

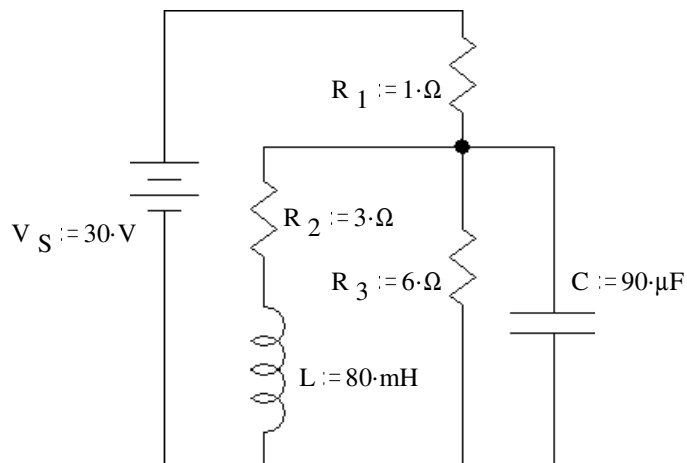
ECE2210 Exam 2 given: Fall 09

(The space between problems has been removed.)

1. (16 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.

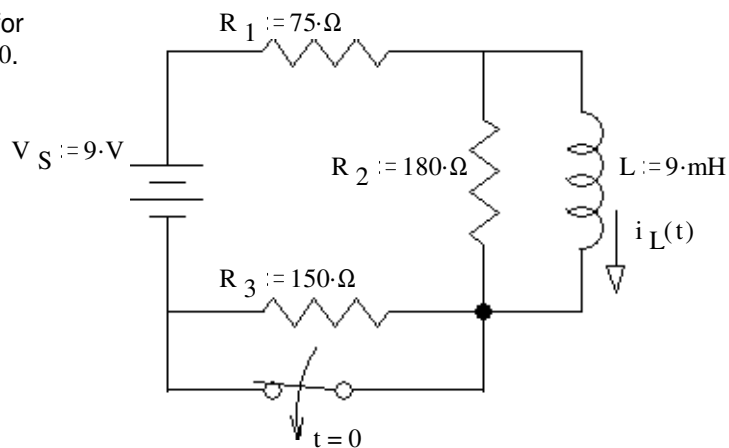


2. (24 pts) The switch has been open (not making contact) for a long time and is switched closed (as shown) at time $t = 0$.

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

b) Find i_L at time $t = 1.2\tau$. $i_L(1.2\tau) = ?$

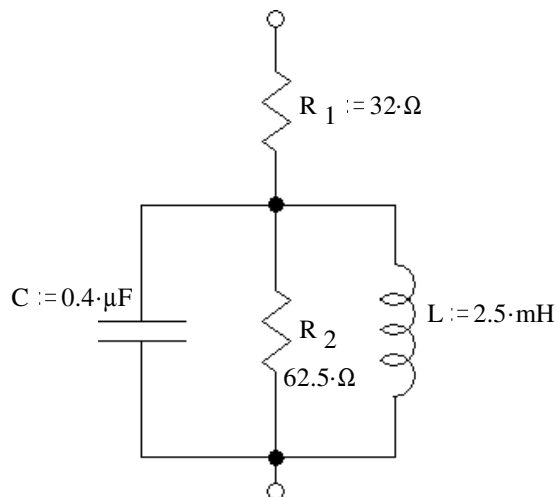
c) At time $t = 1.2\tau$ the switch is opened again. Will the time constant be different now? If yes, find the new time constant.



3. (18 pts) Find Z_{eq} in simple polar form (give me numbers).

