**Exercise 5- Task Management System**

**Understanding LinkedList:**

**Singly Linked List:**

**Definition**: A singly linked list is a collection of nodes where each node contains data and a reference (or pointer) to the next node in the sequence.

**Advantages:**

* It can grow and shrink in size dynamically without the need for resizing.
* Insertions and deletions are efficient (O (1)) if done at the head or tail of the list.

**Doubly Linked List:**

**Definition**: A doubly linked list is similar to a singly linked list, but each node contains an additional reference to the previous node, allowing bidirectional traversal.

**Advantages:**

* It can be traversed in both directions.
* It is more efficient deletions when the node to be deleted is known, as there's no need to traverse from the head to find the previous node.

**Analysis:**

**Time Complexity:**

* **Add Operation**: O(n) in the worst case (when adding to the end of the list).
* **Search Operation**: O(n) as it requires a linear search through the list.
* **Traverse Operation**: O(n) as it requires visiting each node.
* **Delete Operation**: O(n) as it may require a linear search to find the node to be deleted.

**Advantages of Linked Lists Over Arrays for Dynamic Data**

* **Dynamic Size**: Linked lists can grow and shrink in size dynamically without the need for resizing.
* **Efficient Insertions/Deletions**: Insertions and deletions are more efficient (O (1)) at the head/tail) compared to arrays where shifting elements is required (O(n)).
* **No Wasted Memory**: Unlike arrays, there is no need to allocate memory in advance, which can lead to wasted space.