## COE 301 – Computer Organization

## **Floating-Point Matrix Computation**

Write a program that prints a menu with the following options:

- 1. Enter a Matrix of Single-Precision Floats
- 2. Print the Matrix
- 3. Compute a Row Sum
- 4. Compute a Column Sum
- 5. Compute the Matrix Transpose
- 6. Exit the Program

The matrix should be allocated statically in the data segment. It should have 10 rows and 10 columns. All the elements should be single-precision floats and initialized to zero.

- a) (3 points) Write a function *print\_menu*, that displays the menu and asks the user to enter his choice. The function should return the user choice back to the caller (main function) as an integer between 1 and 6. If the user enters a choice outside the range 1 to 6 then it should be rejected and the function should re-ask the user to enter his choice again. If the user enters choice 6 then the main function should terminate the program.
- b) (3 points) Write a function *read\_matrix* that asks the user to enter N in the range 2 to 10. It should reject any value of N outside this range and asks the user to re-enter N. The function should ask the user to input all the N×N elements, starting at row 0, then row 1, etc. and store the values in memory. The function should return N back to the caller (main function).
- c) (3 points) Write a function *print\_matrix* that prints a square matrix of N×N single-precision floats. The matrix should be displayed row by row. Each row should be displayed on a single line.
- **d**) (3 points) Write a function *row\_sum* that asks the user to enter a row index between 0 and N-1, computes, prints the row sum, and return back to the main function.
- e) (3 points) Write a function *col\_sum* that asks the user to enter a column index between 0 and N-1, computes, prints the column sum, and returns back to the main function.
- **f)** (3 points) Write a function *transpose* that does the matrix transpose, by interchanging the values of the rows and the columns of the matrix in memory. The function *transpose* should call the function *print\_matrix* to display the matrix after doing the matrix transpose in memory.

(2 points) Program documentation and readability.

## **Submission Guidelines:**

This assignment can be solved individually or in groups of two students only. No group should have more than two students. Both students should contribute to the solution. At the beginning of your program, write the names of the two students who worked on the program. If this program was solved individually then write your name only. The rest of the code should be well written and well document.

All submissions should be done through Blackboard. Submit the source code of the program. Make sure that your program is well written and documented. The program will be graded according to its correctness, documentation, and the writing of functions. It is your responsibility to make sure that the program works. A program that does not assemble or run will receive zero on correctness.