



## Analysis & Design of Algorithms (1110)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** questions from each unit.
5. Figures to right indicates full marks.
6. Non programmable calculator is allowed.
7. Assume suitable data if necessary.

### UNIT – I

- |      |    |  |    |
|------|----|--|----|
| 1. I | a) | Define algorithm along with the criteria that all algorithms must satisfy.       | 5  |
|      | b) | Explain different algorithm complexities.  | 5  |
|      | J) | Explain different methods to design algorithm.                                   | 10 |
|      | K) | Write algorithm for insertion sort and apply on list {I, N, S, E, R, T, I, O, N} | 10 |

### UNIT – II

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|------|----|---|----|
| 2. I | a) | Explain Randomized hiring problem.  | 5  |
|      | b) | Calculate the time complexity of merge sort.  | 5  |
|      | J) | Write down algorithm for Quick Sort along with it's complexities and apply on (8, 10, 6, 4, 3, 1, 13) | 10 |
|      | K) | Use Strassen's Matrix multiplication algorithm to compute the following matrix product.               | 10 |

$$\begin{bmatrix} 4 & 7 \\ 6 & 5 \end{bmatrix} \begin{bmatrix} 5 & 6 \\ 7 & 4 \end{bmatrix}$$

**UNIT – III**

3. I) a) Write a note on maze problem. 5  
 b) Draw a state space tree for 4 – queen problem. 5  
 J) Consider traveling salesman problem instance defined by the cost matrix 10

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

Obtain the reduced cost matrix and draw the state space tree that will be generated by LCBB label each node by the value.

- K) Explain graph coloring problem & it's algorithm with example. 10

**UNIT – IV**

4. I) Write a note on : 5  
 a) Dynamic Programming  
 b) Greedy Method. 5  
 J) a) Consider the Knapsack for the instance  $n = 5$  and  $M = 11$ . Profit  $P(5, 4, 7, 2, 3)$ , weights  $W(4, 3, 6, 2, 3)$  use dynamic approach. 5  
 b) What is optimal merge pattern. 5  
 K) Obtain tour for the following graph given by the adjacency matrix. 10

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

**UNIT – V**

5. I) State & Prove Cook's theorem. 10  
 J) a) Explain NP – Hard code generation problem. 5  
 b) Explain Decision problem. 5  
 K) Write a note on :  
 a) Vertex Cover Problem. 5  
 b) Relationship of P & NP class problem. 5

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