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# B.E. (Computer Engineering)
# DESIGN AND ANALYSIS OF ALGORITHMS
## (2019 Pattern) (Semester - VII) (410241)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:
1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate marks.
4) Assume suitable data, if necessary.

**Q1) a)** Solve the matrix chain multiplication for the following 6 matrix problem using Dynamic programming. **[10]**

| Matrix | $A_1$ | $A_2$ | $A_3$ | $A_4$ | $A_5$ | $A_6$ |
|---|---|---|---|---|---|---|
| Dimensions | 10×20 | 20×5 | 5×15 | 15×50 | 50×10 | 10×15 |

**b)** Explain Greedy strategy: Principle, control abstraction, time analysis of control abstraction with suitable example. **[8]**

**OR**

**Q2) a)** Explain the 'dynamic programming' approach for solving problems. Write a dynamic programming algorithm for creating an optimal binary search tree for a set of 'n' keys. Use the same algorithm to construct the optimal binary search tree for the following 4 keys. **[10]**

| Key | A | B | C | D |
|---|---|---|---|---|
| Probability | 0.1 | 0.2 | 0.4 | 0.3 |

**b)** Explain Dynamic programming: Principle, control abstraction, time analysis of control abstraction with suitable example. **[8]**

**Q3) a)** Explain the 'branch and bound' approach for solving problems. Write a branch and bound algorithm for solving the 0/1 Knapsack problem. Use the same algorithm to solve the following 0/1 Knapsack problem. The capacity of the Knapsack is 15 kg. **[9]**

| Item | A | B | C | D |
|---|---|---|---|---|
| Profit (Rs.) | 18 | 10 | 12 | 10 |
| Weight (kg.) | 9 | 4 | 6 | 2 |

**b)** Explain with suitable example Backtracking: Principle, control abstraction, time analysis of control abstraction. **[8]**

**OR**

*Q4)* a) What is Branch and Bound method? Write control abstraction for Least Cost search? **[9]**

b) Explain the backtracking with graph coloring problem. Find solution for following graph **[8]**

|       | $C_1$ | $C_2$ | $C_3$ | $C_4$ | $C_5$ |
|-------|-------|-------|-------|-------|-------|
| $C_1$ | 0     | 1     | 0     | 1     | 0     |
| $C_2$ | 1     | 0     | 1     | 0     | 0     |
| $C_3$ | 0     | 1     | 0     | 1     | 1     |
| $C_4$ | 1     | 0     | 1     | 0     | 1     |
| $C_5$ | 0     | 0     | 1     | 0     | 0     |

Adjacency matrix for graph G

*Q5)* a) Write short notes on the following. **[10]**

   i) Aggregate Analysis

   ii) Accounting Method

   iii) Potential Function method

   iv) Tractable and Non-tractable Problems

b) Write short notes on with suitable example of each **[8]**

   i) Randomized algorithm

   ii) Approximation algorithm

OR

*Q6)* a) What is Potential function method of amortized analysis? To illustrate Potential method, find amortized cost of PUSH, POP and MULTIPOP stack operations. **[9]**

b) What is embedded algorithm? Explain Embedded system scheduling using power optimized scheduling algorithm. **[9]**

**Q7)** a) Write short notes on the following. **[10]**

     i) Multithreaded matrix multiplication.

     ii) Multithreaded merge sort

     iii) Distributed breadth first search

     iv) The Rabin-Karp algorithm

  b) With respect to Multithreaded Algorithms explain Analyzing multithreaded algorithms, Parallel loops, Race conditions. **[7]**

<div align="center">OR</div>

**Q8)** a) Write and explain pseudo code for Multi-threaded merge sort algorithm. How parallel merging gives a significant parallelism advantage over Merge Sort? **[9]**

  b) Write a pseudo code for naïve string matching algorithm and Rabin-Karp algorithm for string matching and analyze the same. **[8]**

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