Data Structure

- Time Complexity :- **Average**

Data Structure	Access	Search	Insertion	Delation
Array	O(1)	O(n)	O(n)	O(n)
Stack	O(n)	O(n)	O(1)	O(1)
Singly-Linked-List	O(n)	O(n)	O(1)	O(1)
Doubly-Linked-List	O(n)	O(n)	O(1)	O(1)
Skip List	O(log(n))	O(log(n))	O(log(n))	O(log(n))
Hash Table	-	O(1)	O(1)	O(1)
Binary Search Tree	O(log(n))	O(log(n))	O(log(n))	O(log(n))
Cartesian Tree	-	O(log(n))	O(log(n))	O(log(n))
B-Tree	O(log(n))	O(log(n))	O(log(n))	O(log(n))
Red-Black Tree	O(log(n))	O(log(n))	O(log(n))	O(log(n))
Splay Tree	-	O(log(n))	O(log(n))	O(log(n))
AVL Tree	O(log(n))	O(log(n))	O(log(n))	O(log(n))

- **Time Complexity :-**

Worst

Data Structure	Access	Search	Insertion	Delation
Array	O(1)	O(n)	O(n)	O(n)
Stack	O(n)	O(n)	O(1)	O(1)
Singly-Linked-List	O(n)	O(n)	O(1)	O(1)
Doubly-Linked-List	O(n)	O(n)	O(1)	O(1)
Skip List	O(n)	O(n)	O(n)	O(n)
Hash Table	-	O(n)	O(n)	O(n)
Binary Search Tree	O(n)	O(n)	O(n)	O(n)
Cartesian Tree	-	O(n)	O(n)	O(n)
B-Tree	O(log(n))	O(log(n))	O(log(n))	O(log(n))
Red-Black Tree	O(log(n))	O(log(n))	O(log(n))	O(log(n))
Splay Tree	-	O(log(n))	O(log(n))	O(log(n))
AVL Tree	O(log(n))	O(log(n))	O(log(n))	O(log(n))

- **Space Complexity :-**

Data Structure	Space Complexity
Array	O(n)
Stack	O(n)
Singly-Linked-List	O(n)
Doubly-Linked-List	O(n)
Skip List	O(n log(n)
Hash Table	O(n)
Binary Search Tree	O(n)
Cartesian Tree	O(n)
B-Tree	O(n)
Red-Black Tree	O(n)
Splay Tree	O(n)
AVL Tree	O(n)

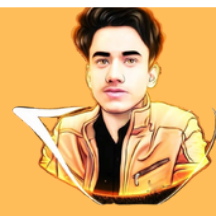
Array Sorting Algorithms

- Time Complexity :-

Data Structure	Best	Average	Worst
Quick Sort	O(n (log (n))	O(n (log (n))	O(n^2)
Merge Sort	O(n (log (n))	O(n (log (n))	O(n (log (n))
Tim Sort	O(n)	O(n (log (n))	O(n (log (n))
Heap Sort	O(n (log (n))	O(n (log (n))	O(n (log (n))
Bubble Sort	O(n)	O(n^2)	O(n^2)
Insertion Sort	O(n)	O(n^2)	O(n^2)
Selection Sort	O(n^2)	O(n^2)	O(n^2)
Shell Sort	O(n)	O(n log(n))^2)	O(n log(n))^2)
Bucket Sort	O(n+k)	O(n+k)	O(n^2)
Radix Sort	O(n k)	O(n k)	O(n k)
Binary Search	O(1)	O(log (n))	O(log (n))

- **Space Complexity :-**

Sorting Algorithm	Space Complexity
Quick Sort	O(log(n))
Merge Sort	O(n)
Tim Sort	O(n)
Heap Sort	O(1)
Bubble Sort	O(1)
Insertion Sort	O(1)
Selection Sort	O(1)
Shell Sort	O(1)
Bucket Sort	O(n)
Radix Sort	O(n+k)
Binary Search	O(1)



Graph

- **Time Complexity :-**

	Storage	Add Vertex	Add Edge
Adjacency LIst	O(|V| + |E|)	O(1)	O(1)
Incidence List	O(|V| + |E|)	O(1)	O(1)
Adjacency Matrix	O(|V| ^ 2)	O(|V| ^ 2)	O(1)
Incidence Matrix	O(|V|.|E|)	O(|V|.|E|)	O(|V|.|E|)

- **Time Complexity :-**

	Remove Vertex	Remove Vertex	Query
Adjacency LIst	O(|V| + |E|)	O(|E|)	O(|V|)
Incidence List	O(|E|)	O(|E|)	O(|E|)
Adjacency Matrix	O(|V| ^ 2)	O(1)	O(1)
Incidence Matrix	O(|V|.|E|)	O(|V|.|E|)	O(|E|)

Heap

- **Time Complexity :-**

	Find Max	Extract Max	Increase Key
Linked List(Sorted)	O(1)	O(1)	O(n)
Linked List (Unsorted)	O(n)	O(n)	O(1)
Binary Heap	O(1)	O(log(n))	O(log(n))
Binomial Heap	O(1)	O(log(n))	O(log(n))
Fibonacci Heap	O(1)	O(log(n))	O(1)

	Insert	Delete	Merge
Linked List(Sorted)	O(n)	O(1)	O(m+ n)
Linked List (Unsorted)	O(1)	O(1)	O(1)
Binary Heap	O(log(n))	O(log(n))	O(m+ n)
Binomial Heap	O(1)	O(log(n))	O(log(n))
Fibonacci Heap	O(1)	O(log(n))	O(1)