You must show work and intermediate results. $f := 3.1831 \cdot \text{kHz}$

$Z_{eq} = \underline{\hspace{2cm}} / \underline{\hspace{2cm}}^\circ$
Polar Form



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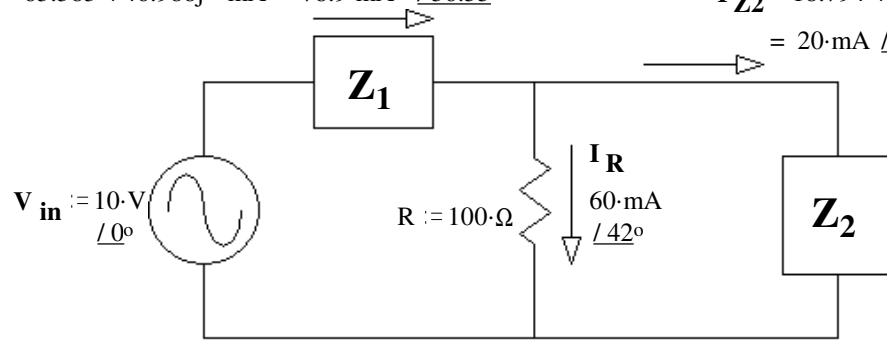
4. (22 pts)

$$I_{Z1} = 63.383 + 46.988j \text{ mA} = 78.9 \text{ mA} \angle 36.55^\circ$$

$$I_{Z2} = 18.794 + 6.84j \text{ mA}$$

a) Find Z_2

b) Find Z_1 in polar form.



c) Circle the best, most comprehensive answer:

i) Z_1 must contain a capacitor

ii) Z_1 must contain a resistor and a capacitor

iii) Z_1 must contain an inductor

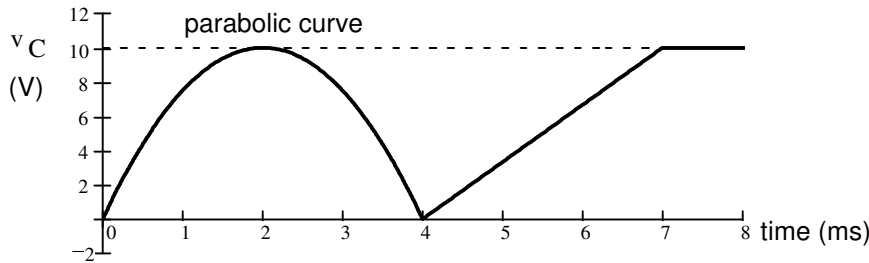
iv) Z_1 must contain a resistor and an inductor

5. (20 pts) The voltage across a $15 \mu\text{F}$ capacitor is shown below. Make an accurate drawing of the capacitor current. Make reasonable assumptions where necessary. Label your graph.

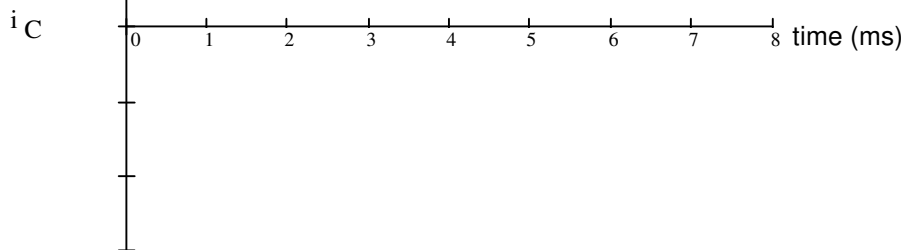
Note: You will be graded on the accuracy of your plot at 0, 2, 4, 7 and 8 ms, so calculate those values and plot or label them carefully. Between those points your plot must simply be the correct shape.

You **MUST SHOW** how you calculate your values.

$$C := 15 \mu\text{F}$$



label this axis with numbers & units



Answers

1. $6.67 \cdot A$ $1.78 \cdot J$ $20 \cdot V$ $18 \cdot mJ$ 2. a) $120 \cdot mA - 80 \cdot mA \cdot e^{-\frac{t}{170 \mu s}}$ b) $95.9 \cdot mA$ c) $90 \cdot \mu s$

3. $78 \Omega \angle 22.6^\circ$ 4. a) $300 \Omega \angle 22^\circ$ b) $86.7 \Omega \angle -72.5^\circ$ c) ii)

5. Ramps from $+150 \text{ mA}$ down to -150 mA at 4 ms , jumps up to $+50 \text{ mA}$ and stays there until 7 ms , 0 after that.