Design and Analysis of Algorithms

PART: 01	
	Introduction to Algorithm and Syllabus
	What is Algorithm | How to Analyze an Algorithm | Prior vs Posteriori Analysis
	Asymptotic Notations | Big O | Big Omega | Theta Notations
	Various Properties of Asymptotic Notation with Examples
	Comparison of Various Time Complexities | Different Types in Increasing Order
	Time Complexities of All Searching and Sorting Algorithm
-	Question on Comparison of Various Time Complexities
-	Question on Comparison of Various Time Complexities
	What is Recurrence Relation | How to Write Binary Search Recurrence Relation
	Recurrence Relation [T(n)=T(n/2)+c] | Substitution Method
	Recurrence Relation [T(n)=n*T(n-1)] | Substitution Method
	Recurrence Relation [T(n)=2T(n/2)+n] | Substitution Method
	Recurrence Relation [T(n)=T(n-2)+logn] | Substitution Method
	Recurrence Relation [T(n)=8T(n/2)+n^2] | Master Theorem
	Recurrence Relation [T(n)=T(n/2)+c] | Master Theorem
	Recurrence Relation [T(n)=T(/n)+logn] | Master Theorem
	Recurrence Relation [T(n)=2T(n/2)+cn] | Recursive Theorem
	Recurrence Relation [T(n)=3T(n/4)+cn^2] | Recursive Theorem
	Divide and Conquer Algorithm
	How Quick Sort Words | Performance of Quick Sort with Example
	Performance of Quick Sort | Worst Case Time Complexity with Example
	How Merge Sort Works, Full Explanation with Example
	Merge Sort Pseudocode | Merge Sort with Example
	Question on Merge Sort | Divide and Conquer | Algorithm
	How Bubble Sort Works | Performance of Bubble Sort with Examples
	Insertion Sort | Time Complexity Analysis | Stable Sort | In-place Sorting
	Selection Sort | Time Complexity (Best, Avg and Worst) Analysis
	Radix Sort | Easiest Explanation with Example
	Counting Sort | Easiest Explanation with Example
	Bucket Sort | Easiest Explanation | Time Complexity Analysis with Pseudocode
	Introduction to Trees (Binary Tree, Almost Complete Binary Tree | Full BT | Complete BT)
	Introduction to Heap Tree with Examples | Max Min Heap
	Insertion in Heap Tree | Max-Heap and Min-Heap Creation | Time Complexity
	Question on Max Heap / Min Heap
	Build Heap in O(n) Time Complexity | Heapify Method | Full Derivation with Example
	Deletion in Heap Tree | Time Complexity
	Heap Sort with Example | Heapify Method
	Introduction to Greedy Techniques with Example | What is Greedy Technique
	Knapsack Problem with Example | Greedy Techniques
	Huffman Coding Algorithm with Example | Greedy Techniques

-	Question Huffman Coding in Greedy Technique
	Job Sequencing Algorithm with Example | Greedy Techniques
	Optimal Merge Pattern Using Greedy Method
	What is Spanning Tree with Example
	Kruska Algorithm for Minimum Spanning Tree
	Prim’s Algorithm for Minimum Cost Spanning Tree
	Dijkstra’s Algorithm Single Source Shortest Path – Greedy Method
	Dijkstra’s Algorithm Analysis | Time Complexity | Pseudocode Explanation
	Why Does Dijkstra Fail on Negative Weights | Full Explanation with Example
	Bellman Ford Algorithm | Dijkstra vs Bellman Ford | Single Source Shortest Path
	Bellman Ford Pseudocode and Time Complexity | Single Source Shortest Path
	BFS and DFS | Breadth First Search | Depth First Search | Graph Traversing | DAA
	Introduction to Dynamic Programming | Greedy vs Dynamic Programming
	0/1 Knapsack Failed Using Greedy Approach
	0/1 Knapsack Problem | Dynamic Programming | Recursion Equation | Recursion Tree
	Traveling Salesman Problem | Dynamic Programming
	Sum of Subsets Problem | Dynamic Programming
	Multistage Graph | Dynamic Program
	Introduction to All Pair Shortest Path (Floyd Warshall Algorithm)
	Floyd Warshall Working with Example | All Pair Shortest Path Algorithm
	Floyd Warshall Time and Space Complexity | All Pair Shortest Path Algorithm
	What is Hashing with Example | Hashing in Data Structure
	Collision Resolution Techniques in Hashing | What are the Collision Resolution
	Chaining in Hashing | What is Chaining in Hashing with Example
	Linear Probing in Hashing with Example
	Question on Hashing | Linear Probing for Collision in Hash Table
	Quadratic Probing in Hashing with Example
	Double Hashing | Collision Resolution Technique
	Topological Sorting with Example | Topological Sorting using DFS |
	Kahn’s Algorithm | Topological Sorting | DAA
	Branch and Bound Algorithm with Example | Easiest Explanation of B&B with Example
	0/1 Knapsack Using Branch and Bound with Example
	Shortcut for Swaps in Bubble Sorting | Best Case | Worst Case
	Optimized Bubble Sort | Best Case | O(n) Time Complexity | Shorting Algorithm
	Recurrence Relation [T(n)=2T(n/2)+2] Min-Max Algorithm
	Min-Max Algorithm without Divide and Conquer | Linear Approach | Find Max and Min
	Min-Max Algorithm with Divide and Conquer
	Time Complexity and Comparison of All Data Structures

