

**Faculty of Engineering & Technology**  
**Fifth Semester B.E. (Computer Technology) (C.B.S.)**  
**Examination**

**DESIGN AND ANALYSIS OF ALGORITHM**

Time : Three Hours]

[Maximum Marks : 80

**INSTRUCTIONS TO CANDIDATES**

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

1. (a) Solve the following Recurrence Relation :

$$t_n = \begin{cases} 1 & \text{for } n = 0 \\ 2t_{n-1} + n \cdot 2^n & \text{otherwise} \end{cases} \quad 8$$

- (b) Define Algorithm. Explain various types of algorithm design techniques. 6

OR

2. (a) Explain the concept of "summing using integration to find lower and upper bounds. 6

- (b) Solve the given recurrences using Master Theorem :

(1)  $T(n) = 2T(\sqrt{n}) + \lg n$

(2)  $T(n) = T(\sqrt{n}) + 1. 8$

3. (a) Write Quick Sort Algorithm. Explain its time complexity. Illustrate its working using suitable example. 7

- (b) What is Divide and Conquer Strategy, write Binary Search Algorithm? 6

OR

4. (a) Write an Algorithm for Insertion Sort. Derive its best case and worst case time complexity. 6

- (b) Use Strassen's algorithm to compute the matrix product and find the recurrence relation and its time complexity:

$$\begin{pmatrix} 1 & 3 \\ 7 & 2 \end{pmatrix} \begin{pmatrix} 4 & 5 \\ 3 & 6 \end{pmatrix} \quad 7$$

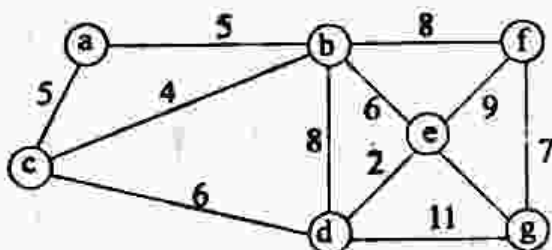
5. (a) Explain Job Sequencing approach. Find the best possible sequence for the following deadline :

Job	Gain	Deadline
1	35	3
2	20	1
3	18	3
4	16	4
5	12	2
6	10	2
7	08	1

6

- (b) Obtain MST with its cost for given undirected graph using PRIM's algorithm. Assume vertex 'a' as a root vertex :

7



OR

6. (a) Given 10 activities along with their start and finish time as :

$$S = (A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10})$$

$$\text{Start time} = (1, 2, 3, 4, 7, 8, 9, 9, 11, 13)$$

$$\text{Finish time} = (3, 5, 4, 8, 10, 11, 13, 12, 14, 17)$$

Compute a schedule where largest number of activities take place.

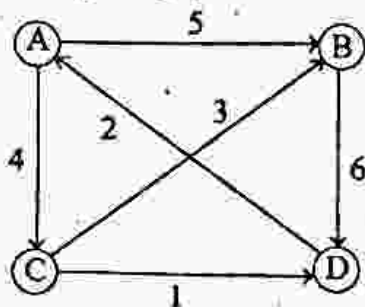
6

- (b) Write the algorithm of Optimal Huffman Code. Find Optimal Huffman codes for the following set of frequencies and discuss its time complexity :

a : 25, b : 50, c : 15, d : 75, e : 40. 7

7. (a) Differentiate between Greedy approach and Dynamic programming. 6

- (b) Find All Pair shortest paths using Floyd Warshall algorithm for given graph : 8



OR

8. (a) Find Optimal Solution using 0/1 Knapsack problem for given data :

$$M = 6, n = 3,$$

$$(W_1, W_2, W_3) = (3, 2, 3)$$

$$(P_1, P_2, P_3) = (2, 1, 4).$$

8

- (b) Determine LCS of  $X = (a, b, a, b, a, a, b, a)$

and  $Y = (a, b, a, a, b, a, b).$

6

9. (a) Explain the principal of optimality and show how it can be applied on optimal binary search tree problem. 3

(b) For the following four matrices, find the order of parenthesization for the optimal chain multiplication :

$$A_1 = 15 \times 5$$

$$A_2 = 5 \times 10$$

$$A_3 = 10 \times 20$$

$$A_4 = 20 \times 25.$$



OR

10. (a) Explain Graph coloring method with example. Give algorithm for the same. 6
- (b) Discuss 4-Queen problem and give its algorithm using backtracking method. 7
11. (a) Explain the following NP problems and relation between them :
- (i) Clique
- (ii) Graph Partitioned into Triangle
- (iii) Independent Set Problem (ISP). 8
- (b) Write an algorithm for Non-deterministic Sorting. 5

OR

12. (a) Comment on  $P \subseteq NP$ . 4
- (b) Explain Polynomial Reduction. 4
- (c) Give the definition of NP hard and NP-complete class of problems. 5