EL2208	Problem Solving with C Lab.	Lab #6

Computing and plotting voltage across capacitor.

Use Putty+Xming like you did in Lab #5. Re-open the module if you forget the steps

This week you are going to compute and plot the voltage across the capacitor $\mathbf{V_c}$ for the circuit shown in Figure 1. The voltage as a function of time is given by the equation

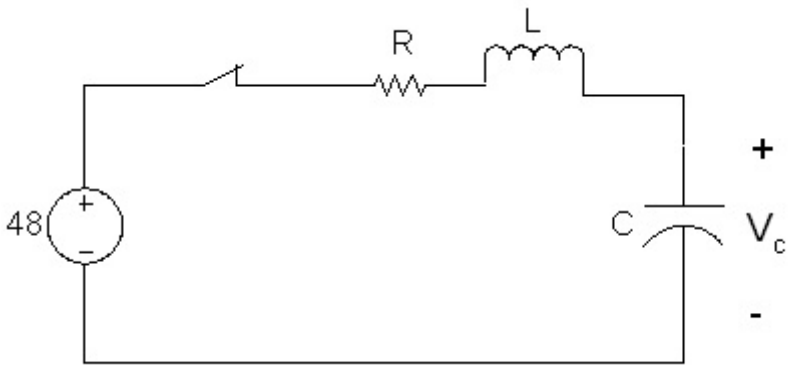

Figure 1 RLC circuit

$$V_c = 48 - 48e^{-\alpha t}\cos(\omega_d t) - 14e^{-\alpha t}\sin(\omega_d t) \quad \textbf{(1)}$$

where

$$\alpha = \frac{R}{2L} \quad \textbf{(2)}$$

$$\omega_d = \sqrt{\omega_0^2 - \alpha^2} \quad \textbf{(3)}$$

and

$$\omega_o = \frac{1}{LC} \quad \textbf{(4)}$$

Write a program to read in the values for the resistor (R), inductor (L) and capacitor (C) from an input file and compute $\mathbf{V_c}$ with the formula shown above. Do not ask the user at runtime to enter the values for the circuit elements. Use a for loop to iterate over time from **t=0** to **t=.01** seconds at intervals of .1 milliseconds. For each time step, print the time (t) and voltage (V_c), with a space between the two values. Format both number to 8 places of accuracy past the decimal. Do **NOT** put any column headings in your output.

Next, start a file called lab6.in with text editor and type the input values 280, .1 and .4e-6 for the resistor, inductor and capacitor, respectively. Run your program with redirection for both input and output files:

```
./lab6 < lab6.in > lab6.out
```

where `lab6` is the name of your executable file. To view the contents of the output file, type `more lab6.out`. There should be two columns of data, the first being time and the second being the voltage ($\mathbf{V_c}$). What voltage should you see at **t=0**? How about as time goes to infinity?

Next, Start Gnuplot by typing

```
gnuplot
```

on the Command Prompt. When it has started, type

```
plot "lab6.out" with lines
```

at the Gnuplot prompt. You should see the plot of the voltage across the capacitor as a function of time appear on your screen.

Show your lab instructor when you are done and submit your C code.

Exit Gnuplot by typing the word `exit` at the Gnuplot command prompt and log out from the server.