Sohag University
Faculty of Engineering
Electrical Engineering Department

Programming Languages
1st Year

Sheet 8

N-dimensional Arrays

Problem1

Consider the following definition of the function main:

```
int main() {
   int A[3][3], transpose_A[3][3];
   .
   .
   .

   Return 0;
}
```

Write the definitions of the following functions described below. Each of the functions must have the appropriate parameters.

a. Write the definition of the function **initMatrix** that prompts the user to input integers and initialize the matrix A with the user input integers.

b. Write the definition of the function **displayMatrix** that take a 3X3 matrix and print it in the format shown.

```
  1  | 13  |  5
-----+-----+-----
100  |  2  |  4
-----+-----+-----
  5  | 42  |  1
```

c. Write the definition of the function **getSum** that take a 3X3 matrix and return the summation of the matrix elements.

d. Write the definition of the function **getLargest** that take a 3X3 matrix and return the largest element in the matrix.

e. Write the definition of the function **getTranspose** that take two 3X3 matrixes and update the second matrix to be the transpose of the first one.

f. Write the definition of the function **printRowsSum** that take a 3X3 matrixes and print the summation of each row elements in the format shown.

```
summation of Row #1:    19
summation of Row #2:    106
summation of Row #3:    48
```

g. Write the definition of the function **isSymmetric** that take a 3X3 matrixes and return true if it is symmetric, or false otherwise. (Hint: matrix A is symmetric if $A_{ij} = A_{ji}$, for every i, j)

h. Write the definition of a function main to test each of those functions by performing the following:

1. Allow the user the initialize the matrix **A**.
2. Display the matrix **A** using the **displayMatrix** function.
3. Initialize the **transpose_A** to the transpose of **A**.
4. display the matrix **transpose_A** using the **displayMatrix** function.
5. Print the largest element in the matrix **A**.
6. Print the summation of all elements in matrix **A**.
7. Display the summation of each row in **transpose_A**.
8. Check if **A** is symmetric or not.

Problem2

Write a C++ program that initialize a 2D array store at least 4 students ID and there marks in 5 exams, then :

- write a function **displyStudentsInfo** that print all student's record (ID and all marks) in the format shown.

ID	sub1	sub2	sub3	sub4	sub5
1	50	65	43	56	98
2	65	34	68	23	87
3	75	56	78	34	42
4	35	67	32	67	37

- write a function **displyStudentInfo** that take a student ID and print the student's marks, alsoprint his highest and lowest mark.

```
Enter ID to search for:3
student record:
  sub1  sub2  sub3  sub4  sub5
    75    56    78    34    42
Highest score:  78
Lowest Score: 34
```

- write a function **isPass** that take a student ID and return True if the student pass, return false otherwise. (the student is consider passed if his marks over 59 in 3 subjects at least)

```
Enter ID to search for:3
student status: failed
```

```
Enter ID to search for:2
student status: passed
```