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T.E. (Information Technology) (Semester - II)
DESIGN AND ANALYSIS OF ALGORITHMS

(2015 Pattern)

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.7 or Q.8, Q.9 or Q.10.
- 2) Near diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Write an algorithm to solve 8 queen's problem using Brute force method. [5]

b) Let $n = 3$ and $(11, 12, 13) = (5, 10, 3)$ find the optimal ordering on tapes using Greedy method. [5]

OR

Q2) a) Prove by mathematical induction that for each positive number n
 $1 + 2 + 3 + \dots + n = n(n+1)/2$. [5]

b) Write an algorithm for finding the maximum and minimum element using divide and conquer and verify its complexity. [5]

Q3) a) Find the solution of following travelling salesman problem using dynamic programming. [8]

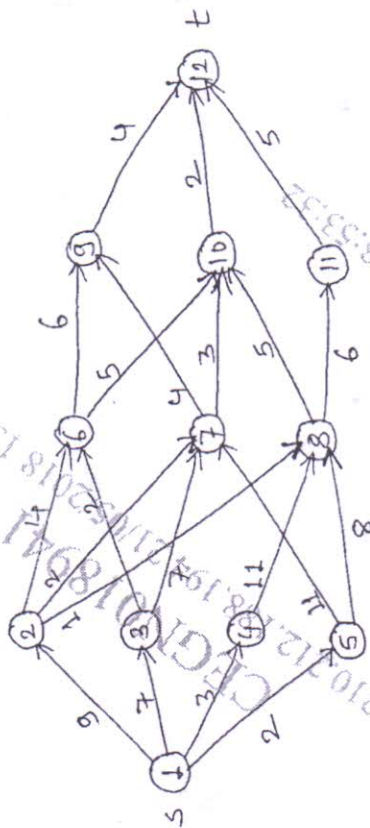
$$\text{Cost Matrix} = \begin{matrix} & \begin{matrix} 1 & 2 & 3 & 4 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \end{matrix} & \begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 4 \\ 8 & 8 & 9 & 0 \end{bmatrix} \end{matrix}$$

b) Define greedy method. [2]

P.T.O.

OR

Q4) Find the minimum cost path from source (s) to sink (t) of the following multistage graph. [10]



Q5) a) Write a recursive and Iterative algorithm of backtracking method. [8]

b) Let $W = \{5, 10, 12, 13, 15, 18\}$ and $M = 30$. Find all possible subsets of W that sum to M . Draw the portion of state space tree. [8]

OR

Q6) a) Write an algorithm for backtracking solution to the 0/1 knapsack problem. [8]

b) Explain the following terms : [8]

- i) State space tree.
- ii) Live node.
- iii) E-node.
- iv) Dead node.

Q7) a) Solve the following instance of 0/1 knapsack problem by LC branch and bound approach [10]

$N = 4$, $(p_1, p_2, p_3, p_4) = (10, 10, 12, 18)$
 $(w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$ and $M = 15$

b) Write an algorithm for FIFO branch and bound. [8]

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OR

- Q8) a) What is travelling salesman problem? Find the solution of the following travelling salesman problem using branch and bound method. [12]

$$\text{Cost matrix} = \begin{bmatrix} \infty & 4 & 2 \\ 4 & \infty & 4 \\ 3 & 8 & \infty \end{bmatrix}$$

- b) Explain the following terms: [6]

- Branch and bound.
- LC search.
- Bounding Function.

- Q9) a) What is Nondeterministic algorithm? Write the Nondeterministic algorithm for sorting the element of an array. [8]

- b) Explain complexity classes P and NP. And differentiate between NP complete and NP Hard. [8]

OR

- Q10) a) Prove that Clique Decision problem is NP complete. [8]

- b) Explain the Flynn's classification for Parallel Computing. [8]

