SUMMER VACATION DSA PROBLEM SHEET

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1.Arrays (5 days)

a. Array Basics (2 days)
   i. Theory (0.5 days)
      1. C++ Arrays (With Examples)
      2. Java Array (With Examples)
      3. Python Array (With Examples)
   ii. Problems (1.5 days)
      1. Wave Array | Practice | GeeksforGeeks
      2. Sort an array of 0s, 1s and 2s | Practice | GeeksforGeeks
      3. Subarray with given sum | Practice | GeeksforGeeks
      4. Kadane's Algorithm | Practice | GeeksforGeeks
      5. Missing number in array | Practice | GeeksforGeeks

b. Binary Search (2 days)
   i. Theory (0.5 days)
      1. https://www.geeksforgeeks.org/binary-search/
   ii. Problems (1.5 days)
      1. Search Insert Position - LeetCode
      2. Sqrt(x) - LeetCode
      3. Find Smallest Letter Greater Than Target - LeetCode
      4. Kth Smallest Element in a Sorted Matrix - LeetCode

c. Two Pointers (1 day)
   i. Theory (about 1 hr)
      1. https://www.geeksforgeeks.org/two-pointers-technique/
   ii. Problems (1 day)
      1. 3 Sum | Interviewbit
      2. Merge Two Sorted Lists II | Interviewbit
      3. Remove Duplicates from Sorted Array | Interviewbit

2. Strings (2 days)

a. String Basics (2 days)
   i. Integer To Roman | Interviewbit
   ii. Reverse the String | Interviewbit
   iii. Implement StrStr | Interviewbit
   iv. Vowel and Consonant Substrings! | Interviewbit
   v. Longest Common Prefix | Interviewbit
   vi. Longest Palindromic Substring | Interviewbit

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3. Linked Lists (4 days)

a. Theory (1 day)
   i. https://www.programiz.com/dsa/linked-list
b. Problems (3 days)
   i. Reverse a linked list - GeeksforGeeks
   ii. Rotate a Linked List - GeeksforGeeks
   iii. Function to check if a singly linked list is palindrome - GeeksforGeeks
   iv. Nth node from end of linked list | Practice | GeeksforGeeks
   v. Detect Loop in linked list | Practice | GeeksforGeeks
   vi. Find the middle of a given linked list - GeeksforGeeks
   vii. Delete N nodes after M nodes of a linked list - GeeksforGeeks
   viii. Reverse a Linked List in groups of given size. | Practice | GeeksforGeeks
   ix. Reverse alternate K nodes in a Singly Linked List - GeeksforGeeks

4. Stacks and Queues (5 days)

a. Theory (2 days)
   i. https://www.programiz.com/dsa/stack
   ii. https://www.geeksforgeeks.org/stack-in-cpp-stl/
   iii. https://www.geeksforgeeks.org/stack-class-in-java/
   iv. https://www.geeksforgeeks.org/stack-in-python/
   v. https://www.programiz.com/dsa/queue
   vi. https://www.geeksforgeeks.org/queue-cpp-stl/
   vii. https://www.geeksforgeeks.org/queue-interface-java/
   viii. https://www.geeksforgeeks.org/queue-in-python/
b. Problems (3 days)
   i. Balanced Parantheses! | Interviewbit
   ii. Redundant Braces | Interviewbit
   iii. Nearest Smaller Element | Interviewbit
   iv. Largest Rectangle in Histogram | Interviewbit
   v. Min Stack | Interviewbit
   vi. First Unique Character in a String - LeetCode
   vii. Implement Stack using Queues - LeetCode
   viii. Time Needed to Buy Tickets - LeetCode
   ix. Implement Queue using Stacks - LeetCode

5. Hashing (3 days)

a. Theory (1 day)
   i. https://www.programiz.com/dsa/hash-table
   ii. https://www.geeksforgeeks.org/unordered_map-in-cpp-stl/
   iii. https://www.geeksforgeeks.org/java-util-hashmap-in-java-with-examples/
   iv. https://www.geeksforgeeks.org/hash-map-in-python/

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b. Problems (2 days)
   i. Largest subarray of 0's and 1's | Practice | GeeksforGeeks
   ii. Find All Four Sum Numbers | Practice | GeeksforGeeks
   iii. Array Subset of another array | Practice | GeeksforGeeks
   iv. Sorting Elements of an Array by Frequency | Practice | GeeksforGeeks
   v. Union of Two Linked Lists | Practice | GeeksforGeeks
   vi. Top K Frequent Elements in Array - | | Practice | GeeksforGeeks

