**Exercise 5: Task Management System**

**Understand Linked Lists:**

**Explain the different types of linked lists (Singly Linked List, Doubly Linked List).**

**Singly Linked List:**

A single linked list has nodes where each node possess the address of the next node.

A node has data and reference link

The last node will have null as reference link

We can traverse through the elements in only one direction

Doubly Linked List:

Each node possess the reference link for previous node and the next node

Here we can traverse in both the directions

It requires extra pointers which leads to overhead

**4.Analysis:**

Analyze the time complexity of each operation.

Add: O(1) – when node added at the front

Search: O(n)- In worst case, where all the nodes where traversed to search

Traverse: O(n)- As we need to pass through all n nodes

Delete: O(n)- When the element is not available, resulting in traversing the entire linked list

**Discuss the advantages of linked lists over arrays for dynamic data.**

* As the size is dynamic, we can grow and shrink the size dynamically, efficient use of memory
* Efficient insertions/deletions as we don’t need to shift elements
* Efficient and easier memory allocation as we don’t require contiguous memory allocation.