

Stony Brook University  
ESE 224: Computer Techniques for Electronic Design II  
Spring 2017

**Assignment 1**  
**Review of C Topics**

Total Score: 12 points

## 1 Assignment

1. Write a program that reads a `char` as input, and determines if it is a lowercase letter, uppercase letter, a digit or something else (call this a special character).
2. The Taylor series expansion for the exponential function, for small values of  $x$  is given by:

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

Write a program that takes as input the value of  $x$  (for example 0.01), and computes  $e^x$  using the above approximation. The program should sum up  $n$  terms, and stop when the value of the  $n$ th term is less than a predefined constant `accuracy`, set to 0.00001.

3. Write a program to generate  $m$  random integers from an array of size  $n$ , such that the probability of selecting even elements is twice that of odd elements. The same element may be selected multiple times. As an example, let  $n = 100$  and  $m = 30$ . Read in the array elements from the provided data file `ArrayInp.dat`, using the `fscanf()` function. Utilize the function `rand()` to generate a pseudo random number and the function `srand()` to seed the random number generator. Start with the code `RandomArrayGenerate.c` provided on the Blackboard. An example on generating random numbers in a given range can be found at the link <http://www.cplusplus.com/reference/cstdlib/rand/>.
4. Design an algorithm, and write the code to find all pairs of integers in a *sorted array*, which sum up to a specified value. For example, if the given array is

```
int arrN[10] = {1, 3, 7, 14, 22, 35, 44, 45, 46, 53};
```

and the specified sum is 49, the output would be:

```
3 46
```

```
14 35
```

The algorithm should work well for very large array sizes.

5. Write a program that initializes an array, and prints out its elements using the *pointer notation* and pointer incrementing.
6. In the file `Cauchy.dat` provided on the Blackboard, find all occurrences of the word *mathematician*. For reading the data from the input file, you can use the `fscanf()` function with the `%s` specifier. Utilize the string function `strcmp()` for string comparison.

## 2 Grading

In addition to code functionality, there will be points for optimized algorithm, coding style and comments. A few useful comments would be sufficient.

## 3 Assignment Submission

The Assignments **must** be submitted on the Blackboard, and should include the following:

1. All the C code, that is, source in .c format, for the programming problems.
2. A screen shot showing your program executing.
3. A file (can be hand written, maybe in .PDF or .JPG format), if necessary, for the other problems.