CSE 2216 : Data Structures and Algorithm 1 Lab

Problem Set for Linked List

1. Create and Display a Singly Linked List

Problem:
Write a program to create a singly linked list and display its elements. Allow the user to input the values for the nodes.
Example Input:
Values = [10, 20, 30, 40]
Example Output:
Linked List: 10 → 20 → 30 → 40 → NULL

2. Insert at the Beginning of the List

Problem:
Implement a function to insert a new node at the beginning of a singly linked list.
Example Input:
List = [20, 30, 40], Value = 10
Example Output:
Linked List: 10 → 20 → 30 → 40 → NULL

3. Insert at the End of the List

Problem:
Write a function to insert a new node at the end of the singly linked list.
Example Input:
List = [10, 20, 30], Value = 40
Example Output:
Linked List: 10 → 20 → 30 → 40 → NULL

4. Delete a Node by Value

Problem:
Write a function to delete the first node with a specific value in a singly linked list.
Example Input:
List = [10, 20, 30, 40], Value = 30
Example Output:

Linked List: 10 → 20 → 40 → NULL

5. Search for an Element in the List

Problem:
Implement a function to search for a specific value in the singly linked list and return its position. If not found, return -1.
Example Input:
List = [10, 20, 30, 40], Value = 30
Example Output:
Position: 3

6. Reverse a Singly Linked List

Problem:
Write a function to reverse the singly linked list in place.
Example Input:
List = [10, 20, 30, 40]
Example Output:
Reversed List: 40 → 30 → 20 → 10 → NULL

7. Find the Middle Node of the List

Problem:
Implement a function to find the middle node of a singly linked list. If the list has an even number of nodes, return the second middle node.
Example Input:
List = [10, 20, 30, 40, 50]
Example Output:
Middle Node: 30

8. Detect and Remove a Cycle

Problem:
Detect if a cycle exists in a singly linked list and remove it.
Example Input:
List with Cycle: [10 → 20 → 30 → 40 → 20 (back to 20)]
Example Output:
Cycle Removed: 10 → 20 → 30 → 40 → NULL

9. Merge Two Sorted Singly Linked Lists

Problem:
Given two singly linked lists sorted in ascending order, merge them into one sorted linked list.
Example Input:
List1 = [10, 30, 50], List2 = [20, 40, 60]
Example Output:
Merged List: 10 → 20 → 30 → 40 → 50 → 60 → NULL

10. Remove Duplicates from a Sorted Singly Linked List

Problem:
Write a function to remove all duplicate elements from a sorted singly linked list.
Example Input:
List = [10, 10, 20, 30, 30, 40]
Example Output:
Modified List: 10 → 20 → 30 → 40 → NULL