UNIVERSITY OF PARMA

Department of Engineering and Architecture
Degree course in Computer, Electronic and Communications Engineering
PRACTICAL TEST IN COMPUTER SCIENCE & PROGRAMMING LABORATORY
June 17th , 2024

Name: _____ Surname:_____ Matr:_____ Workstation: _____

Write a program using the C language (name the project with your student **<ID>**) that behaves as described below. The available time is 120 minutes. At the end of the time, the saved files on **U:** are going to be automatically collected. Additional documents, files… are available in **T:\Bertozzi**, it is recommended to use WordPad to read text files.

A polynomial of the form

$$\mathbf{2x^7 + 3x^3 - 5x^2 + 7}$$

can be represented as a sequence of multiplicative constants and exponents, in this case:

(2, 7) (3, 3) (-5, 2) (7, 0) namely **2, 7, 3, 3, -5, 2, 7, 0**

We want to develop a program in C that is able to manage such representation and also deal with the sum of polynomials. Specifically, the program must:

1. Read and store in an appropriate data structure the contents of the file "polinomi.txt" which contains, line by line, the sequence of constants and exponents representing a single polynomial, separated by one or more spaces. **They are not necessarily ordered by exponent**.

   At the end of the reading, it should print the number of polynomials read from the file.

2. Iteratively:

   a) Considering the number of polynomials contained in the file, generate two random numbers to randomly select two polynomials among those read and stored from the file.

   b) Print the "selected" polynomials in the **ordered** form a_nx^n + $a_{(n-1)}$x^(n-1) + … + a_0.

   c) Calculate the sum of the two polynomials and print it using the indicated format.

Example of execution:

```
I read 512 polynomials, calculating the sum of polynomials #201 and #4
P1:     -19x^19+3x^17-2x^16+11x^15-4x^13-18x^9+4
P2:     +16x^19+2x^18+1x^17+8x^16+2x^14+6
SUM:    -3x^19+2x^18+4x^17+6x^16+11x^15+2x^14-4x^13-18x^9+10
```

Simplifying assumptions:

- **Assume that the maximum possible degree for a polynomial is 20. Use this to size any data structures.**
- **The last number of each line is directly followed by a newline character. Use this to determine when you reach the end of the line when reading the coefficient/exponent pairs.**

The code should be developed following the proposed order. The correction stops at the first incorrectly implemented step.