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UNIT-I [15h]

Chapter-1 (Algorithms and Program Performance)

Designing and analysing algorithms, Time and Space complexity, Average and worst case Analysis, Asymptotic notations, recurrence equations and their solution: substitution method, recursion-tree method, master method.

Chapter-2 (Review of Data Structures)

Arrays, Stacks, Queues, Pointers, Linked Lists (One –way, Two-way and circular Two-way), Hashing, Trees (BST, B Tree, balanced trees (AVL, Red black trees)), Heaps, Graphs

Chapter-3 (Sorting algorithm)

Sorting in linear time: counting sort, radix sort, bucket sort

UNIT-II [15h]

Chapter-4 (Divide and conquer & Greedy algorithms)

Divide and conquer: The General method, Binary search, Finding maximum and minimum of a sequence of numbers, 2 way Merge sort, Quick sort, Selection sort, Strassen's matrix multiplication.

Greedy algorithms: The general method, Fractional Knapsack problem, Minimum cost spanning tree: Prim's Algorithm, Kruskal Algorithm; Huffman coding, Optimal merge patterns.

Chapter-5 (Dynamic programming)

The general method, 0/1 knapsack, Subset Sum problem, Change making problem, optimal binary search tree, Matrix-chain Multiplication, Longest common Subsequence Problem, Travelling salesman problem. Comparison of Divide & Conquer and Dynamic Programming techniques.

Chapter-6 (Backtracking & Branch and Bound)

Backtracking: The general method, N-queen's problem, sum-of-subsets, Hamiltonian cycles.

Branch and Bound: Branch and Bound method, 0/1 Knapsack problem, Travelling salesperson problem.

UNIT-III [15h]

Chapter-7 (Graph Algorithms)

Representation of Graphs, Depth First Search, Breadth First search, Topological sort, Single source shortest path: Dijkstra Algorithm & Bellman Ford Algorithm, All-pair shortest paths: Floyd Warshall Algorithm, Minimum Spanning Tree: Sollin's algorithm.

Chapter-8 (Computational complexity)

Basic concepts, P and NP-classes, proof of NP-hard and NP-completeness.

Chapter-9 (Miscellaneous topics)

Euclid Algorithm for GCD of 2 numbers, modulo arithmetic, Chinese remainder theorem, string manipulation/matching algorithms: Rabin Karp algorithm, KMP (Knuth-Morris-Pratt) algorithm, Boyer-Moore algorithm; Convex Hull.

Suggestive Readings:

1. Cormen, Leiserson, Rivest, Stein, "*Introduction to Algorithms*", Prentice Hall of India, 3rd edition 2012. problem, Graph coloring. Free online version is also available.

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