Data Structure and Algorithm [Assignment 2]

Submission to be done on UCP PORTAL
Deadline: Tuesday, June 04, 2024, 2:00pm

Task 1

Implement a doubly linked list with the following functionalities:

- Insert a node at the beginning,
- Insert a node at the end,
- Insert a node at a specific position,
- Delete a node from the beginning,
- Delete a node from the end,
- Delete a node from a specific position,
- Reverse the doubly linked list,
- Display the list from the beginning to the end,
- Display the list from the end to the beginning.

Task 2

Implement a circular singly linked list using only a tail pointer with the following functionalities:

- Insert a node at the beginning,
- Insert a node at the end,
- Insert a node at a specific position,
- Delete a node from the beginning,
- Delete a node from the end,
- Delete a node from a specific position,
- Display the list starting from the node next to the tail.

Task 3

Write a function to merge two sorted singly linked lists into a single sorted linked list.

Task 4

Write a function to find the middle element of a singly linked list. Try to do it in one pass.

Task 5

Write a function to determine if a linked list is a palindrome.

Task 6

Write a function to find the maximum value in a linked list.

Task 7

Write a function to remove duplicates from an unsorted linked list.

Task 8

Write a recursive function to reverse a singly linked list.

Task 9

Write a recursive function to compute the greatest common divisor (GCD) of two numbers.

Task 10

Write a recursive function to compute the power of a number (base^exponent).

Task 11

Write a recursive function to perform a binary search on a sorted array.

Task 12

Write a recursive function to find the length of a linked list.

Practice Tasks (not to be submitted)

Implement the linked list functions using recursion.