**Exercise 5: Task Management System**

**1.Understand Linked Lists:**

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

Ans) **Singly Linked List:** A singly linked list is a type of linked list in which every node points to the next node in line. Each node consists of data and a reference or a pointer to the next node in the list. The very first node is called the head, and the last node points to null, which means it indicates the end of the list.

**Doubly Linked List:** A doubly linked list is a type of linked list whereby every node has an additional pointer pointing to the previous node in the sequence. The nodes are thus connected both ways—forward and backward. Every node consists of data, a reference to the next node, and a reference for the previous node.

**4.Analysis**

Q) Analyze the time complexity of each operation.

Ans) Add: O(n) – Adding a task to the end of the list requires traversal to the end.

Search: O(n) – Searching for a task requires traversal until the task is found.

Traverse: O(n) – Traversal visits each node once

Delete: O(n) – Deletion requires searching for the task and updating pointers.

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

Ans) **Dynamic Size**: Dynamic growing and shrinking of the size of linked lists removes the need for declaring a predefined size.

**Efficient Insertions/Deletions**: Insertion or deletion of an element at the start or in the middle of the linked list is more time efficient compared to arrays because elements need not be shifted.

**Memory Consumption**: This implementation of the linked list uses dynamic data memory more efficiently because it won't waste extra memory reserved by the application.