DESIGN AND ANALYSIS OF ALGORITHMS **3 0 2 4**

OBJECTIVE

Understanding various algorithm design techniques, and to know how to apply those techniques to various problems. Also, gives an understanding of parallel algorithm design, and provides the idea of NP-class of problems and their approximate solutions.

UNIT – I ANALYSIS & DIVIDE-AND-CONQUOR **9**

Introduction to Algorithms – Growth of functions – Solving recurrence equations: Substitution method, Iteration method and Master method – Finding Maximum and Minimum – Selection – Strassen's Matrix Multiplication – Convex Hull.

Lab Component: **6**

Implementing some recursive algorithms and study its theoretical time vs empirical time – Implement and analyze selection problem.

UNIT – II GREEDY & DYNAMIC PROGRAMMING **9**

Greedy Approach: General Method – Knapsack problem – Minimum cost spanning trees – Single source shortest path problem. Dynamic Programming: Principle of optimality – All pairs shortest path problem – Longest common subsequence – Traveling salesperson problem.

Lab Component: **6**

Implement and analyze: Minimum spanning tree problem and Traveling salesperson problem.

UNIT – III BACKTRACKING & BRANCH-AND-BOUND **9**

Backtracking: General method – 8 Queens Problem – Graph coloring – Sum of subset problem – Hamiltonian cycle. Branch and Bound – Knapsack problem – Traveling salesman problem.

Lab Component: **6**

Implement and analyze: Sum of subsets – Implement Branch and Bound based traveling salesperson problem and compare with dynamic programming.

UNIT – IV STRING MATCHING & PARALLEL ALGORITHMS 9

Simple string matching – KMP String matching algorithm – Boyer Moore String matching algorithm. Parallel algorithms: PRAM models – Prefix computation – List ranking – Finding the maximum – Odd-Even merge sort – Sorting on a mesh – Bitonic sort.

Lab Component: 6

Implement and compare simple string matching and KMP algorithms. Implement prefix computation algorithm by using multiple threads or processes.

UNIT – V NP PROBLEMS & APPROXIMATION ALGORITHMS 9

NP-completeness – Polynomial time verification – Theory of reducibility – Circuit satisfiability - NP-completeness proofs – NP-complete problems: Vertex cover, Hamiltonian cycle and Traveling Salesman problems – Approximation Algorithms – Approximation algorithms to vertex-cover and traveling salesman problems.

Lab Component: 6

Implement vertex cover and traveling salesman problems using approximation algorithm.

TOTAL: 45 + 30 = 75

TEXT BOOKS:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Second Edition, Universities Press, Hyderabad, 2008.
2. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, Prentice Hall of India, New Delhi, 2007

REFERENCES:

1. Kenneth A. Berman and Jerome L. Paul, Algorithms, Cengage learning India Edition, New Delhi, 2002.
2. Sara Baase and Allen Van Gelder, Computer Algorithms – Introduction to Design & Analysis, Third Edition, Pearson Education, New Delhi, 2000.