CS & IT ENGINEERING

Algorithm

Analysis of Algorithms

Lecture No.- 01

By- Aditya sir

Topics to be Covered

- **Topic** Schedule
- **Topic** Outcomes
- **Topic** Prerequisites & Books

ABOUT ME

Hello, I'm Aditya.

1. Represented college as the first Google DSC Ambassador.
2. The only student from the batch to secure an internship at Amazon. (9+ CGPA)
3. Appeared for GATE during BTech and secured AIR 60 in GATE in very first attempt - City topper
4. Had offer from IIT Bombay and IISc Bangalore to join the Masters program
5. Joined IIT Bombay for my 2 year Masters program, specialization in Data Science
6. Published multiple research papers in well known conferences along with the team
7. Received the prestigious excellence in Research award from IIT Bombay for my Masters thesis
8. Completed my Masters with an overall GPA of 9.36/10
9. Joined Dream11 as a Data Scientist
10. Have mentored working professions in field of Data Science and Analytics
11. Have been mentoring GATE aspirants to secure a great rank in limited time
12. Have got around 27.5K followers on Linkedin where I share my insights and guide students and professionals.

Topic : Lecture Schedule

1. Analysis of Algorithms

1. Algorithm Concept and Lifecycle
2. Analysis of Algorithms
3. Methodology & Types of Analysis
4. Asymptotic Notations
5. Framework for Analysing Recursive Algorithms
6. Apriori analysis of Non-Recursive Algorithms
7. Analysing Loops
8. Space Complexity
9. Mathematical Background

What
How
Why

log, functions, etc

Topic : Lecture Schedule

2. Divide & Conquer (Design Strategies)

(DnC)

1. General Method
2. Max-Min Problem
3. Merge Sort
4. Binary Search
5. Quick Sort
6. Matrix Multiplication
7. Long Integer Multiplication (LIM)
8. Master Method for D and C Recurrences
9. Recursion Tree

Applications ★★★

DAA → Design & Analysis of Algorithms

Topic : Lecture Schedule

3. **Greedy Method**
    1. General Method
    2. Knapsack Problem
    3. Job Sequencing with Deadlines
    4. Optimal Merge Patterns
    - 4.1 Huffman Coding
    5. Minimum Cost Spanning Trees
        1. Prims Method
        2. Kruskal's Method
    6. Dijkstra's Shortest Paths Problem

Topic : Lecture Schedule

4. Dynamic Programming (DP)

1. The Method
2. Difference between DP, Greedy Method and Divide and Conquer
3. Multistage Graphs
4. Travelling Salesperson Problem
5. Binary Knapsack Problem
6. All Pairs Shortest Paths
7. Bellman-Ford Single Source Shortest Paths
8. Longest Common Subsequence
10. Matrix Chain Multiplication
11. Reliable System Design
12. Optimal Cost Binary Search Tree

DnC

(TSP)

Applications

(SSSP)

(LCS)

(MCP)

(SOS)

Topic : Lecture Schedule

5. Graph Algorithms

1. Representation of Graphs
2. Graph Traversals

DFS
- 5.2.1 Undirected Connected Graphs (UCG)
- 5.2.2 Undirected Disjoint Graphs: DFT
- 5.2.3 Directed Graphs & Types of Edges
- 5.2.4 DAG

BFS
- 5.2.5 FIFO BFS
- 5.2.6 LIFO BFS
- 5.2.7 LC BFS

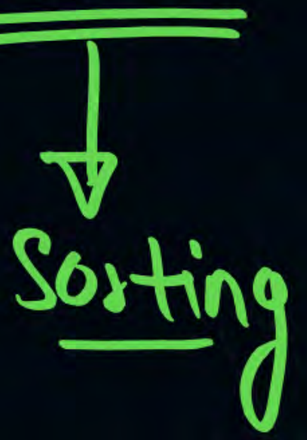
5.3 Parenthesization Theorem

Depth First Search

BFS → Breadth First Search

Topic : Lecture Schedule

6. **Heap Algorithms**
   1. Operations : Create, Insert, Delete, Modify
   2. Applications : Heapsort



Topic : Lecture Schedule

7. **Sets**
    1. Representations
    2. Operations

Topic : Lecture Schedule

8. **Sorting Algorithms**
    1. Basic terminology
    2. Methods
        1. Bubble Sort
        2. Selection Sort
        3. Insertion Sort
        4. Radix Sort

