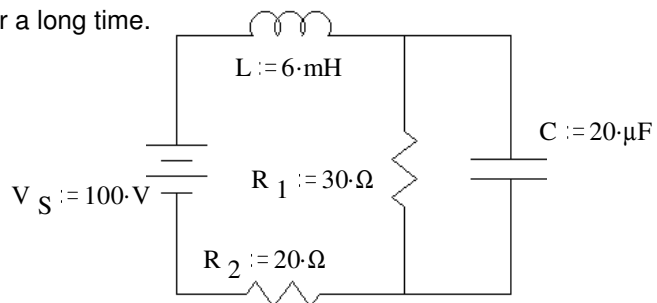


# ECE2210/00 Exam 2 given: Spring 06 (The space between problems has been removed.)

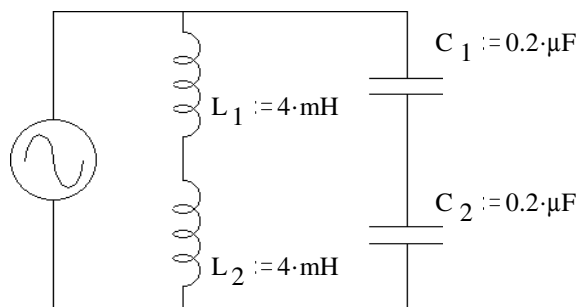
1. (10 pts) The following circuit has been connected as shown for a long time.

Find the energy stored in the capacitor and the inductor.

Also show the values of the voltage(s) and current(s) necessary to answer this question.



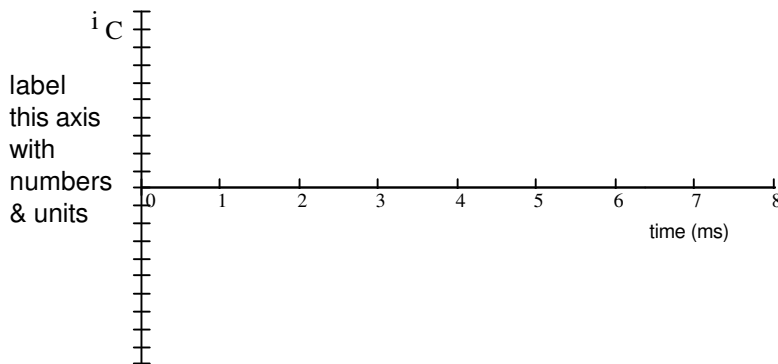
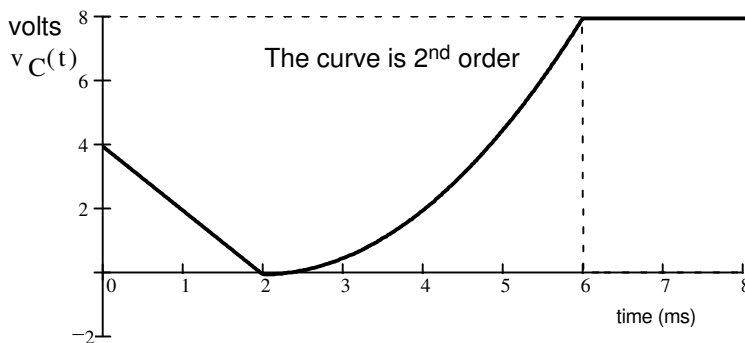
2. (9 pts) Find the resonant frequency (or frequencies) of the circuit shown (in cycles/sec or Hz).



3. (18 pts) The voltage across a 0.5 μF capacitor is shown below. Make an accurate drawing of the capacitor current. Label the y-axis of your graph (I've already done the time-axis).

$$C := 0.5 \cdot \mu\text{F}$$

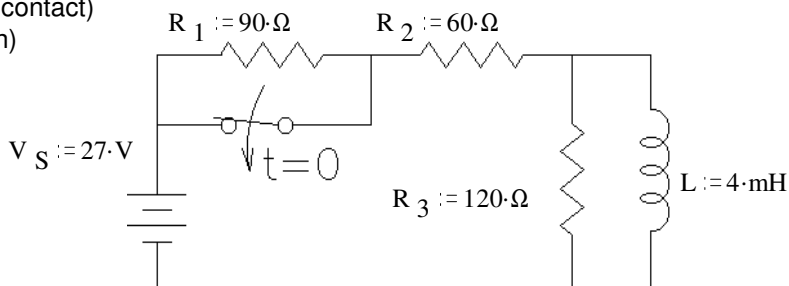
Note: You will be graded on the accuracy of your plot at 0, 2, 6, and 8 ms, so calculate those values and plot or label them carefully. Between those points your plot must simply be the correct shape.



4. (24 pts) The switch has been open (not making contact) for a long time and is switched closed (as shown) at time  $t = 0$ .

a) Find the complete expression for  $i_L(t)$ .

b) What is  $i_L$  when  $t = \tau$  ?

