**DSA I**

Topics

1. Introduction to Data Structure: linear data structure
2. Complexity Analysis, Big Oh, Big Omega
3. Lower and Upper Limit, Best and Worst Cases
4. Arrays: Memory Mapping, Linear and Binary Search, Linear Time
5. Sorting (Counting Sort)
6. Arrays: Sorting, Merge Sort
7. Arrays: Sorting, Quick Sort
8. Linked Lists: Single Linked List
9. Linked Lists: Double Linked List, Circular Linked List
10. Linked Lists: Application
11. Stack: Implementation using Array and Linked Lists
12. Stack: Application, Tower of Hanoi, Recursion
13. Infix to Postfix and Postfix evaluation,
14. Introduction to Queue
15. Implementation of Queue using Arrays and Linked lists
16. General Tree, Binary Tree Implementation using Array and left-right
17. pointers
18. Tree Traversal Algorithms, Tree Applications
19. Binary Search Trees, Insertion, Deletion
20. Binary Search Tree Properties
21. Heap and Priority Queue
22. Heap Sort and Application of Priority Queue
23. Graphs: Implementation using adjacency matrix and Adjacency lists
24. Sparse and Dense graph, Space requirements
25. Graphs: BFS using adjacency matrix and Adjacency lists
26. Graphs: DFS using adjacency matrix and Adjacency lists
27. Graphs: Application of Graphs, Directed Acyclic Graph, Topological Sort
28. Set Operations
29. Set Operations Continued
30. Breath First Search
31. Depth First Search

**DSA II**

Topics/Assignments

1. Analyzing Algorithms: Worst-Case and Best-Case Analysis
2. Asymptotic Notation
3. Class Test; The Divide-and-Conquer Approach; Analyzing Divide-and- Conquer Algorithms
4. The Maximum-Subarray Problem; The Recursion-Tree Method for Solving Recurrences
5. The Recursion-Tree Method for Solving Recurrences
6. An Activity-Selection Problem; Elements of the Greedy Strategy
7. Class Test; Some Legacy Greedy Problems
8. Fractional Knapsack Problem, Coin Change Problem
9. Dynamic Programming Basics, The Rod Cutting Problem
10. Coin Change Problem, Elements of Dynamic Programming
11. 0/1 Knapsack Problem, Review
12. Applications of BFS, DFS
13. Disjoint-Set Operations; Disjoint-Set Forests
14. Growing a Minimum Spanning Tree
15. Class Test; Kruskal’s Algorithm
16. Single-Source Shortest Path Variants, Optimal Substructure of a Shortest Path, Negative-weight Edges, Cycles, Relaxation
17. The Bellman-Ford Algorithm
18. Introduction to C++
19. Standard Template Libraries (STL) of C++
20. Review of Recursive Function
21. Divide and Conquer: Max-Min Problem, Maximum Sum Subarray;
22. Greedy Algorithms: Activity Selection Problem, Coin Change Problem, 0/1 & Fractional Knapsack;
23. Dynamic Programming: Coin Change Problem
24. Dynamic Programming: 0/1 Knapsack Problem