Topic : Lecture Schedule

9. Backtracking & Branch- Bound

Text - Books ⟶

Weightage ✓

- Introduction to Algorithms - Coremen (LCS)
- Fundamentals of Algorithms - Horowitz & Sahni ✓

Scope [outcomes]

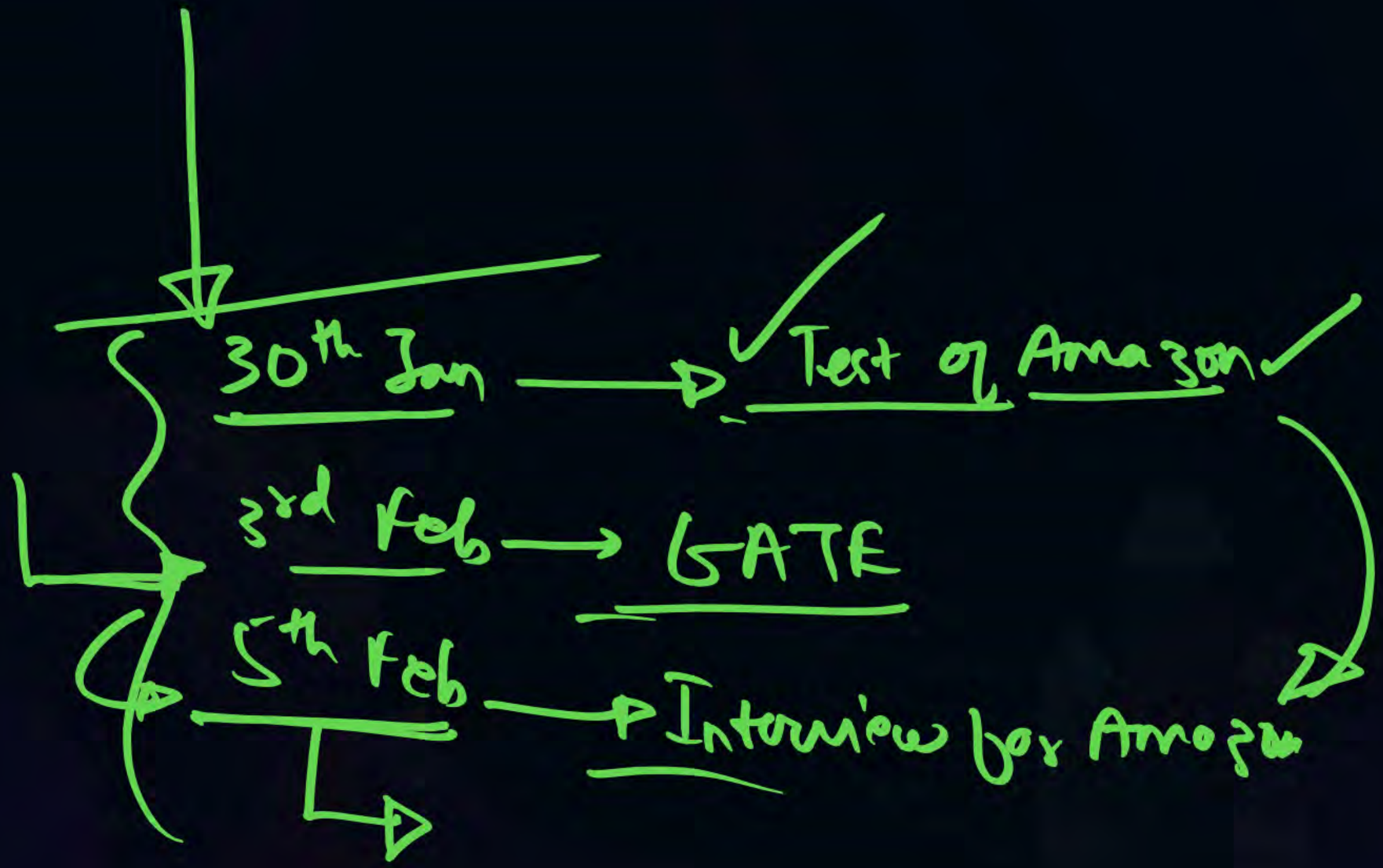
→ GATE + TIFR + ISRO + NIC + BARC.....

