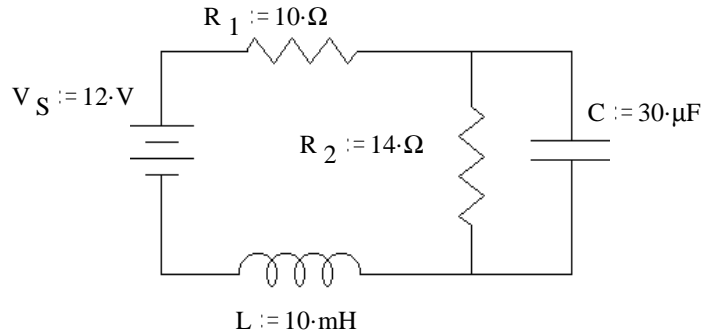


ECE 2210/00 Exam 2 given: Spring 14 (The space between problems has been removed.)

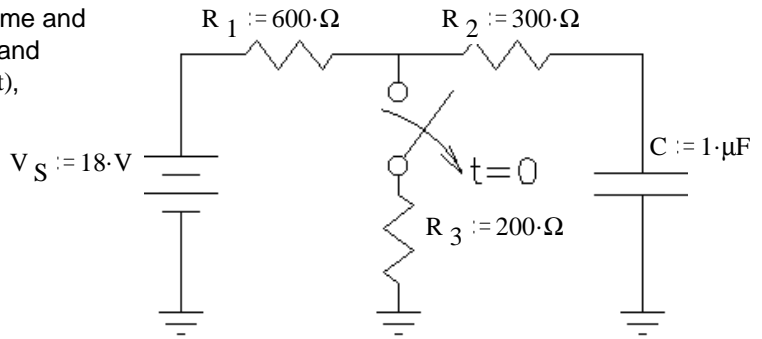
1. (11 pts) The following circuit has been connected as shown for a long time.

Find the energy stored in the capacitor and the inductor (2 answers).

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



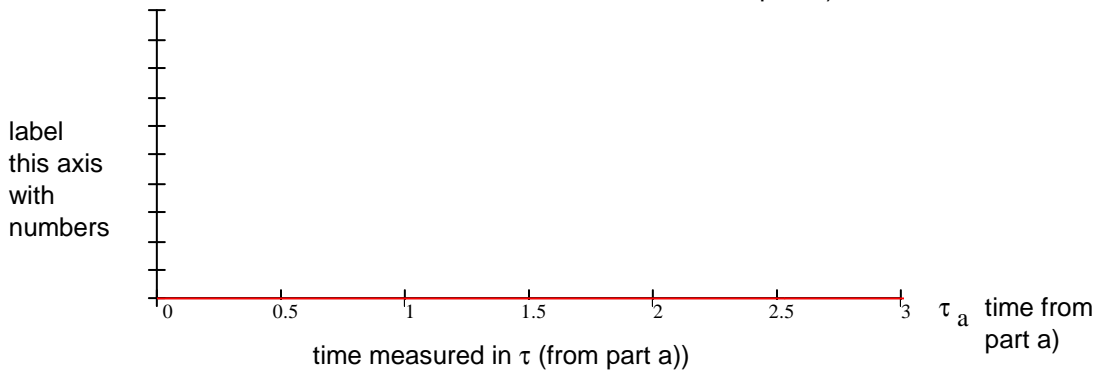
2. (34 pts) a) The switch has been closed for a long time and is opened (as shown) at time $t = 0$. Find the initial and final conditions and write the full expression for $v_C(t)$, including all the constants that you find.



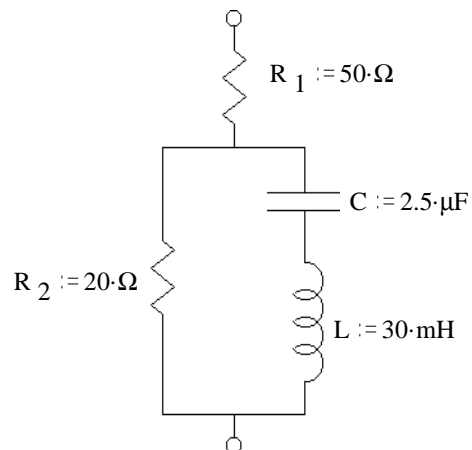
b) Find v_C at time $t = \tau$.

