

Total No. of Questions : 12]

SEAT No. :

P3393

[Total No. of Pages : 3

T.E. (IT)

DESIGN AND ANALYSIS OF ALGORITHMS

(2008 Pattern) (314455)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

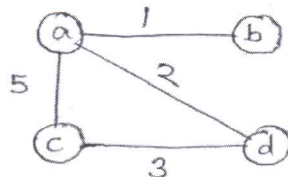
- 1) Answer three questions from each section.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Assume suitable data if necessary.

SECTION - I

- Q1) a) Define algorithm. Name two types of algorithmic complexities based on computer resources. [6]
- b) Write an algorithm for searching an element in an array of size  $n$ . Calculate complexity of this algorithm. [10]

OR

- Q2) a) Define best-case, worst-case and average-case efficiency. Is average-case efficiency, an average of best-case and worst-case efficiencies? [6]
- b) Write an algorithm to find MaxElement from unsorted array of size  $n$ . Calculate complexity of this algorithm. [10]
- Q3) a) Find MST using Prim's algorithm. [6]



- b) Comment on the complexity of Prim's algorithm. Analyse complexity of Prim's algorithm using Greedy approach. [12]

OR

P.T.O.

**Q4) a)** What is divide and conquer (D & C) strategy? Write Master's theorem. [6]

b) A binary search splits array into two parts. If it splits array into three parts, write down recurrence relation and complexity. [12]

**Q5)** Using Warshall's algorithm, find transitive closure for

$$\begin{array}{c}
 a \quad b \quad c \quad d \\
 a \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \end{bmatrix} \\
 b \\
 c \\
 d
 \end{array}$$

State its complexity. Which algorithm design technique does it use? State its advantages. [16]

OR

**Q6) a)** What is memory function? Explain why it is advantageous to use memory functions. [8]

b) What is BST? What is OBST? [8]

### SECTION - II

**Q7) a)** Current configuration is (7, 5, 3,1) for 8-queens problem. Find answer tuple. [10]

b) Explain implicit and explicit constraints. [6]

OR

**Q8) a)** Solve the following knapsack problem using backtracking [10]

| i | $p_i$ | $w_i$ |
|---|-------|-------|
| 1 | 24    | 15    |
| 2 | 15    | 10    |
| 3 | 25    | 18    |

for  $n = 3$  and  $m = 20$ .

b) What are planar graphs? Explain graph coloring. [6]

**Q9)** Solve the following job scheduling problem using LCBB.

**[18]**

| Job | $p_i$ | $d_i$ | $t_i$ |
|-----|-------|-------|-------|
| 1   | 5     | 1     | 1     |
| 2   | 10    | 3     | 2     |
| 3   | 6     | 2     | 1     |
| 4   | 3     | 1     | 1     |

Where  $p_i$  : indicates penalty if  $i^{\text{th}}$  job is not completed by deadline  $d_i$ .  $p_i$  has burst time  $t_i$ .

We want to have minimum penalty.

OR

**Q10)a)** Explain dynamic reduction with all steps with respect to Travelling Salesperson problem. **[6]**

b) Explain for Branch and Bound- **[12]**

i) LIFO search

ii) FIFO search

iii) LC search

**Q11)a)** What is a deterministic and non-deterministic algorithm? Write a non-deterministic algorithm for searching element. **[8]**

b) Prove that : A clique problem is NP-complete. **[8]**

OR

**Q12)a)** Write a note on Satisfiability problem. **[8]**

b) Explain : NP-complete, NP-Hard, Decision Problem and Polynomial Time Algorithm. **[8]**

