B.E. (Computer Technology) Fifth Semester (C.B.S.)

Design & Analysis of Algorithms

P. Pages : 3 **TKN/KS/16/7435**

Time : Three Hours Max. Marks : 80

Notes : 1. All questions carry mark as indicated.
2. Solve Questions 1 OR Questions 2.
3. Solve Questions 3 OR Questions 4.
4. Solve Questions 5 OR Questions 6.
5. Solve Questions 7 OR Questions 8.
6. Solve Questions 9 OR Questions 10.
7. Solve Questions 11 OR Questions 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non-programmable calculator is permitted.

1. a) State and explain Asymptotic notations used for analyzing the algorithms. **6**

b) Solve the given Recurrences using Master Theorem. **8**

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

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

OR

2. a) What is an algorithm. Explain the properties of Algorithm. **6**

b) Solve the following Recurrence relation, **8**
$T(n) = 3T(n/4) + \theta(n^2)$
using Recursion Tree method.

3. a) Write an algorithm of 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. **7**
$\begin{pmatrix} 3 & 2 \\ 6 & 1 \end{pmatrix} \begin{pmatrix} 4 & 5 \\ 7 & 9 \end{pmatrix}$

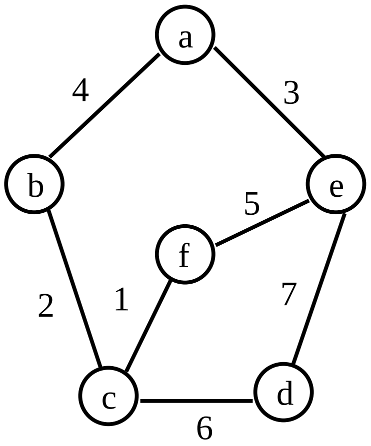
OR

4. a) Prove that the n-element heap has height h=lgn. **4**

b) Show the snapshots of Merge sort when supplied with the input (1,3,5,8,9,6,4,2). Also find the Recurrence Relation and time complexity of Merge sort in Best and worst cases. **9**

5. a) Define Amortized analysis of algorithm? Explain any one method with suitable example. **4**

b) Obtain MST with its cost for given Undirected graph using PRIM's algorithm. Assume vertex 'a' as a root vertex. **9**



OR

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

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

$Si = (1,2,3,4,7,8,8,9,11,12)$

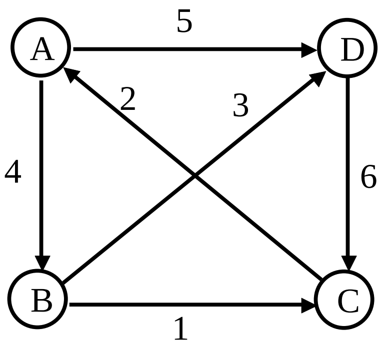
$fi = (3,5,4,6,10,11,13,12,14,9)$

Compute a schedule where largest number of activities take place.

b) Write the algorithm of optimal Huffman code. Find Optimal Huffman codes for following set of frequencies: **7**

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

7. a) Find all pairs shortest paths using Floyd Warshall algorithm for given graph: **8**



b) What is articulation point of an graph? Write a dynamic programming algorithm to find articulation point in a graph. **6**

OR

8. a) Find optimal solution using 0/1 knapsack problem for given data **8**

$M = 6, n = 3, (w_1, w_2, w_3) = (3, 2, 3)$

$(p_1, p_2, p_3) = (2, 1, 4)$

b) Determine LCS of – **6**

X = (a, b, a, b, a, a, b)

Y = (a, b, a, b, b, a, a)

9. a) For the following four matrices, find the order of parenthesization for the optimal chain multiplication. **9**

$A_1 = 15 \times 5$

$A_2 = 5 \times 10$

$A_3 = 10 \times 20$

$A_4 = 20 \times 25$

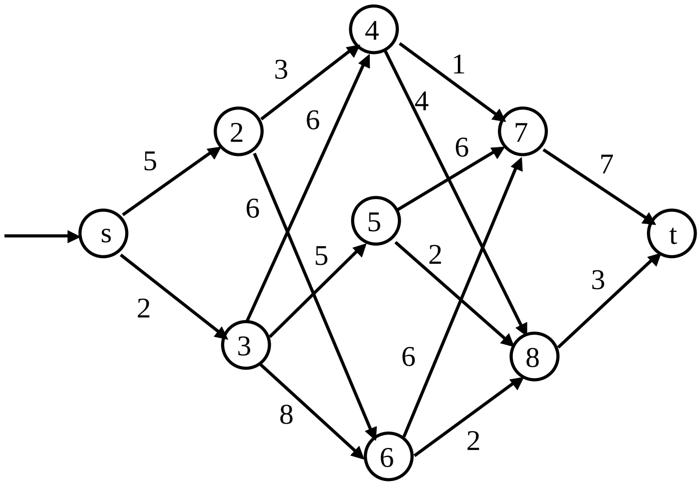
b) Explain the principle of optimality and show how it can be applied on optimal Binary search tree problem. **4**

OR

10. a) Discuss 4-Queen problem and given its algorithm using backtracking method. **7**

b) Explain Graph coloring method with example. Give algorithm for it. **6**

11. a) For a given graph, find out the shortest distance from vertex 's' to vertex 't'. **7**



b) Differentiate between DFS & BFS. **6**

OR

12. a) Comment on P=NP **3**

b) Explain polynomial Reduction **3**

c) Give the definition of NP hard and NP-complete class of problems. **3**

d) How polynomial Reduction can be used for showing NP-completeness of a problem? **4**

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