6. Tree-based Data Structures (7 days)

a. Binary Tree & BST (5 days)
   i. Theory (1 day)
      1. https://www.geeksforgeeks.org/introduction-to-tree-data-structure/
      2. https://www.geeksforgeeks.org/binary-tree-set-1-introduction/?ref=lbp
      3. https://www.geeksforgeeks.org/binary-tree-set-2-properties/?ref=lbp
      4. https://www.geeksforgeeks.org/binary-tree-set-3-types-of-binary-tree/?ref=lbp
   ii. Problems (4 days)
      1. Inorder Traversal | Interviewbit
      2. Preorder Traversal | Interviewbit
      3. Postorder Traversal | Interviewbit
      4. Max Depth of Binary Tree | Interviewbit
      5. Right view of Binary tree | Interviewbit
      6. Sorted Array To Balanced BST | Interviewbit
      7. Root to Leaf Paths With Sum | Interviewbit
      8. ZigZag Level Order Traversal BT | Interviewbit
      9. Symmetric Binary Tree | Interviewbit
      10. Balanced Binary Tree | Interviewbit
      11. Valid BST from Preorder | Interviewbit
      12. Kth Smallest Element In Tree | Interviewbit

b. Heaps (1 day)
   i. Theory
      1. https://www.geeksforgeeks.org/binary-heap/
   ii. Problems
      1. K Largest Elements | Interviewbit
      2. Merge K Sorted Lists | Interviewbit

c. Trie (1 day)
   i. Theory
      1. https://www.geeksforgeeks.org/advantages-trie-data-structure/?ref=lbp
      2. https://www.geeksforgeeks.org/trie-insert-and-search/?ref=lbp
      3. https://www.geeksforgeeks.org/trie-delete/?ref=lbp

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ii. Problems
    1. Hotel Reviews | Interviewbit
    2. Shortest Unique Prefix | Interviewbit

7. Dynamic Programming (8 Days)

a. Theory (3 days)
    i. https://www.youtube.com/watch?v=OQ5jsbhAv_M&list=PLcDimPvbmfT8qAxD6JH_kmXiQwTNcoK78
    ii. https://www.youtube.com/watch?v=ENyox7kNKeY&list=PLcDimPvbmfT8qAxD6JH_kmXiQwTNcoK78&index=2
    iii. https://www.youtube.com/watch?v=ocZMDMZwhCY&list=PLcDimPvbmfT8qAxD6JH_kmXiQwTNcoK78&index=3
    iv. https://www.geeksforgeeks.org/program-for-nth-fibonacci-number/
    v. https://www.geeksforgeeks.org/0-1-knapsack-problem-dp-10/
    vi. https://www.geeksforgeeks.org/longest-increasing-subsequence-dp-3/
    vii. https://www.geeksforgeeks.org/longest-common-subsequence-dp-4/
    viii. https://www.geeksforgeeks.org/longest-common-substring-dp-29/
b. Problems (5 Days)
    i. Nth Fibonacci Number | Practice | GeeksforGeeks
    ii. 0 - 1 Knapsack Problem | Practice | GeeksforGeeks
    iii. Coin Change | Practice | GeeksforGeeks
    iv. nCr | Practice | GeeksforGeeks
    v. Longest Increasing Subsequence | Practice | GeeksforGeeks
    vi. Longest Common Subsequence | Practice | GeeksforGeeks
    vii. Longest Common Substring | Practice | GeeksforGeeks
    viii. Edit Distance | Interviewbit
    ix. Ways to Decode | Interviewbit
    x. Longest valid Parentheses | Interviewbit
    xi. Dungeon Princess | Interviewbit
    xii. Max Product Subarray | Interviewbit
    xiii. Max Sum Without Adjacent Elements | Interviewbit
    xiv. Best Time to Buy and Sell Stocks I | Interviewbit
    xv. Best Time to Buy and Sell Stocks II | Interviewbit

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8. Graphs (8 Days)

a. Theory (3 days)
   i. https://www.geeksforgeeks.org/graph-and-its-representations/
   ii. https://www.geeksforgeeks.org/breadth-first-search-or-bfs-for-a-graph/
   iii. https://www.geeksforgeeks.org/depth-first-search-or-dfs-for-a-graph/
   iv. https://www.geeksforgeeks.org/dijkstras-shortest-path-algorithm-greedy-algo-7/
   v. https://www.geeksforgeeks.org/prims-minimum-spanning-tree-mst-greedy-algo-5/
   vi. https://www.geeksforgeeks.org/kruskals-minimum-spanning-tree-algorithm-greedy-algo-2/
   vii. https://www.geeksforgeeks.org/floyd-warshall-algorithm-dp-16/
   viii. https://www.geeksforgeeks.org/union-find-algorithm-union-rank-find-optimized-path-compression/

b. Practice (5 days)
   i. BFS of graph | Practice | GeeksforGeeks
   ii. DFS of Graph | Practice | GeeksforGeeks
   iii. Find the number of islands | Practice | GeeksforGeeks
   iv. Implementing Dijkstra Algorithm | Practice | GeeksforGeeks
   v. Detect cycle in a directed graph | Practice | GeeksforGeeks
   vi. Detect cycle in an undirected graph | Practice | GeeksforGeeks
   vii. Topological sort | Practice | GeeksforGeeks
   viii. Minimum Spanning Tree | Practice | GeeksforGeeks
   ix. Unit Area of largest region of 1's | Practice | GeeksforGeeks
   x. Floyd Warshall | Practice | GeeksforGeeks
   xi. Shortest path from 1 to n | Practice | GeeksforGeeks
   xii. Covid Spread | Practice | GeeksforGeeks
   xiii. Distance from the Source (Bellman-Ford Algorithm) | Practice | GeeksforGeeks
   xiv. Biconnected Graph | Practice | GeeksforGeeks
   xv. Union-Find | Practice | GeeksForGeeks