University of Cyprus
Department of Electrical and Computer Engineering

ECE 325 - Iterative Methods

Practical Assignment 8 (Due Date: 15/11/2021 - 23:59)

Examination Date: 16/11/2021

Report and Executables: Your report and source code should be sent via email to the Teaching Assistant (cmakri07@ucy.ac.cy) the day before the assignment examination date and must include a cover page with the names of all students in the group and a statement that this is your own work together. You should also list all other students that have helped you in completing the lab assigned as well as any references that you have used (e.g., websites where you found any information). In your report, include only the pseudocode, not the actual code, with any comments and description you may want to add, as well as typical scenarios that you use to test your programs. Email Subject MUST be: ECE325_Assignment8_TeamX (Replace X with the number of your team). You can use Java, C or C++, but you are NOT ALLOWED to use any ready structures or algorithms such as "sort". Make sure that your code runs before submitting.

1. [40%] Write a program that reads a file describing an interval $[a, b]$ and a polynomial function:
$$f(x) = c_0x^0 + c_1x^1 + \cdots + c_nx^n$$

ECE325_function.txt

a
b
n
c_0
c_1
...
c_n

Where a, b are floats, indicating the interval.
$n > 0$ is an integer, showing the order of the polynomial.
The following $n + 1$ lines have the float coefficients of a polynomial function.

Given the above polynomial function $f(x)$, find the point $x \in [a, b]$, where the function changes sign $(f(x) = 0)$, by implement the following methods:

a. Bisection method.
b. False Position method.

Count how many iterations your program needed for each method, with error $\varepsilon = 0.0001$ and show them in your report

2. On the next page.

2. [60%] Write a program that reads a file describing a system of equations:

ECE325_system.txt

n
$a_{11}\ a_{12}\ \ldots a_{1n}\ b_1$
$a_{21}\ a_{22}\ \ldots a_{2n}\ b_2$
$\ldots$
$a_{n1}\ a_{n2}\ \ldots a_{nn}\ b_n$

Where $n > 0$ is an integer, showing the number of equations.
The following n lines, each have n + 1 floats separated by space. The first n floats are the coefficients of the unknown variables of each equation, while the n+1 float has the solution of each equation. These result into the following matrix form:

$$A = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix},\ b = \begin{bmatrix} b_1 \\ \vdots \\ b_n \end{bmatrix},\ such\ that\ Ax = b$$

Find $x = [x_1\ x_2\ \ldots x_n]'$ using the following algorithms:

a. Gauss Elimination
b. LU decomposition