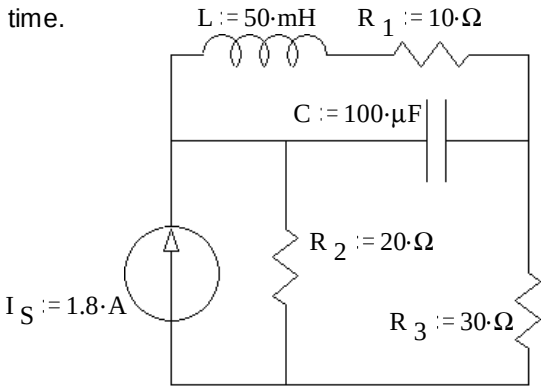
# ECE 2210/00 Exam 2 given: Fall 19

(The space between problems has been removed.)

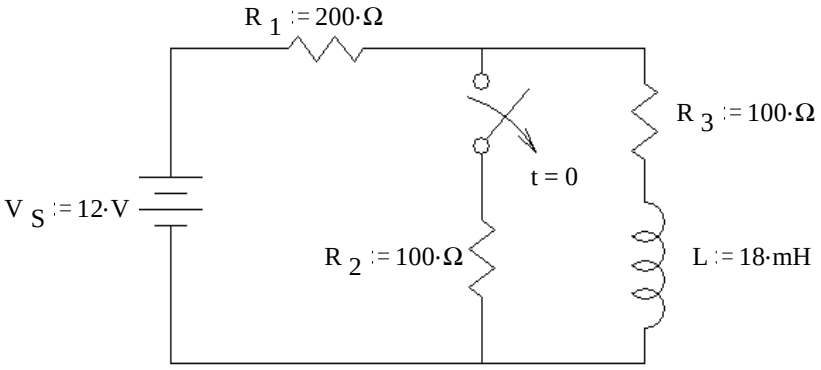
1. (13 pts) The following circuit has been connected as shown for a long time.

   Find the energy stored in the capacitor and in the inductor.
   Also show the values of the voltage(s) and current(s)
   necessary to answer this question.




2. (30 pts) The switch has been closed for a long time and is opened (as shown) at time $t = 0$.

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

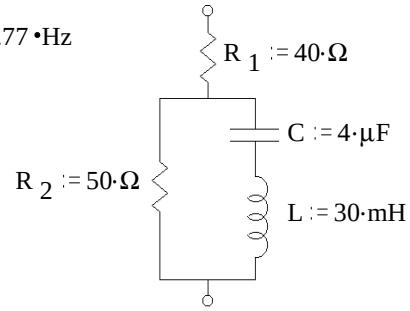



   b) What is $i_L$ when $t = 1.2\tau$ ? $i_L(1.2\cdot\tau) = ?$

   c) At time $t = 1.2\tau$ the switch is closed again. Find the complete expression for $i_L(t')$, where t' starts at $t = 1.2\tau$.
   Be sure to clearly show the time constant.

3. (17 pts) Find $\mathbf{Z_{eq}}$ in simple polar form (give me numbers).
   For partial credit, you must show work and/or intermediate results.

$f = 795.77 \cdot Hz$



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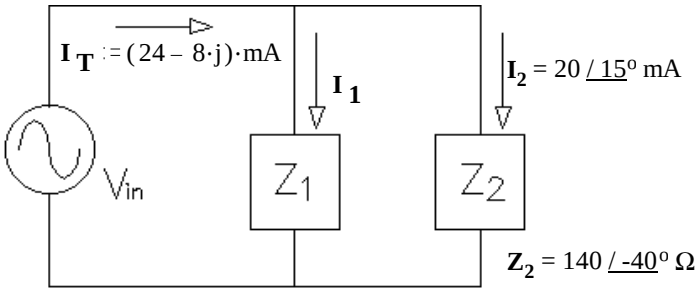
4. (22 pts) a) Find $\mathbf{V_{in}}$. For partial credit, you must show work and/or intermediate results.




