

Roll No.

8616

Printed Pages : 4

BT-6 / M-15**ANALYSIS AND DESIGN OF ALGORITHMS****Paper-IT-352***Time allowed : 3 hours**[Maximum marks : 100]*

Note : Attempt five questions in all, selecting at least one question from each unit. All questions carry equal marks.

Unit-I

1. (a) Explain how time complexity of an algorithm is computed. Explain asymptotic notations used in algorithm analysis. 10

- (b) Use mathematical induction to show that when n is an exact power of 2, the solution of the recurrence :

$$T(n) = \begin{cases} 2 & \text{if } n = 2, \\ 2T(n/2) + n & \text{if } n = 2^k, \text{ for } k > 1 \end{cases}$$

is $T(n) = n \lg n$ 10

2. (a) Write the quick sort algorithm. Analyze the worst case and average case complexity. 10

- (b) Find asymptotic bound for following recurrence :

(i) $T(n) = T(3n/4) + 1$ and $T(1) = \theta(1)$

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(2)

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

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

(iv) $T(n) = 2T(n/2) + n - 1$

(v) $T(n) = 3T(n/3) + \log 3n$ 10

Unit-II

3. (a) What is a spanning tree? Explain the Prim's algorithm with an example. 10

- (b) Find solution of fractional knapsack problem, considering five items along with their respective weights and values:

$$I = \langle I_1, I_2, I_3, I_4, I_5 \rangle$$

$$w = \langle 5, 10, 20, 30, 40 \rangle$$

$$v = \langle 30, 20, 100, 90, 160 \rangle$$

The knapsack has a capacity, $W = 60$. 10

4. (a) In how many ways, following chain of matrices may be multiplied?

$$A \times B \times C \times D$$

$$(2 \times 5) (5 \times 3) (3 \times 6) (6 \times 4)$$

Find number of multiplications required in each case.

10

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- (b) Find the shortest tour of TSP for the following instance using dynamic programming:

	A	B	C	D	
A	∞	12	5	7	
B	11	∞	13	6	
C	4	9	∞	18	
D	10	3	2	∞	10

Unit-III

5. (a) Explain backtracking technique for obtaining optimal solution to knapsack problem. Apply same to three types of items with the following respective weights and values, knapsack capacity is $W = 5$.

$$T = \langle T_1, T_2, T_3 \rangle$$

$$w = \langle 1, 4, 5 \rangle$$

$$v = \langle 4, 5, 6 \rangle \quad 10$$

- (b) Explain backtracking algorithm to solve 8-queen problem. 10
6. (a) Explain the principles of FIFO branch-and-bound. 8
- (b) Differentiate between dynamic knapsack and branch and bound knapsack problem. 4
- (c) Describe TSP in branch-and-bound. 9

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Unit-IV

7. (a) Explain DFS techniques of graph traversal. 10
- (b) Explain classes of P and NP. 10
8. (a) Explain Deletion in Binary Search tree. 10
- (b) Explain B⁺ tree. 4
- (c) Write algorithm for BST traversal and find out its complexity. 6