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 :

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

(i) $T(n) = 2T\left(\sqrt{n}\right) + \lg n$

(2) $T(n) = T\left(\sqrt{n}\right) + 1$. 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 Stressen's algorithm to compute the matrix product and find the recurrence relation and its time complexity :

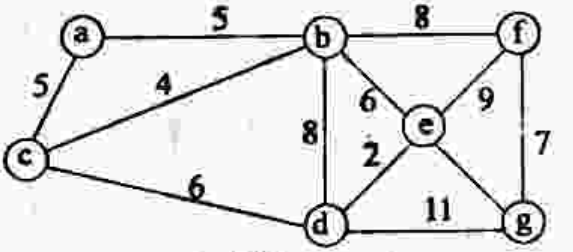
$$\begin{pmatrix} 1 & 3 \\ 7 & 2 \end{pmatrix} \begin{pmatrix} 4 & 5 \\ 3 & 6 \end{pmatrix}$$ 7

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 :

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

Start time = (1, 2, 3, 4, 7, 8, 9, 9, 11, 13)

Finish time = (3, 5, 4, 8, 10, 11, 13, 12, 14, 17).

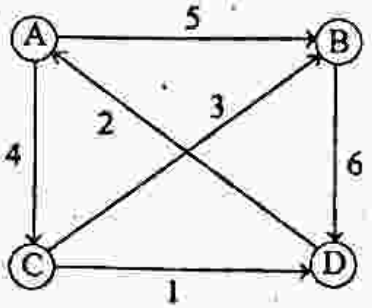
Compute a schedule where largest number of activities take place. 6

(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 optimally 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 :

$A_1 = 15 \times 5$

$A_2 = 5 \times 10$

$A_3 = 10 \times 20$

$A_4 = 20 \times 25$.

10

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 Partioned 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