CS23302 –Data Structures Laboratory

Stack, Queue, List

Date: 13.8.26 marks: 20

1. Write a C program to represent a single-variable polynomial using a singly linked list and evaluate its value for a given real number x. (4 marks)
   A polynomial expression can be represented as:
   $P(x) = a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0$
   Each term in the polynomial contains a **coefficient** and an **exponent**.

Node Structure: Define a structure named Node containing:

- float coefficient: The multiplier of the term.
- int exponent: The power of x for the term.
- struct Node* next: A pointer to the next term in the polynomial.

Operations to Implement:

- void insertTerm(struct Node** head, float coeff, int exp): Inserts a new term into the linked list while keeping the terms sorted in descending order of their exponents. If a term with the same exponent already exists, add their coefficients.
- float evaluatePolynomial(struct Node* head, float x): Traverses the linked list and computes the total value of the polynomial for a given input value of x.
- void displayPolynomial(struct Node* head): Prints the polynomial in a readable mathematical format (e.g., 4.00x3 + 2.50x1 + 7.00).
- void freePolynomial(struct Node* head): Frees all dynamically allocated memory to prevent memory leaks.

2. Given two polynomial expression using singly linked list, perform the following operations:
   a. Add (4 marks)
   b. Subtract (4 marks)
   c. Multiply (4 marks)
   d. Divide (4 marks)
3. Implement a Deque (Double Ended Queue) data structure in C (using either an array-based or pointer-based queue) that supports insertion and deletion from both ends in O(1) time. (5 marks)