**ECE 1111: Engineering Computation I**

**Homework No. 8: Loops and Conditionals**

**Goal:** Looping is a major part of any programming language. In this homework assignment, you will learn how to control program flow using for and while loops. Note that you have already done this quite a few times in previous assignments.

**Description:** There are three tasks in this homework assignment:

1. **For Loop:** Create an array of floats in memory that is *1,000,000* (*1M*) elements long. Initialize it with randomly generated values using the drand48() random number generator. Start by doing a simple loop from *[0, N-1]* where *N = 1M*, and use an increment of *1*. Next, change the single loop to a double loop where you increment the outer loop by *M* and the inner loop by *1*. *N* and *M* should be set from the command line using argv[1] and argv[2] respectively. The total number of iterations should be exactly N. **Your loop should work for any combination of the integers *N* and *M*, even if *N* is not evenly divisible by *M*.**
2. **While Loop:** Using the same float array (*N = 1M*), increment from the last sample to the first sample using a while loop. For each iteration of the loop, generate a random integer in the range of *[0, 0.1\*N]*. (you can use drand48(), multiply the value by *0.1\*N*, and round it to an integer to make this easy), set the *ith* value to i, and decrement your counter by that number of elements after your loop has finished. Pseudo-code for this would look something like this:

**i = N;**

**while (i > 0) {**

* **Generate a random value of M**
* **For loop: set array values from [i,i-M+1]**
* **Decrement your counter by M**

**}**

Make sure you set all *N* elements and do not initialize each element more than once. Sum up the values of the array and make sure that sum is the correct value (we call this a checksum). *N* should be set from the command line using argv[1].

1. **Character Pointers:** Initialize a character string of *N* elements to random ASCII values, where *N = 1M*. Copy this string to another string *M* elements at a time, where M is a random value in the range *[1, 100]* using a double loop (generate a random value of *M*, copy the first *M* elements, update your counter, generate a new value of *M*, copy the next *M* elements, and repeat until you have copied exactly *N* elements. But this time only use character pointers – do not use integers or for loops. For each time you copy M elements, compute the starting memory address, the ending memory address, and use a while loop and pointer increments (e.g., chr++). Do the copies manually with a loop. Do not use functions like memcpy or strcpy. *N* should be set from the command line using argv[1].

Submit your deliverables into the directory:

/**data/courses/ece\_1111/current/homework/hw\_08/lastname\_firstname**

Create directories named p01a, p01b, p02 and p03. Put the corresponding code in each of these directories. No write up is needed for this assignment. We will compile and run your code, and, of course, read your comments. Use make files.