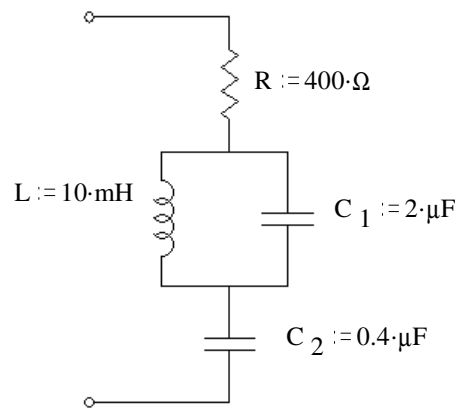


c) At time  $t = \tau$  the switch is opened again. Find the complete expression for  $i_L(t')$ , where  $t'$  starts at  $t = \tau$ .

Be sure to clearly show the time constant.

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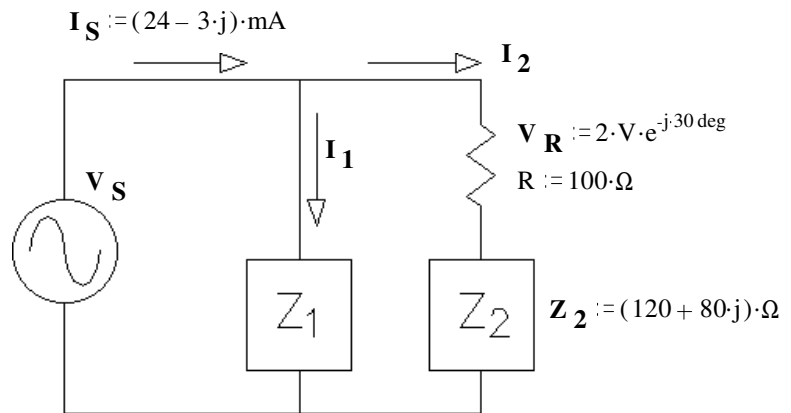
5. (14 pts)  $Z_{eq}$  is the total impedance between the two terminals.  
 Find  $Z_{eq}$  in rectangular or polar form (give me numbers).  
 For partial credit, you must show work and/or intermediate results.  
 $f := 1\text{-kHz}$



6. (19 pts) For partial credit, you must show work and/or intermediate results.  
 a) Find  $I_2$

b) Find  $V_S$

c) Find  $I_1$  in polar form.

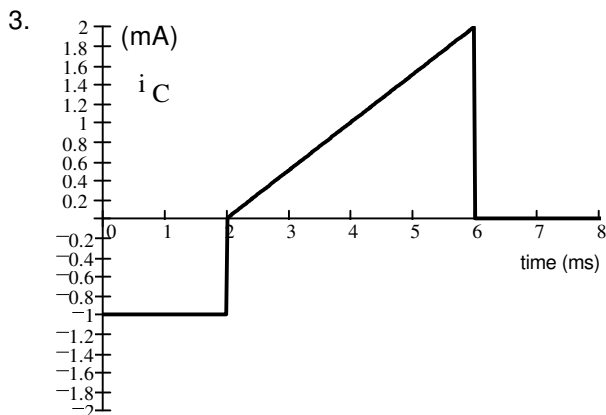


7. (6 pts)  $Z := 40\text{-}\Omega - 10\text{-}j\text{-}\Omega$  To make  $Z$  in the simplest way, what part(s) would you need?  
 Draw the parts and find the values.  $\omega := 50000 \frac{\text{rad}}{\text{sec}}$

**Answers**

1.  $W_L := 12\text{-mJ}$       $W_C := 36\text{-mJ}$

2.  $f_o = 5627\text{-Hz}$



4. a)  $i_L(t) = 450\text{-mA} - 270\text{-mA} \cdot e^{-\frac{t}{0.1\text{-ms}}}$

b)  $i_L(0.1\text{-ms}) = 351\text{-mA}$

c)  $i_L(t') = 180\text{-mA} + 171\text{-mA} \cdot e^{-\frac{t'}{60\text{-}\mu\text{s}}}$

OR  
 6 a)  $17.3 - 10j = 20\text{-mA} \cdot e^{-j30\text{-deg}}$

OR  
 b)  $4.61\text{-V} - 0.814\text{-}j\text{-V} = 4.68\text{-V} \cdot e^{-j10\text{-deg}}$

c)  $9.68\text{-mA} \cdot e^{j46.3\text{-deg}}$

7.  $R := 40\text{-}\Omega$       $C := 2\text{-}\mu\text{F}$      in series

OR  
 5.  $Z_{eq} = 400\Omega - 99.3j\Omega = 412\Omega \angle -13.9^\circ$

ECE 2210/00 Exam 2

Name \_\_\_\_\_

Scores:

Page 1&2 \_\_\_\_\_ of a possible 37 pts

Page 3&4 \_\_\_\_\_ of a possible 38 pts

Page 5&6 \_\_\_\_\_ of a possible 25 pts

Total \_\_\_\_\_ of a possible 100 pts