**Assignment # 5 & 6**

**Review (part 1 of 2) for test # 2**

Statement

**Due date is March 26th via Blackboard.** Hand in the header files only**.** This assignment, which happens to be the first review for test 2 as well, focuses on using passing by reference. On the next review we’ll work on how to apply this functions.

Instructions

1. Function 1 – name it “**pie**”, no arguments, and returns a double with the value: 3.14159265;
2. Function 2 – name it “**Exponent**”. It receives a double on its argument and returns a double. This function calculates the power of the input double, using as the base the Euler constant e: 2.718281828.
3. Include the following variables to the PLC structure declaration: a double named **System\_T, System\_D, System\_G,** and an array of 2 elements, type double, named **CharacteristicEffects**. Remove the **Alarm\_1** and **Alarm\_2** members.
4. Function 3 – name it “**Equation\_1**”. This function receives the memory address of a variable type PLC (structure). This is a **void** function.
   1. This function has a failsafe. If the member System\_T of the input structure is equal to 0, the value assigned to the first element (index 0) of **CharacteristicEffects** should be 0**.**
   2. If it is not 0, the same element in the array receives the value of the following equation (remember: this are members of the input structure. A label must be defined to identify such input):

.CharacteristicEffects [0] =

* + 1. Hint: Question 2 of this assignment is useful here. Notice the negative sign in front of the exponent. 1/System\_T is the power of the exponent.

1. Function 4 – name it “**capacitance**”. This function receives two doubles on its argument, and returns a double. Doubles are used here to be able to handle large decimal values.
   1. The first input of this function will represent a frequency; the second value, a capacitor. Mind the order requested.
   2. This function calculates the capacitance (i.e. capacitive reactance) according to the input values and returns the result characterized by the following equation:

XC =

Where: XC is the value returned by the function, π is a constant (hint: problem 1 of this assignment is useful here), f is the input frequency (in Hertz), and C is the value of the capacitor (in Farads). **Remember**: In C/C++, there is no implied math; you have to be specific when multiplying, dividing, and using brackets.

1. Function 5 – Name it “**inductance**”. Just as problem 5, this function receives two doubles on its argument, and returns a double with the result of the following equation:

XL2 π f L

Where: XL is the value returned by the function, π is a constant (hint: problem 1 of this assignment is useful here), f is the input frequency (in Hertz), and L is the value of the input inductor (in Henry). **Remember**: In C/C++, there is no implied math; you have to be specific when multiplying, dividing, and using brackets.

1. From the structure “**Filter\_RC**”, include the following members: “**cap\_LP**” and “**cap\_HP**”. Both **doubles**. Remove both **Capacitance\_LP** and **Capacitance\_HP**, leaving only a single **double** member called **Capacitance**. This has to be done in your header file.
2. In the same structure, please include the following double variables: **Fl** (F lower case L), **Fr** (F lowercase R), and **Fh** (F lowercase H).
3. Function 6 – Name it “**Equation\_2**”. This function will return a value with decimals that will be stored in the second element of the array CharacteristicEffects (index 1), of the structure PLC. That means, this function is a void, and receives in its argument the memory address of the structure PLC.

.CharacteristicEffects [1] = .System\_G \* (1 + .CharacteristicEffects [0]);

Remember these are members of the input structure. They are missing the name you assign to such input.

1. Function 7 – Name it “**Equation\_3**”. This function is a void, and receives the memory address of a structure Filter\_RC. This function performs the following calculation:

Fh =

Remember Fh, the resistance, and cap are members of the input structure.

1. Function 8 – Name it “**Equation\_4**”. This function is a void, and receives the memory address of a structure Filter\_RC. This function performs the following calculation:

Fl =

Remember Fh, the resistance, and cap are members of the input structure.

1. Function 9 – Name it “**Equation\_5**”. This is a void function that receives the memory address of a structure Filter\_RC. This function first calls for the functions **Equation\_3** and **Equation\_4**, and then performs the following calculation.

Fr =

Remember Fh, the resistance, and cap are members of the input structure.

1. Function 10 – Name it “**impedance**”. This function will **return a double**, and will receive **three doubles on its argument**. It will return the result of the following equation:

Z =

Where Z is the result to be returned by the function

1. Include two more members to the structure Filter\_RC: **Frequency, Impedance** and **Amplitude**. Delete the member **Period**.

Testing

Almost all these functions are self-sufficient. In the next review (not part of the assignment) we’ll test them so see what they could be used for.