



CS & IT ENGINEERING



Algorithms

Analysis of Algorithms

Lecture No.- 01



By- Aditya sir

Topics to be Covered



Topic

Schedule

Topic

Outcomes

Topic

Intro to Algorithms



About Aditya Jain sir

(AJ Sir)



1. Appeared for GATE during BTech and secured AIR 60 in GATE in very first attempt - City topper
2. Represented college as the first Google DSC Ambassador.
3. The only student from the batch to secure an internship at Amazon. (9+ CGPA)
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 12,000+ students & working professions in field of Data Science and Analytics
11. Have been mentoring & teaching 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.

(77.33/100)



Telegram



Telegram Link for Aditya Jain sir: https://t.me/AdityaSir_PW

Today → 9 PM ✓

Tomorrow onwards → 7 AM - 9 AM



Topic : Lecture Schedule

1. Analysis of Algorithms

1. Algorithm Concept and Lifecycle
2. Analysis of Algorithm ★
3. Methodology & Types of Analysis
4. Asymptotic Notations ★
5. Analyzing Recursive Algorithms - Back Substitution method
6. Analyzing Loops ★
7. Space Complexity



Topic : Lecture Schedule

2. Sorting Algorithms
 1. Basic terminologies
 2. Sorting Techniques
 1. Bubble Sort
 2. Selection Sort
 3. Insertion Sort
 4. Radix Sort



Topic : Lecture Schedule

3. Divide & Conquer Technique

1. Background
2. Max-Min Problem
3. Binary Search
4. Merge Sort
5. Quick Sort
6. Masters Method for Time Complexity Analysis
7. Matrix Multiplication
8. Long Integer Multiplication (LIM)



Topic : Lecture Schedule

4. Greedy Method

1. Background
2. Fractional Knapsack Problem
3. Job Sequencing with Deadlines (JSD)
4. Optimal Merge Patterns (omp)
5. Huffman Coding
6. Minimum Cost Spanning Trees (mcst)
 1. Prims Method
 2. Kruskal's Method
7. Dijkstra's Single Source Shortest Paths Problem

(v.v.imp)
↖

→ SSSP



Topic : Lecture Schedule

5. Dynamic Programming (DP)

1. Background
2. Binary(0/1) Knapsack Problem
3. Longest Common Subsequence (LCS)
4. Matrix Chain Multiplication (mcm)
5. Sum of Subsets (SOS)
7. Bellman-Ford Single Source Shortest Paths \rightarrow (SSSP)
8. Floyd Warshall - All Pairs Shortest Paths \rightarrow (APSP)
10. Multi-stage Graphs \rightarrow TSP
11. Travelling Salesperson Problem



Topic : Lecture Schedule

5. Graph Algorithms

1. Background

2. DFS

3. BFS

4. Properties

→ Topological ordering
→ Connected Components (CC)
→ Strongly CC (SCC)
→ Bi-Connected Components (BCC)



Topic : Lecture Schedule

6. Miscellaneous

1. Heap Algorithms
2. Recursive Tree Approach for Time Complexity Analysis
3. Back-tracking & Branch-Bound



Topic : Lecture Schedule

Reference Books:

1. Introduction to Algorithms → Cormen
2. Fundamentals of Algorithms → Sahani

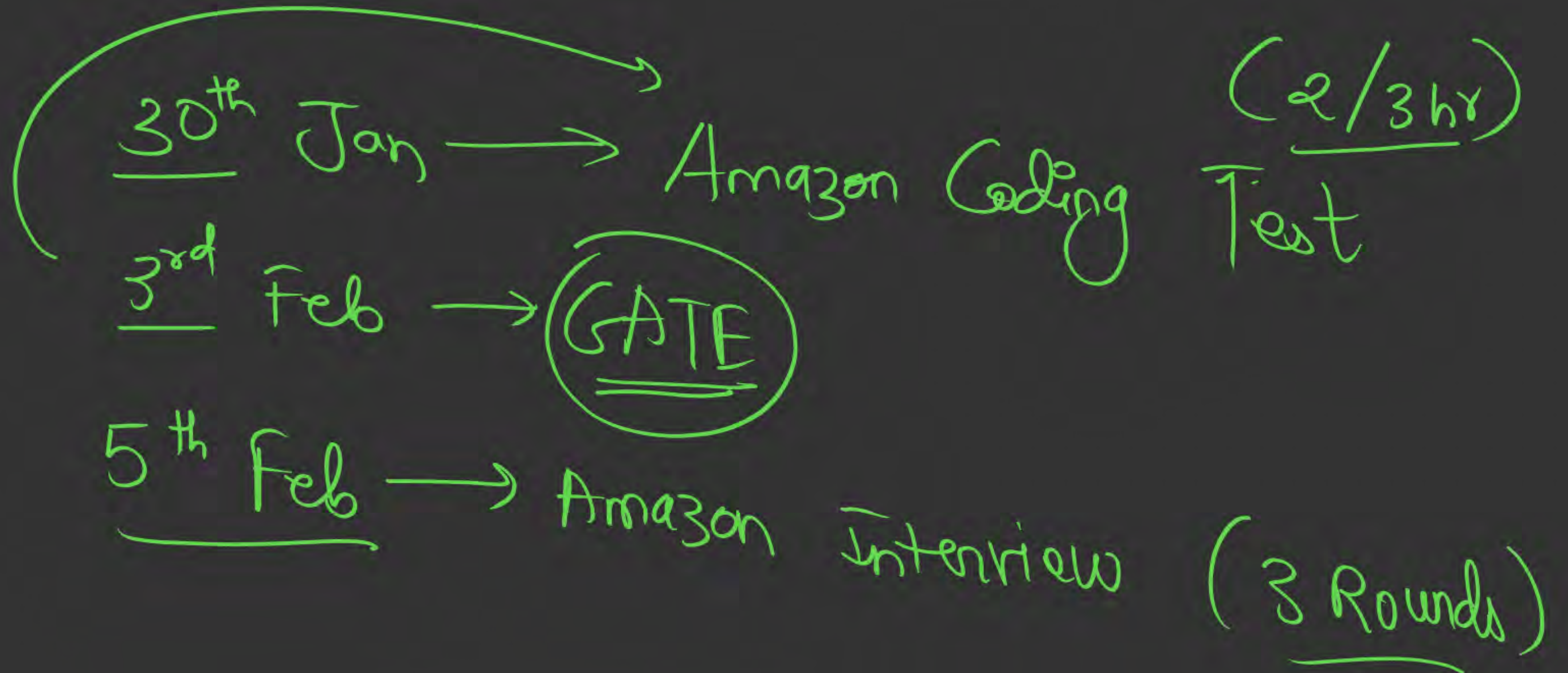


Topic : Lecture Schedule

Scope/ Outcomes

- GATE, TIFR, ISRO
- College exam ✓
- Placement → Product/service based
- Coding Tests ✓

AJ Sir Experience





Topic : Lecture Schedule

Pre-Requisites

1. Data Structures Fundamental
 - [Stacks, ~~Queues~~, Tree...]
2. Programming Fundamental
 - If-else
 - Loops
3. Basic Math's
 - Series - AP, GP, HP
 - Logarithms



Topic : Lecture Schedule

Algorithm:-

- An Algorithm is a collection of finite number of instruction to solve a given problem.
- These instruction are fundamental and should follow a proper sequence.
- It Should be unambiguous in nature.
- An Algorithm should be terminated after finite time.
- It Should produce at least one output.
- It is independent of programming language .

(Pseudo Code)





Topic : Lecture Schedule

Input (i/p)



Algorithm



Output (o/p)

[An algorithm may take
○ or more inputs]

[Must always produce
at least one output]



Topic : Lecture Schedule

① Algo AJSir () \rightarrow 0 inputs

{

printf ("Hello students!"); \rightarrow One output

}

② Algo AJsir2();

{

return 100;

}



Topic : Lecture Schedule

Algorithm → Pseudo code- For i: $1 \rightarrow n$

(Set of sequential rules /statement /instructions)

Program → Algorithm implemented using some programming language

Python:- for i in range (0, n+1) ✓

C++:- for (i =0; i \leq n; i++) ✓



2 min Summary



Topic

Intro

Topic

Syllabus

Topic

Intro to Algo

Topic



THANK - YOU