→ Placements → Product / Service

→ Semester Exams

→ Domain knowledge

→ Interviews


30th Jan → Test of Amazon
3rd Feb → GATE
5th Feb → Interview for Amazon

Prerequisites

1) Programming → Constructs
   - if-else
   - Loops
2) Data Structures (Stack, Queue, LL, Tree, Graphs, ...)
3) Mathematics
   - Series (AP, GP, HP)
   - Prob
   - log, Matrices


Algorithms
AI
→ ML
→ Deep Learning
→ Research
→ NLP

Algorithms: Consists of finite set of steps to solve a Problem.

(Statements)

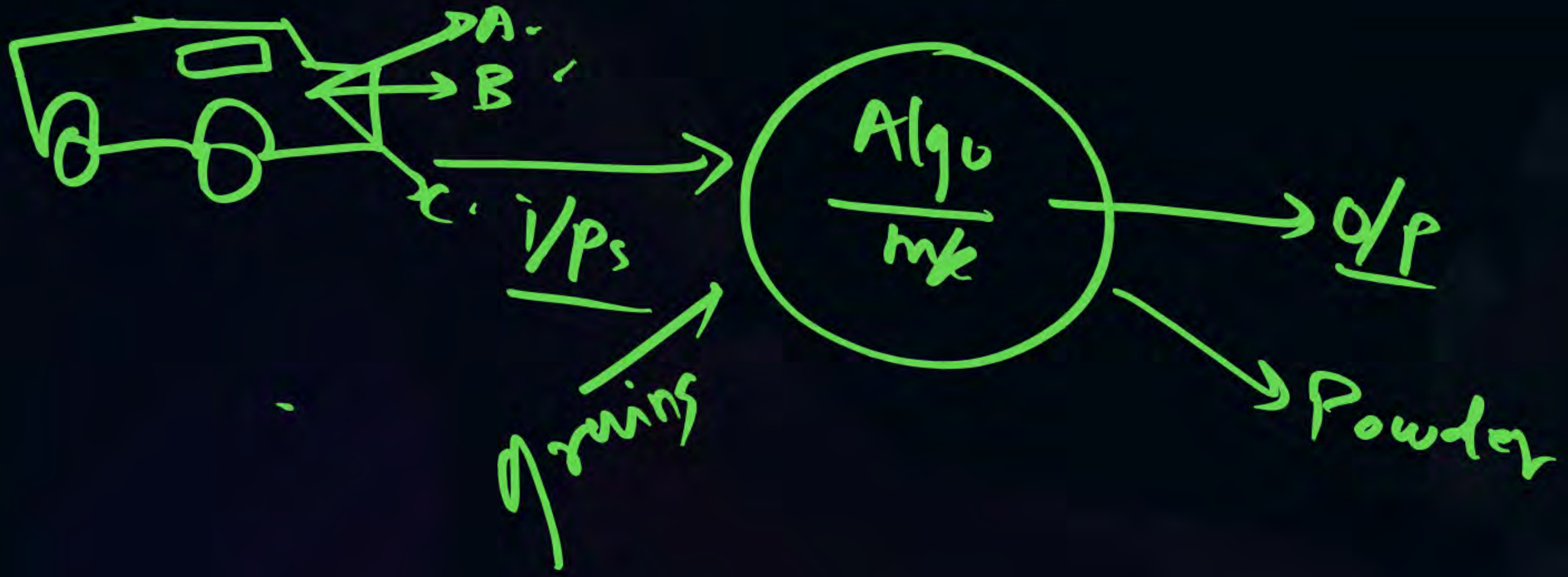
→ Consists of one or more fundamental Operation

$a = b + c$ → Addition
→ Assignment

An algo may take Zero/more inputs

But every Algo must produce atleast 1 output.

Algo → Abstract Machine



Algorithm Lifecycle Steps:

1) Problem Definition
2) Requirements
3) Logic/Design
4) Develop Algo
5) Validation (correctness)
6) Analysis
7) Implementation (Program)
8) Testing & Debugging

DAA

2 mins Summary

- Topic Schedule
- Topic Books
- Topic Prerequisite
- Topic Outcomes

THANK - YOU