**Time and Space Complexities of all Sorting Algorithms :-**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Algorithm** | **Time Complexity** | | | **Space Complexity** |
| **Best Case** | **Average Case** | **Worst Case** |  |
| **Selection Sort** | O (n2) | O (n2) | O (n2) | O (1) |
| **Bubble Sort** | O (n) | O (n2) | O (n2) | O (1) |
| **Insertion Sort** | O (n) | O (n2) | O (n2) | O (1) |
| **Heap Sort** | O (n log(n)) | O (n log(n)) | O (n log(n)) | O (1) |
| **Quick Sort** | O (n log(n)) | O (n log(n)) | O (n2) | O (n) |
| **Merge Sort** | O (n log(n)) | O (n log(n)) | O (n log(n)) | O (n) |
| **Bucket Sort** | O (n + k) | O (n + k) | O (n2) | O (n) |
| **Radix Sort** | O (n \* k) | O (n \* k) | O (n \* k) | O (n + k) |
| **Count Sort** | O (n + k) | O (n + k) | O (n + k) | O (k) |
| **Shell Sort** | O (n log(n)) | O (n log(n)) | O (n2) | O (1) |
| **Tim Sort** | O (n) | O (n log(n)) | O (n log(n)) | O (n) |
| **Tree Sort** | O (n log(n)) | O (n log(n)) | O (n2) | O (n) |
| **Cube Sort** | O (n) | O (n log(n)) | O (n log(n)) | O (n) |

**Time Complexities of Data Structures Operations :-**

|  |  |  |  |
| --- | --- | --- | --- |
| **Data structure** | **Access** | | |
| **Best Case** | **Average Case** | **Worst Case** |
| **Array** | O(1) | O(1) | O(1) |
| **Stack** | O(1) | O(N) | O(N) |
| **Queue** | O(1) | O(N) | O(N) |
| **Singly Linked list** | O(1) | O(N) | O(N) |
| **Doubly Linked List** | O(1) | O(N) | O(N) |
| **Hash Table** | O(1) | O(1) | O(N) |
| **Binary Search Tree** | O(log n) | O(log N) | O(N) |
| **AVL Tree** | O(log n) | O(log N) | O(log N) |
| **B Tree** | O(log n) | O(log N) | O(N) |
| **Red Black Tree** | O(log n) | O(log N) | O(log N) |

|  |  |  |  |
| --- | --- | --- | --- |
| **Data structure** | **Search** | | |
| **Best Case** | **Average Case** | **Worst Case** |
| **Array** | O(1) | O(N) | O(N) |
| **Stack** | O(1) | O(N) | O(N) |
| **Queue** | O(1) | O(N) | O(N) |
| **Singly Linked list** | O(1) | O(N) | O(N) |
| **Doubly Linked List** | O(1) | O(N) | O(N) |
| **Hash Table** | O(1) | O(1) | O(N) |
| **Binary Search Tree** | O(log n) | O(log N) | O(N) |
| **AVL Tree** | O(log n) | O(log N) | O(log N) |
| **B Tree** | O(log n) | O(log N) | O(N) |
| **Red Black Tree** | O(log n) | O(log N) | O(log N) |

|  |  |  |  |
| --- | --- | --- | --- |
| **Data structure** | **Insertion** | | |
| **Best Case** | **Average Case** | **Worst Case** |
| **Array** | O(1) | O(N) | O(N) |
| **Stack** | O(1) | O(1) | O(1) |
| **Queue** | O(1) | O(1) | O(1) |
| **Singly Linked list** | O(1) | O(1) | O(N) |
| **Doubly Linked List** | O(1) | O(1) | O(1) |
| **Hash Table** | O(1) | O(1) | O(N) |
| **Binary Search Tree** | O(log n) | O(log N) | O(N) |
| **AVL Tree** | O(log n) | O(log N) | O(log N) |
| **B Tree** | O(log n) | O(log N) | O(N) |
| **Red Black Tree** | O(log n) | O(log N) | O(log N) |

|  |  |  |  |
| --- | --- | --- | --- |
| **Data structure** | **Deletion** | | |
| **Best Case** | **Average Case** | **Worst Case** |
| **Array** | O(1) | O(N) | O(N) |
| **Stack** | O(1) | O(1) | O(1) |
| **Queue** | O(1) | O(1) | O(1) |
| **Singly Linked list** | O(1) | O(1) | O(N) |
| **Doubly Linked List** | O(1) | O(1) | O(1) |
| **Hash Table** | O(1) | O(1) | O(N) |
| **Binary Search Tree** | O(log n) | O(log N) | O(N) |
| **AVL Tree** | O(log n) | O(log N) | O(log N) |
| **B Tree** | O(log n) | O(log N) | O(N) |
| **Red Black Tree** | O(log n) | O(log N) | O(log N) |