (IT)

DESIGN AND ANALYSIS OF ALGORITHMS
(2015 Pattern)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

Q1) a) How do we analyze and measure the time complexity of algorithm? What are the basic components, which contribute to space complexity? In what way the asymmetry between Big - Oh notation and Big - Omega notation helpful. **[5]**

b) Write an algorithm for finding out the maximum and minimum number in an array using divide and conquer. **[5]**

OR

Q2) a) Consider the following instance of the knapsack problem : $n = 3$, $m = 20$, $(p_1, p_2, p_3) = (25, 24, 15)$ and $(w_1, w_2, w_3) = (18, 15, 10)$. Solve it using greedy approach. **[5]**

b) Write a recursive algorithm and set up a recurrence relation for finding factorial of a given number and analyze it. **[5]**

Q3) a) Write a prims algorithm to find shortest path and analyze it. **[5]**

b) Compare **[5]**

i) Divide and conquer and Dynamic programming

ii) Greedy and Dynamic programming.

OR

P.T.O.

Q4) a) Solve the TSP problem using Dynamic Programming. [8]

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

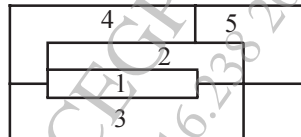
b) Define OBST? [2]

Q5) a) Write a recursive algorithm which shows a recursive formulation of the backtracking technique and explain it. [8]

b) If $m = 30$, Given data set $w = \{5, 10, 12, 13, 15, 18\}$ find all possible subset of w that sum to m . Draw the portion of state space tree that is generated by sum of subset. Are there any differences in the computing time in given set of elements? $w = \{18, 15, 13, 12, 10, 5\}$ And $w = \{15, 13, 5, 18, 10, 12\}$ [8]

OR

Q6) a) Construct planar graph for following map. Explain how to find m -coloring of this planar graph by using m -coloring Backtracking algorithm. [8]



b) Write a recursive algorithm to find the Hamiltonian cycle using backtracking technique and explain it. [8]

Q7) Consider the travelling salesman instance defined by cost matrix. [18]

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

a) Obtain reduced matrix.

b) Obtain the portion of state space tree generated by LCBB.

OR

- Q8)** a) What is Branch and bound algorithmic strategy? Draw the portion of the state space tree generated by LCBB for the following knapsack instances: $N = 4$, $M = 15$ and $\{p_1, p_2, p_3, p_4\} = \{10, 10, 12, 18\}$, $(w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$ [10]
- b) What is least cost search? Explain in detail control abstraction for LC search. [8]
- Q9)** a) Explain the need and significance of parallel algorithms. Define the speedup of parallel algorithm. [8]
- b) What do you mean by P, NP, NP - Hard and NP - Complete Problems? Give an example of each category. [8]

OR

- Q10)** a) State and explain pointer doubling concept with example. [8]
- b) Prove that Clique problem is NP complete. [8]