Data Structure

PART: 01	
	Roadmap of DSA Syllabus
	Introduction to Data Structure with Real Life Examples
	Arrays in Data Structure | Initialization, Declaration, Memory Representation
	Types of Array | One Dimensional and Multi-dimensional Array
	Addressing in One Dimensional Array
	Arrays | Addressing in 2D Arrays | Row Major Order
	3D Arrays | Addressing in 3D Arrays | Row Major Order
	Addressing in Lower Triangular Matrix
	Find 2nd Largest Number in Array
	Two Pointer Technique | Two Sum Problem in Data Structure
	Maximum Sum Subarray Problem | Understand Naïve Approach
	Sliding Window Technique
	Remove Duplicate Elements in Sorted Array | Various Methods
	Linear Search in Data Structure | Time Complexity
	Binary Search in Data Structure
	Introduction to Linked List | Types and Need of Linked List
	Arrays vs Linked List
	Single Linked List in Data Structure | Self Referential Structure
	The Basic Operations of Linked List
	Traversing in Linked List
	Insert a Node At The Beginning of Linked List
	Insert a Node At the End of Linked List
	Insert a Node After a Given Node in Linked
	Delete a Node From The Beginning of Linked List
	Delete a Node From The End of Linked List
	Deletion After a Given Node in Linked List
	Deleting Entire Linked List | Single Linked List
	Introduction to Double Linked List
	How to Find a Cycle in Linked List | 2 Pointer Algorithm
	Introduction to Stack | PUSH and POP Operations
	PUSH Operation Using Array | Implementation of Stack
	POP Operation Using Array | Implementation of Stack
	PUSH Operation Using Linked List | Implementation of Stack
	POP Operation Using Linked List | Implementation of Stack
	Recursion vs Loop | How Both Approaches Work
	Infix, Prefix and Postfix with Examples
	Infix to Prefix Conversion | Infix to Prefix Conversion with Examples
	Infix to Postfix Conversion | Infix to Postfix Conversion with Examples
	Infix to Prefix Conversion Using Stack
	Infix to Postfix Conversion Using Stack

	Question on Infix to Postfix notation
	Postfix Expression Evaluation | Stack Application
	Question On Postfix Evaluation | Stack
	Understanding Call Stack with Example
	The Magic Recursion: Understanding The Power of Recursive Function
	Introduction to Queue Data Structure with Real Life Example
	Enqueue(), Dequeue() and Other Operations on Queue
	Dequeue() in Queue Using Array
	Isfull() and isempty() in Queue | Queue Operations
	Implementation of Queue Using Array | Enqueue() in Queue
	Implementation of Queue Using Linked List | Euqueue() in Queue
	Introduction to Trees | Binary Tree, Almost Complete Binary Tree | Full BT
	Binary Search Tree in Data Structure | Insertion and Traversal in BST
	Deletion From Binary Search Tree (BST) with Example
	Find Preorder, Post-Order, In-Order of Binary Search Tree (BST)
	Preorder, In-Order and Post-Order in 5 Minute | Tree Traversal | Easiest and Shortest
	Question on Binary Search Tree
	Introduction to AVL Tree in Data Structure with Example
	How to Crate AVL Tree | LL, RR, LR, RL Rotation in AVL
	AVL Tree Creation in Data Structure | All Points
	Time Complexities of All Trees | Binary Tree, Binary Search Tree, AVL Tree, Heap Tree
	Introduction to Red-Black Tree
	Insertion in Red Black Tree
	Topological Order / Sort in DAG (Direct Acyclic Graph)

Design Patterns	
PART: 01	
	What are Design Patterns | Introduction to Design Patterns and Principles
	The Singleton Pattern Explained and Implemented in Java | Creational Pattern
	The Factory Method Pattern Explained and Implemented in Java | Creational Pattern
	The Abstract Factory Patten Explained and Implemented | Creational Pattern
	The Builder Pattern Explained and Implemented in Java | Creational Pattern
	The Prototype Pattern Explained and Implemented in Java | Creational Pattern
	The Chain of Responsibility Pattern Explained and Implemented | Behavioral Pattern
	The Command Pattern Explained and Implemented in Java | Behavioral Pattern
	The Template Method Pattern Explained Implemented in Java | Behavioral Pattern
	The Mediator Pattern Explained and Implemented in Java | Behavioral Pattern
	The Memento Pattern Explained and Implemented in Java | Behavioral Pattern
	The Observer Pattern Explained and Implemented in Java | Behavioral Pattern
	The State Pattern Explained and Implemented in Java | Behavioral Pattern

	The Iterator Pattern Explained and Implemented in Java | Behavioral Pattern
	The Visitor Pattern Explained and Implemented in Java | Behavioral Pattern
	The Adapter Pattern Explained and Implemented in Java | Structural Pattern
	The Bridge Pattern Explained and Implemented in Java | Structural Pattern
	The Composite Pattern Explained and Implemented in Java | Structural Pattern
	The Decorator Pattern Explained and Implemented in Java | Structural Pattern
	The Façade Pattern Explained and Implemented in Java | Structural Pattern
	The Flyweight Pattern Explained and Implemented in Java | Structural Pattern
	The Proxy Pattern Explained and Implemented in Java | Structural Pattern