



Inter-State School Of Higher Education
PAUL BIYA TECHNOLOGICAL CENTRE OF EXCELLENCE
P.O Box 13 719 Yaounde (Cameroon) Tel. (237) 22 72 99 58
Web site: www.iaicameroun.com E-mail: iaicameroun@yahoo.fr

RESIT June 2021 Session DESIGN AND IMPLEMENTATION OF DATA STRUCTURES
Level: I Academic year: 2020/2021 Speciality: Software Engineering Duration: 01h

Question: (2+2 = 4 marks)

1. Write a recursive algorithm to delete a value in a doubly linked list. It takes as parameter the linked list and the element to be deleted, then returns the list without the element.
2. Translate this algorithm to a C program.

Problem: (2 + 2 + 2 + 2 + 3 + 3 + 2 = 16 marks)

Given the polynomial of degree d and of coefficients p_i .

We want to represent P by occupying as little memory space as possible, in particular when the degree is high and / or when there are zero coefficients.

The idea is to consider only useful $p_i X^j$ monomials. The useful monomials will be stored in a linked list, of which each element will contain both the coefficient p_i of the monomial and an int (the exponent j of the monomial). Each coefficient of a useful monomial will thus be linked via a pointer to the next useful monomial of a strictly lower degree (or Null if there are no more useful monomials).

1. Write precisely the structure that will be suitable to represent this polynomial.
2. Write a function which allocates and initializes the memory necessary for a monomial.
3. Write a function that frees all the necessary memory used by a polynomial.
4. Write a function to display a polynomial. (For example: $P = 4x^5 + 5x^4 + 10x^3 + 9x + 14$ and it is of degree 5).
5. Write a function converting an array of coefficients to a list of useful monomials.
6. Write a derivation function of a polynomial in this form.
7. Write an addition function of two polynomials in this form.

NB: A polynomial with only one term is called a monomial e.g $3x^2$

Course Instructor: M. NDENGE