**Contest Programming**

**Section 1:**

1. C & C++ Basics (Data types, Conditional Statements, Loop, Arrays, String, Structure and File (a little bit), Bitwise Operation)
2. Recursion Basics and Practice

**Section 2: Mathematics**

1. Modular Arithmetic
2. Prime Number
3. Prime generator – Sieve of Eratosthenes
4. Bitwise Sieve
5. Factors of a number, Prime factorization
6. G.C.D and L.C.M
7. Euler’s totient function
8. BigMod
9. Modular Inverse
10. Extended G.C.D
11. Trailing zeroes of a factorial
12. Number of digits of a factorial
13. Combination
14. Derrangement
15. Catalan and Stirling Number
16. Fibonacci Number
17. Inclusion Exclusion Principal
18. Probability and Expectation
19. Base Conversion
20. Big Integer Implementation
21. Floyd’s Cycle Finding Algorithm
22. Gaussian Elimination

**Section 3: Searching Algorithm**

1. Binary Search and Bisection
2. Ternary Search

**Section 4: Data Structure**

1. Linked List
2. Stack and implementation (Highest rectangle of ones in a 0-1 matrix)
3. Queue, Circular Queue and implementation
4. Sliding Range Minimum Query (Deque)
5. Tree
6. Trie (Prefix Tree/Radix Tree)
7. Binary Search Tree
8. Heap/Priority Queue
9. Disjoint Set Union
10. Square Root Segmentation
11. Query in Static Data
12. Segment Tree
    1. Segment Tree Making, Updating and Query
    2. Lazy without Propagation
    3. Lazy with Propagation
13. Array Compression (mapping)
14. Lowest Common Ancestor
15. Binary Indexed Tree

**Section 5: Graph Theory**

1. Graph theory definitions
2. Graph Representation
3. Breadth First Search (BFS)
4. Depth First Search (DFS)
5. Problems related to BFS-DFS
   1. BFS in 2D Grid
   2. Bi-coloring
   3. Component finding
   4. Distance of two nodes
   5. 3 glass and water
   6. UVa 10653
   7. UVa 10651
   8. Graph of 0-1 cost
6. Dijkstra Algorithm (Extra- 2nd shortest path)
7. Bellman Ford Algorithm
8. Floyd Warshall Algorithm
9. Greedy Technique- Minimum Spanning Tree (MST)
   1. Prim’s Algorithm
   2. Kruskal’s Algorithm
   3. 2nd best Minimum Spanning Tree (MST)
10. Articulation Point and Bridge (Extra- Unique Path Problem)
11. Euler Path and Euler Cycle
12. Topological Sort
13. Strongly Connected Component (SCC)
14. 2-satisfiability (2-sat)
15. Bi-connected Component
16. Stable Marriage
17. Flow Algorithms
    1. Maximum Flow (All variations)
    2. Minimum Cut
    3. Minimum cost maximum flow
    4. Maximum Bipartite Matching
    5. Vertex Cover and Independent Set (requires DP)
    6. Weighted Maximum Bipartite Matching
18. Tree Diameter
19. Longest path Problem

**Section 6: Dynamic Programming**

1. DP State, nCr, 0-1 Knapsack
2. Fibonacci
3. Coin Change (All Variants)
4. Rock Climbing
5. Printing DP Solution
6. Bitmask DP
7. Minimum Vertex Cover
8. Travelling Salesman Problem
9. Longest Increasing Subsequence (LIS)
10. Longest Common Subsequence (LCS)
11. Matrix chain multiplication
12. Optimal binary search tree

**Section 8: Backtracking**

1. Backtracking Basic and Permutation Generator
2. Combination Generator
3. Eight Queen
4. Knapsack

**Section 9: Greedy Technique**

1. Fractional Knapsack
2. Washing Machine and Drawer
3. Huffman Coding

**Section 10: Game Theory**