

ESO207 Programming Assignment-1

Due on: 24:00 hrs, Aug 31, 2021

Maximum Marks 50

Instructions

- Please insert suitable comments in your pseudo-code and actual code so that someone grading it may understand your code easily.

Q1 Polynomials may be represented as linked lists. Consider a polynomial $p(x)$, with n non-zero terms,

$$p(x) = a_1x^{e_1} + a_2x^{e_2} + \dots + a_{n-1}x^{e_{n-1}} + a_nx^{e_n}$$

where $0 \leq e_1 < e_2 < \dots < e_{n-1} < e_n$ are (non-negative) integers. We assume that coefficients a_1, \dots, a_n are *non-zero* integers.

Polynomial $p(x)$ can be represented as a linked list of nodes. Each node has three fields: coefficient, exponent and link to the next node. Let us assume that list is a doubly linked list, with sentinel node, sorted in ascending order of exponents.

(a) (marks 5+15) Write pseudo-code to add two polynomials $p(x)$ and $q(x)$ in this representation. Your algorithm should take $O(n + m)$ time, where n, m are the number of terms in $p(x), q(x)$ respectively.

Implement your pseudo-code as an actual program.

(b) (marks 10+20) Write pseudo-code to multiply two polynomials $p(x)$ and $q(x)$ in this representation. Do runtime complexity analysis of your algorithm in terms of n, m , the number of terms in $p(x), q(x)$ respectively. State this complexity in 'O' notation.

Implement your pseudo-code as an actual program.

Note that output list should satisfy all constraints (non-zero coefficients, exponents in strict ascending order etc.) of representation of a polynomial. Make your code non-destructive, that is, it should not modify the lists for $p(x)$ and $q(x)$.