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

Design and Analysis of Algorithms

P. Pages : 3 **KNT/KW/16/7347**

Time : Three Hours Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Explain what do you mean by recurrence relation. Solve the following recurrences using master theorem. **7**

a) $T(n) = 4T(n/2) + n$

b) $T(n) = 4T(n/2) + n^2$

c) $T(n) = 4T(n/2) + n^3$

b) Draw the recursion tree for the following recurrence relation. **6**

$$T(n) = 2T(n/2) + n^2$$

OR

2. a) Explain summation of Arithmetic and Geometric series. **6**

b) Solve the following recurrence using changing variable method. **7**

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

3. a) Explain different Asymptotic notations : **7**

1) Big Oh
2) Theta
3) Big omega
4) Little Oh
5) Little omega

b) What do you mean by complexity of an algorithm? State different approaches of algorithm analysis. Also comment on worst case complexity of Quicksort is n^2. **7**

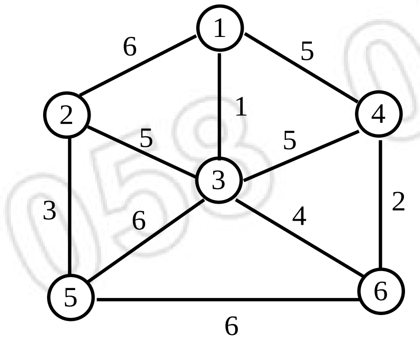
OR

4. a) Explain Amortized analysis with example? Give its application for analyzing stack operations. **7**

b) Explain divide and conquer strategy for binary search algorithm. Write its recurrence relation and comment on its complexity. **7**

5. a) Explain Strassen's matrix multiplication algorithm. Also perform its complexity analysis. **7**

b) What is minimum cost spanning tree? Show the snapshots of Prim's algorithm to find minimum cost spanning tree for the given graph. **6**



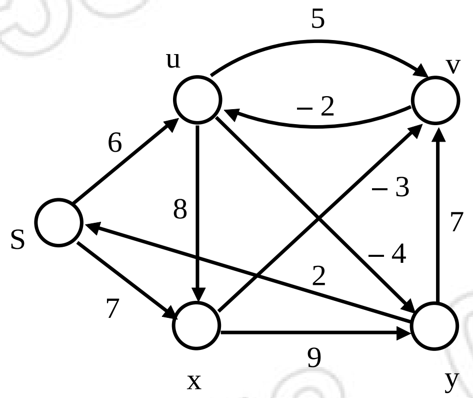
OR

6. a) Write Huffman code algorithm. Also find optimal Huffman code for following set of frequencies. **7**

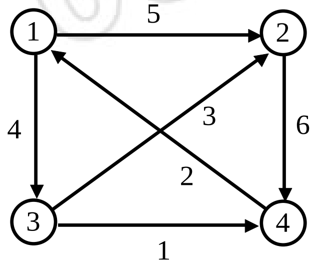
a:20, b:15, c:5, d:25, e:35, f:11.

b) Find optimal solution to knapsack instance n = 3 m = 20 (p_1, p_2, p_3) = (25, 24, 15) and w_1, w_2, w_3 = (18, 15, 10). Also find all feasible solution. **6**

7. a) Explain Bellman-Ford algorithm and find its complexity? Find the shortest distance using Bellman-Ford algorithm for given graph. **7**



b) Find shortest distance between all pairs of vertices & write Flyod-Warshall all pairs shortest path algorithm. **7**



OR

8. a) Determine LCS of x = (e, x, p, o, n, e, n, t, i, a, l) and y = (p, o, l, y, n, o, m, i, a, l) by using dynamic programming algorithm. **7**

b) Give generalized schema for recursive backtracking algorithm. Explain Explicit & Implicit constraints with example. **7**

9. a) Find OBST with its cost and show all necessary matrices for following data. **7**

i	0	1	2	3	4
p_i	-	0.1	0.05	0.15	0.2
q_i	0.1	0.2	0.05	0.05	0.1

b) Give an algorithm to obtain DFS and analyse its complexity. **6**

OR

10. a) Explain backtracking algorithm for sum of subsets problem. State its implicit and explicit constraints. **7**

b) Discuss Hamiltonian cycle. Also write an algorithm for finding Hamiltonian cycle for a graph. **6**

11. a) Explain Knight's tour problem and give algorithm for it. **7**

b) Explain following terms. **6**
1) P class of problems.
2) NP Complete class of problem.
3) NP Hard class of problems.

OR

12. a) Explain Non deterministic algorithm. Give non deterministic algorithm for searching and sorting problem. **7**

b) Explain the concept of polynomial reduction and how it can be used for showing NP completeness of problem. **6**

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