INF212
ALGORITHMS AND PROGRAMMING

PROJECT-4

Create a Project with Your Array Library

Deadline is May 21, 2024 at 23:00.

Projects that are not delivered on time are not accepted.

Upload the project to the Project 4 assignment section of the INF212 class.

The questions can be asked to course lecturer Dr. Tuba GÖZEL and teaching assistant Osman Said BİŞKİN.

Upload your files as followings:

- **Upload ONLY your source codes (*.c, *.h).**
- **After uploading your source files, you must use TURN IN button (GÖNDER butonu) in the system, otherwise it will be a draft of your version and will not be accepted.**
- **MS Teams "INF212" class is the directory for your files.**
- **Do not create a folder or RAR or whatever, just UPLOAD your source codes.**
- **Source codes must be named as: "my_array_library.h", "my_array_library.c" and "main.c"**

PROJECT 4

Write your own array library named "my_array_library.h" with two-dimensional array including the following functions and create a project and test these functions with "main.c".

- Search the value in an array's elements and give index (m and n values for a $m \times n$ matrix type of the array)
- Find the number of non-repeated elements in an array

- Find the minimum element of an array
- Find the maximum element of each array row

- Sort each array row in descending order using bubble sorting

- Find the transpose of an array
- Compute the product of two arrays

- Check if a given matrix is an identity matrix
- Check if a given matrix is a symmetric matrix

- Low-Upper (LU) Decomposition: Calculate the LU decomposition of a square matrix.
- Solve a 5x5 matrix given below by using Gauss Elimination method with previous LU decomposition algorithm.

$$Ax = b \quad \Rightarrow \quad x = A^{-1}b = ?$$

$$\underbrace{\begin{bmatrix} 9 & 0 & -3 & 0 & 0 \\ 4 & -4 & 0 & 0 & 0 \\ 0 & -2 & 9 & 0 & 0 \\ 0 & 1 & 6 & -9 & 2 \\ 5 & 1 & 0 & 0 & -6 \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix}}_{x} = \underbrace{\begin{bmatrix} 120 \\ 0 \\ 350 \\ 0 \\ 0 \end{bmatrix}}_{b}$$

Important notice 0: You are expected to create a Matrix Class that includes all the given features and contains all desired functions.

Important notice 1: You can use examples from the internet to help you complete your project, but please avoid plagiarism. Homeworks found to be an exact copy of another student's work or source code on internet will be given a grade of 0. The necessary disciplinary action defined in the regulations will be taken for the owner of this homework.

Important notice 2: Please include comment lines to explain what you are doing in your code.

Before you upload your task to the relevant assignment, please pay attention to these file naming conventions:

For main: StudentID_Project4_main.c
Example: 121024005065_Project4_main.c
For .c file: StudentID_Project4_Matrix.c
Example: 121024005065_Project4_Matrix.c
For .h file: StudentID_Project4_Matrix.h
Example: 121024005065_Project4_Matrix.h

If your Student ID has lower than 12 digits, please add zero to left side of your Student ID until reaching 12 digits.
Example:

000171053011_Project4_main.c
000171053011_Project4_ Matrix.c
000171053011_Project4_Matrix.h

Good Luck!