

Chapter 1 Basics of Algorithm

Nothing :-)



## Chapter 2

Analysis of Algorithm

- Definitions of all Notations. |||
- Explain Selection Sort derive its all types of time complexities.
- Solve  $T(n) = T(n-2) + n$  using forward Substitution and backward Substitution.
- Heap Sort Numerical
- Quick Sort Numerical & Analysis |||
- Why do we use asymptotic notations?
- What is amortized analysis? Explain aggregate method of amortized analysis using Suitable Example.
- Explain Selection Sort algorithm & analyze it. ||
- Sort "EDUCATION" using insertion Sort
- Bubble Sort {U, N, I, V, E, R, S}
- Master method Numerical, Solve  $T(n) = 9T(n/3) + n$
- Master method Numerical,  $T(n) = T(2n/3) + 1$
- Define algorithm, list different Criteria to analyze an algorithm. ||
- What is the Smallest Value of  $n$  such that an algorithm whose run time is  $100n^2$  runs faster than that of  $2^n$  on same machine
- Prove that  $\max(f(n), g(n)) = \Theta(f(n) + g(n))$
- Solve using iteration method  $T(n) = 8T(n/2) + n^2$   
Here  $T(2) = 2$
- Define Amortize analysis and briefly explain its 2 methods
- Prove or disprove that  $f(n) = 1 + 2 + 3 + \dots + n \in \Theta(n^2)$
- Explain Counting Sort and analyze it
- Solve using recursion tree  $T(n) = 3T(n/3) + n^3$



## Divide and Conquer Algorithm

- ~~Matrix~~ Explain matrix multiplication using Divide and Conquer technique.
- Multiply  $981 \times 1234$  using divide & Conquer
- What do you mean by divide and Conquer Method? List advantages & disadvantages
- Write Standard (Conventional) algorithm and Strassen's algorithm for matrix multiplication Problem. What is the recurrence of Strassen's algorithm? Solve it using Master method to find time Complexity of Strassen's algorithm



Chapter 4Dynamic Programming

- Chained matrix multiplication numerical ||||
- LCS Numerical ||
- Explain how to match two strings using LCS ||
- Dynamic Making Change Problem |||
- Assembly line Scheduling
- LCS Numerical
- Discuss and derive an equation for solving 0/1 Knapsack using dynamic programming.
- What are the disadvantages of dynamic programming method over divide & conquer method.
- What are the three basic steps of development of a DP algorithm. Mention any two ~~real~~ life DP algorithms that we use in real life.
- Justify why longest path problem does not satisfy the principle of optimality.



## Chapter 5

Date

### Greedy Algorithm

- Prim's Algorithm Numerical |||
- Huffman Code Numerical
- Job Scheduling numerical ||
- Define MST
- Explain Kruskal's algorithm with example ||
- Explain in brief characteristics of Greedy ||
- Greedy vs. Dynamic ||||
- Greedy Knapsack numerical ||
- Explain Dijkstra algorithm
- Describe Greedy Choice Property and optimal Substructure.
- List out applications of MST.
- Discuss General characteristics of greedy Method. Mention any two examples of greedy method that we are using in.
- Floyd's algorithm numerical
- what is algorithm for Huffman Code.
- Kruskal's algorithm numerical



## Chapter 6

## Exploring Graphs

- ~~Prims Algorithm Numerical~~
- ~~DFS~~
- Explain DFS with an example. |||
- Explain BFS with an example |||
- DFS algorithm, BFS algorithm.
- Explain articulation Point, Graph, tree
- DFS vs. BFS
- Define graph! Describe Strongly Connected Graph with example
- Given adjacency list representation of an directed Graph. How long does it take to calculate In-Degree and how long does it take to calculate Out-degree
- Prove that if  $G$  is an undirected bipartite graph with odd number of vertices, then  $G$  is ~~not~~ ~~hamiltonian~~ non-hamiltonian.
- Topological Sort algorithm

## Chapter 7

## Backtracking and Branch &amp; Bound

- Explain Backtracking method //
- What is N-Queen Problem //
- Solve N-Queen Problem using backtracking. //
- Explain Travelling Salesman Problem with example
- Define backtracking. State types of constraints used in backtracking
- Explain use of branch and bound technique for Solving assignment Problem

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## Chapter 8

## String Matching

- Explain use of finite Automata in String Matching with example |||
- Explain Robin-Karp String Matching algo with example. ~~also state~~ and runtime of this algo. |||
- Explain naive String Matching algorithm. ||
- Show the comparisons that a naive String Matcher does to match a string  $P=0001$  in the text  $T=000010001010001$
- Working modulo  $q=11$ . How many spurious hits does the Robin-Karp matcher encounter in the text  $T=3141592653589793$  when looking for the pattern  $P=26$  ||



Chapter 9NP-Completeness

- Explain with examples P, NP, NP Complete, NP hard. Problems ||
- State whether travelling Salesman Problem is a NP Complete Problem? Justify Your answer.
- Explain Polynomial time Reduction algorithm.
- What are the major three concepts used to Show that a Problem is a NP Complete Problem?
- What is an approximation algorithm? Explain Performance ratio for approximation algorithm.