b) Find $\mathbf{Z_1}$ in polar form.

c) To make $\mathbf{Z_1}$ in the simplest way, what part(s) would you need? Just circle the needed part(s), don't find the values.

resistor capacitor inductor power supply current source
Thevenin resistor Ideal transformer voltmeter ammeter scope

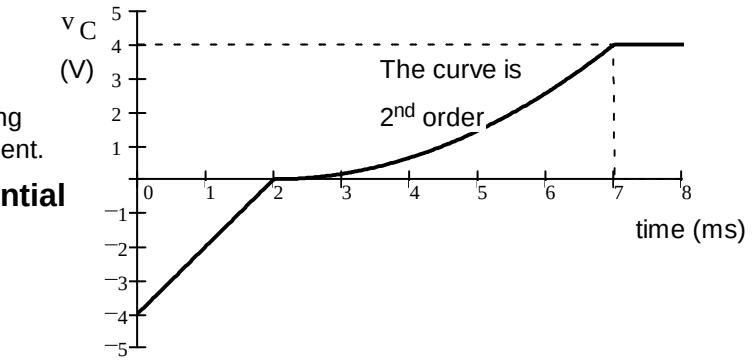
d) Circle 1: i) $\mathbf{I_2}$ leads the source voltage ($\mathbf{V_{in}}$) ii) $\mathbf{I_2}$ lags the source voltage ($\mathbf{V_{in}}$) by _____ degrees give number

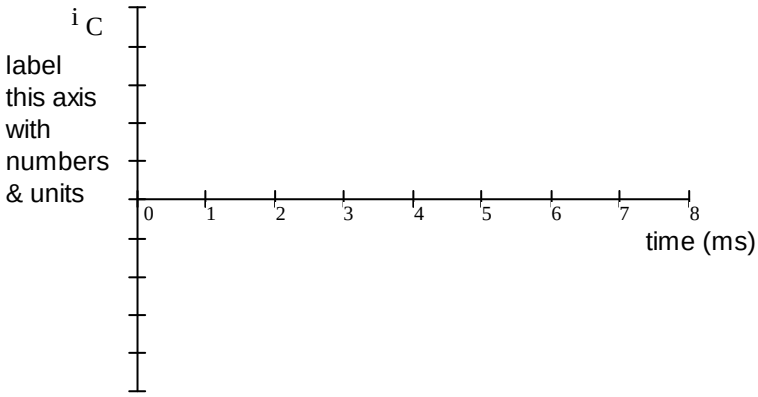
5. (18 pts) The voltage across a $5\ \mu F$ capacitor is shown below. Make an accurate drawing of the capacitor current. Make reasonable assumptions where necessary. Label your graph. $C := 5\cdot\mu F$

Note: You will be graded on the accuracy of your plot at 0, 2, 7 and 8 ms, so calculate those values and plot or label them carefully. Between those points your plot must simply be the correct shape.

You **MUST SHOW** how you calculate your values starting from the original relationships between voltage and current.

That is: **Start** with the **interger** and/or **differential** equations for the capacitor!




## Answers

1. 0.6·A 9·mJ , 6·V 1.8·mJ 2. a) $40\cdot mA - 16\cdot mA\cdot e^{\frac{-t}{60\cdot\mu s}}$ b) 35.2·mA c) $24\cdot mA + 11.2\cdot mA\cdot e^{\frac{-t'}{108\cdot\mu s}}$
3. 82.5 Ω $\angle$ 14° 4. a) 2.8 $\angle$ -25° V b) 200 $\angle$ 45.4° Ω c) resistor inductor d) i) 40° **ECE Exam 2 Fall 19 p2**
5. Flat at 10mA to 2ms. Instantly down to 0mA. Ramp from 0 at 2ms to 8mA at 7ms. Instantly down to 0mA. Remains at 0mA