

Faculty of Engineering & Technology
Fifth Semester B.E. (Computer Science Engg.)
(C.B.S.) Examination
DESIGN AND ANALYSIS OF ALGORITHMS

Time : Three Hours]

[Maximum Marks : 80

INSTRUCTIONS TO CANDIDATES

- (1) All questions carry marks as indicated.
- (2) Solve **SIX** questions as follows :
Que. No. 1 **OR** Que. No. 2
Que. No. 3 **OR** Que. No. 4
Que. No. 5 **OR** Que. No. 6
Que. No. 7 **OR** Que. No. 8
Que. No. 9 **OR** Que. No. 10
Que. No. 11 **OR** Que. No. 12
- (3) Due credit will be given to neatness and adequate dimensions.
- (4) Illustrate the answers with necessary figures/ drawings wherever necessary.

1. (a) Solve the following recurrence

$$T_n = \begin{cases} 1 & \text{if } n = 1 \\ 2T(n/2) + n & \text{otherwise} . \end{cases} \quad 5$$

(b) Solve non homogenous recurrence :
 $T(n) = n$ if $n = 0$ or $n = 1$
 $= st(n - 1) - 6n$ otherwise. 5

(c) Define algorithm. Explain the characteristics of algorithm. 4

OR

2. (a) Using master method, solve the following recurrence and also find the values of constant involved :

$$T(n) = T(n/4) + \sqrt{n} + 4 \text{ for } n \geq 4 \text{ and } T(1) = 4. \quad 7$$

(b) $t_n = \begin{cases} 2 & \text{if } n = 0 \\ 3t_{n-1} + n + 2^n & \text{otherwise.} \end{cases} \quad 4$

(c) State the difference between recursive and iterative method. 3

3. (a) Implement Biotonic sorting network for following set of information. Also explain its advantages :

1 7 5 8 2 6 9 3. 6

(b) Comment on the minimum complexity of sorting algorithm is $O(n \log n)$ in best case and $O(n^2)$ in worst case. 7

OR

4. (a) What are different asymptotic notations ? Explain them briefly. For the following equation find values of constant using various approaches :

- (i) $3n + 2$
- (ii) $10n^2 + 4n + 2$ 7

(b) Implement insertion sort on following array :

18, 12, 44, 64, 76, 15, 129, 20.

Write recursive algorithm. 6

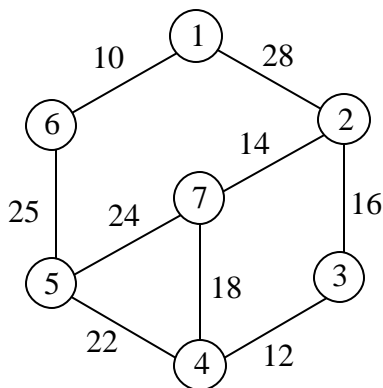
5. (a) Explain the difference between Greedy and Divide and Conquer method of algorithm design. 4

(b) For the following sequence of objects find the profit by three method capacity = 30, Number of objects = 07

Object	Weight	Profit	
1	4	20	
2	6	15	
3	10	20	
4	14	28	
5	2	8	
6	8	18	
7	2	6	9

OR

6. (a) Write algorithm to find out minimum cost spanning tree for the following graph, using PRIM's algorithm : 7

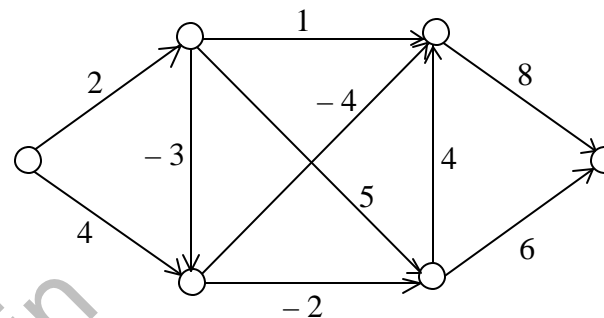


- (b) Draw the merge and split tree using Merge sorting for array size of 15. Write recurrence equation for merge sort algorithm. 6
7. (a) Draw optimal binary search tree for the following parameter :

I	p_i	q_i
0	—	0.05
1	0.15	0.10
2	0.10	0.05
3	0.05	0.05
4	0.10	0.15
5	0.20	0.10

7

- (b) Implement Bellman Ford algorithm for the following graph. Find the distance matrix : 7



OR

8. (a) What is Travelling Salesman Problem ? Implement Travelling Salesman Problem for the following matrix representing complete graph :

$$\begin{bmatrix} 0 & 8 & 16 & 15 \\ 14 & 0 & 9 & 12 \\ 7 & 10 & 0 & 6 \\ 11 & 13 & 10 & 0 \end{bmatrix}$$

7

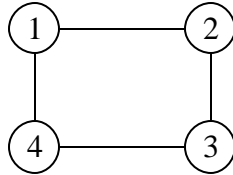
- (b) Write algorithm for LCS. Find the LCS of following sequence :

X = a, a, b, a, a, b, a, b, a, a

Y = b, a, b, a, a, b, a, b.

7

9. (a) Explain the significance of graph colouring algorithm. For the graph drawn complete solution space tree if maximum number of colours permitted are 3. Also write the algorithm for graph colouring. 6



- (b) Explain 8-queen problem. Explain the explicit and implicit constraints associated with this problem. Give at least two solutions for this problem. Write algorithm. 7

OR

10. (a) Design a solution for Hamiltonian path. Explain how the solution can be used to solve Hamiltonian cycle problem. 6
- (b) Explain Articulation point in DFS and give the complete algorithm for finding articulation point of an undirected graph. 7
11. (a) Write short notes on :—
- (i) Deterministic and non-deterministic algorithm. 8
- (ii) Polynomial Reduction. 8

- (b) Write a non-deterministic algorithm to generate CLIQUE of size K from graph of n vertices. 5

OR

12. (a) Explain :
- (i) P-NP class problem 8
- (ii) NP hard and NP complete. 8
- (b) Write algorithm for non-deterministic sorting. 5