

Design and Analysis of Algorithms (DAA-432)

1. Introduction

Basic definitions, Asymptotic notations, Indicator random variables

2. Recursion

Substitution method, Recursive tree method, Master method

3. Heaps

Heap operations, priority queues

4. Sorting algorithms

Bucketsort, Lower bound for simple sorting, Linear time sorting (counting sort)

Quicksort, Mergesort, Heapsort, Radixsort

5. Search and selection

Linear search, binary search, order statistics, BFS, DFS

6. Hashing

Direct Address Table, Open hashing

7. Greedy algorithm

Huffman coding, Fractional knapsack

Prims and Kruskal MSTs, Dijkstra's shortest path

8. Dynamic programming

Concept, Matrix chain multiplication

Longest common subsequence, 0-1 knapsack, Floyd-Warshall

9. Divide and conquer algorithms

Closest pair of points, Convex hull

10. Backtracking algorithms

DFS search, Turnpike reconstruction problem

11. NP problems

Reduction of Hamiltonian path to travelling salesman

12. Amortized algorithms

Splay trees

13. Graph algorithms

Strongly connected components

14. String algorithms

Knuth-Morris-Pratt algorithm

List of labs

1. Elapsed time, gnuplot, graphviz
2. Heapsort vs Mergesort vs QS
3. Priority queues
4. Bucketsort
5. Order statistics
6. Open hashing
7. Huffman coding
8. Dijkstra's algorithm
9. Matrix chain multiplication
10. Longest common sequence
11. Closest pair of points
12. Turnpike reconstruction
13. Splay trees

Suggested books

1. **Introduction to Algorithms** (Ed 3, MIT Press) by *TH Cormen, CE Leiserson, RL Rivest and C Stein*
2. **Data Structures & Algorithms Analysis In C++** (Ed 3, Pearson) by *MA Weiss*