Northeastern University
College of Engineering
Department of Electrical & Computer Engineering

EECE7205: Fundamentals of Computer Engineering

Spring 2020 - Homework 1

Instructions

- For programming problems:
  - Your code must compile and run on the COE Linux server before submitting it on Blackboard.
  - Your code must be well commented by explaining what the lines of your program do. Have at least one comment for every 4 lines of code.
  - At the beginning of your source code files write your full name, students ID, and any special compiling/running instruction (if any).
  - Test your code on the COE Linux server before submitting it:
    - Before uploading your source code file to the server make sure it is saved with Encoding Unicode (UTF-8). In visual studio, Save As -> Click on the arrow next to Save -> Save with Encoding -> Yes -> Unicode (UTF-8) -> Ok
    - Compile using g++ -std=c++11 <filename>

- Submit the following to the homework assignment page on Blackboard:
  - Your homework report submitted as one PDF file. The report includes the answers to the non-programming problems and the screen shots of your program's sample runs for the programming problems. Your report must be developed by a word processor (no hand written or drawn contents are acceptable).
  - Your well-commented source code file(s) for the programming problems.
  - Do NOT submit your files (the PDF and source code) as a compressed (zipped) package. Rather, upload each file individually.

Note: Yon can submit multiple attempts for this homework, however, only your last submitted attempt will be graded.

Problem 1 (20 Points)

Write a C++ program to implement and test two functions: SwapP and SwapR. SwapP swaps the values of two integer variables using pass-by-pointer. SwapR swaps the values of two integer variables using pass-by-reference.

Problem 2 (30 Points)

Write a C++ program to test the following two functions. Call the functions with values for ***n*** between 1 and 10.

```
int F1(int n)
{
      if (n == 0) return 1;
      return F1(n - 1) + F1(n - 1);
}

int F2(int n)
{
      if (n == 0) return 1;
      if (n % 2 == 0) {
            int result = F2(n / 2);
            return result * result;
      }
      else
            return 2 * F2(n - 1);
}
```

Submit your test program and in your report answer the following questions:

a. What does each function do?

b. Which function is faster (*hint:* test them with ***n*** = 30)?

c. Explain why one function is faster than the other.

Problem 3 (50 Points)

Write a C++ program that starts by asking a teacher for the size of his/her class (the number of students). Then the program asks the teacher to enter for each student his/her name along with his/her grade in an exam. Only enter students' last names as one word. All grades are integers that have to be in the range from 0 to 100 (inclusive). Store the names in an array of strings and the grades in another array of integers. Use dynamic memory to create both arrays.

Define a function that implements the insertion sort algorithm (a modified version of the algorithm presented in class). This function sorts the students' info in a descending order of the students' grades in the exam.

After calling the sorting function, your program will display the sorted students' info (i.e., their names along with their grades sorted in descending order of the grades).