B.E. Computer Science & Engineering (Model Curriculum) Semester-IV

SE202CS - Design & Analysis of Algorithms

P. Pages : 3 **GUG/W/23/13807**

Time : Three Hours * 7 3 9 4 * Max. Marks : 80

Notes : 1. All questions are compulsory.
2. All questions carry equal marks.
3. Assume suitable data wherever necessary.

1. a) Explain methods of amortized analysis with an example? **10**

b) Solve the following recurrence relation by recurrence tree method. **6**

i) $T(n) = 3T\left(\frac{n}{3}\right) + cn$

ii) $T(n) = 8T\left(\frac{n}{2}\right) + n^2$

OR

2. a) Solve the following recurrence relation by using Master's Theorem. **9**

i) $T(n) = 3T\left(\frac{n}{2}\right) + n^2$

ii) $T(n) = T\left(\frac{n}{4}\right) + \sqrt{n} + 4$ where $n \geq 4$ and T(1) = 4.

iii) $T(n) = 6T\left(\frac{n}{3}\right) + n^2 \log n$

b) What is time and space complexity? Explain lower bound and upper bound of asymptotic notations? **7**

3. a) Explain Strassen's matrix multiplication by divide and conquer. Find AB. **8**

$A = \begin{bmatrix} 1 & 3 \\ 7 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 6 & 8 \\ 4 & 2 \end{bmatrix}$

b) Define Job sequencing with deadline problem. Find maximum profit value of n = 6 Jobs. **8**

Profit	20	15	10	7	5	3
Deadline	3	1	1	3	1	3

OR

4. Find an optimal solution for following knapsack problem **16**

i) Based on profit

ii) Based on weight

iii) Based on profit per weight ratio

n = 7

m = 15

$(P_1, P_2, P_3, P_4, P_5, P_6, P_7) = \{10, 5, 15, 7, 6, 18, 3\}$

$(W_1, W_2, W_3, W_4, W_5, W_6, W_7) = \{2, 3, 5, 7, 1, 4, 1\}$

Write greedy based algorithm for knapsack problem and determine its time complexity.

5. a) Solve Matrix Chain multiplication problem using dynamic programming method to find cost and S matrix **10**

n = 4.

$A = 5 \times 13$

$B = 13 \times 7$

$C = 7 \times 89$

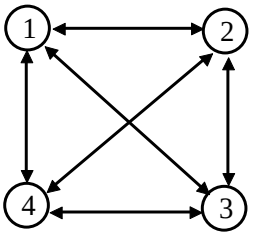
$D = 89 \times 3$

Mention the formulation (for calculating cost)

b) Write algorithm and complexity of Floyd's Warshall algorithm. **6**

OR

6. a) Solve travelling sales person problem using dynamic programming solution **8**



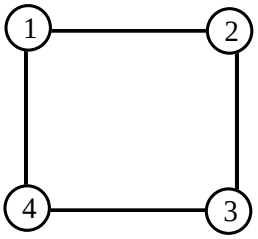
	1	2	3	4
1	0	5	2	3
2	2	0	4	1
3	6	3	0	5
4	2	1	6	0

b) Write algorithm for optimal binary search tree using dynamic programming approach. Also draw tree for the following root matrix. **8**

1	1	2	3	3	6
	2	2	3	3	3
		3	4	4	5
			4	5	5
				5	5
					6

7. a) Explain n-queens problem in details? **8**

b) Write algorithm of graph coloring. Also give solution of n = 4 node graph with m = 3 colors. Draw state space tree (n = 4, n = 3). **8**



OR

8. Write algorithm for sum of subset problem using backtracking method. Also find out sum of subset for following Inputs and show answer using state space tree. **16**
n = 4, m = 8, w[1:4] = {1, 3, 4, 5}

9. a) What is NP-Complete and NP-hard problem? Explain in detail with suitable diagram. **8**

b) What is vertex cover problem? Explain with an example. Give pseudocode for approximate vertex cover. **8**

OR

10. a) Differentiate between P-Class and NP-Class. **8**

b) Explain deterministic and non-deterministic searching? Also write and explain algorithm for non-deterministic searching. **8**

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