**EE 2305 – Introduction to C Programming**

**Programming Project 01**

**Simple RC Circuit**

Program Features: Sequential structure, variables and constants, data input and output, mathematical operators, function calls.

The electrical circuit shown in Figure 1 is called an RC circuit because it contains a resistance (*R*) and a capacitance (*C*). The behavior of the resistance is to resist the flow of electrical current in the closed loop. The behavior of the capacitance is to store electrical charge.

Figure 1: Simple RC Circuit.

After the switch is thrown at time , the current in the circuit is given by the formula

and the voltage across the capacitor is given by the formula

Write a C++ program that defines (voltage in *Volts*), (resistance in Ω), and (capacitance in *Farads*) as constants (using the **const** keyword) and allows the user to input different values of (time in *Seconds*). The program shall then calculate values for and .

The **exp()** function call requires the **<cmath>** library.

Let the values of the constants be

Volts

(kilo-ohms, , or )

pF (pico-Farads, , or )

Write the program to prompt the user to input a time *t* in micro-seconds (μS, , or , using the **cin** function). Convert the time to seconds to perform the calculation. Run the program using the values of shown in the table below. Use the results of the program to fill in the table. The program shall report the current in milliamps (mA, , or ) and the voltage in volts (V).

Table I: Current and Voltage in an RC Circuit

|  |  |  |
| --- | --- | --- |
| Time () () | Current, (mA) | Voltage, (V) |
| 0 |  |  |
| 0.1 |  |  |
| 0.2 |  |  |
| 0.5 |  |  |
| 1.0 |  |  |
| 2.0 |  |  |
| 5.0 |  |  |

To document your program, create a *Word* document and include all of the following sections in the document.

**A. Program Description:**

Write a short description of the purpose of the program. Include a description of the inputs and the outputs. Describe the basic program structure (branching, looping, etc.).

**B. Program Flowchart:**

Draw a flowchart of the program using the Word graphics shapes. Include each section of the program in the flowchart.

**C. Source Code**

Insert the C++ Source Code into the document.

**D. Program Test Results:**

Insert a screen image of the program output that demonstrates the operation of the program.

**E. Tabulated Data.**

Collect the data and insert the values in the chart shown above. Verify that the program produces the correct results.

Save the document as a *PDF* file and submit the *PDF* document to *Blackboard*.