MECH 105: Homework 2

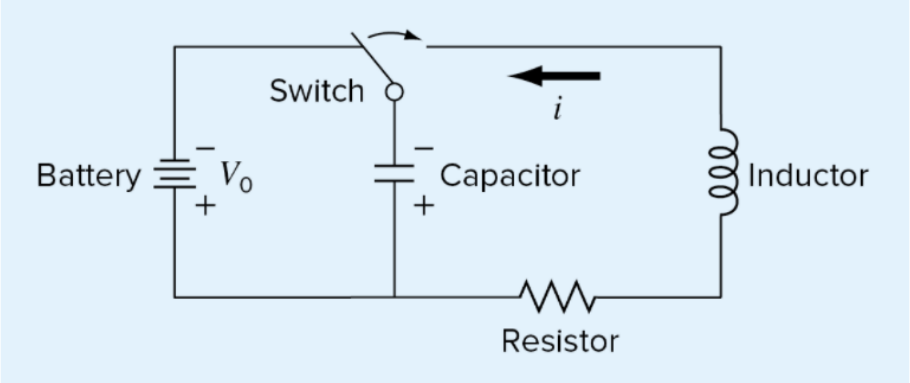
Created on: 21 August 2017
By: Samuel Bechara, PhD

Instructions

You need to use MATLAB for the following problems. When you submit your assignment for grading, please include your MATLAB code. I reccomend using either latex or markdown to create a single PDF file that is easy for us to grade. We will not grade homework that is difficult to decipher.

Problem 1

Consider a simple electric circuit consisting of a resistor, a capacitor, and an inductor as shown below.



The charge on the capacitor $q(t)$ as a function of time can be computed as

$$q(t) = q_0 e^{-Rt/(2L)} cos[\sqrt{\frac{1}{LC} - (\frac{R}{2L})^2}\, t]$$

where t=time, q_0 the initial charge, R=the resistance, L=inductance, and C=capacitance.

1. Use MATLAB to generate a plot of this function from $t = 0$ to 0.8 given that $q_0 = 10$, $R = 60$, $L = 9$, and $C = 0.00005$. Be sure to label your axis appropriately for full credit.
2. Using the subplot function, create another plot showing what happens when the capacitor is 10x greater ($C = 0.0005$). When you turn in your homework, you only need to show the subplot.
3. Explain why the response changed when the capacitance went up.

Problem 2

Here are some data for concentration (c) versus time (t) for the photodegradation of aqueous bromine:

t, min	c, ppm
10	3.4
20	2.6
30	1.6
40	1.3
50	1.0
60	0.5

These data can be described by the following function:

$$c = 4.84e^{-0.034t}$$

Use MATLAB to create a plot displaying both the data (using red diamond shaped) and the function (using a green, dashed line). Plot the function for t=0 to 70min. Be sure to include a legend and label axis appropriately.