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

d) Draw a sketch of the capacitor voltage below. Show values on the vertical scale. The horizontal scale is marked in units of τ from part a).



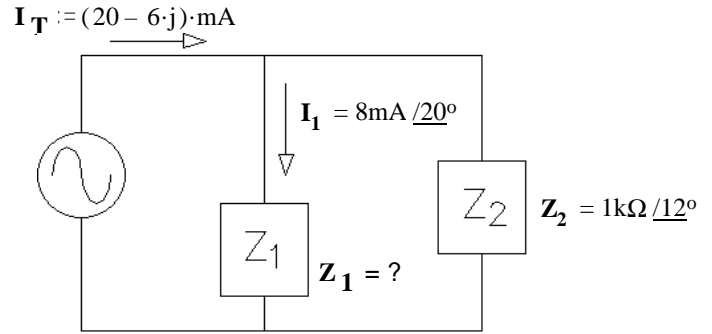
3. (18 pts) Find Z_{en} in simple polar form (give me numbers). For partial credit, you must show work and/or intermediate results. $f = 636.62 \text{ Hz}$



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4. (19 pts)

a) Find Z_1 . For partial credit, you must show work and/or intermediate results.



b) To make Z_1 in the simplest way, what part(s) would you need? Just circle the needed part(s), don't find the values.

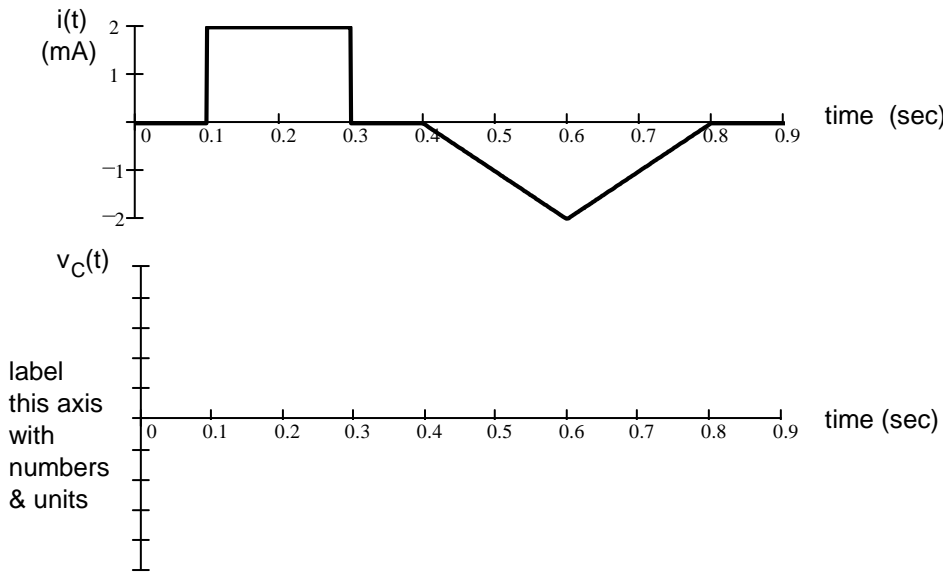
- | | | | | |
|-------------------|-------------------|-----------|--------------|----------------|
| resistor | capacitor | inductor | power supply | current source |
| Thevenin resistor | Ideal transformer | voltmeter | ammeter | scope |

4. 18 pts) The current through a capacitor is shown below. Make an accurate drawing of the capacitor voltage. Make reasonable assumptions where necessary. Label your graph.

Note: You will be graded on the accuracy of your plot at 0, .1, .3, .4, .6, .8 and 0.9 sec, 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. a) $0.735 \cdot \text{mJ}$ $1.25 \cdot \text{mJ}$ 2. a) $18 \cdot V - 13.5 \cdot V \cdot e^{-\frac{t}{0.9 \cdot \text{ms}}}$ b) $13.03 \cdot V$ c) $4.5 \cdot V + 8.5 \cdot V \cdot e^{-\frac{t}{0.45 \cdot \text{ms}}}$

3. $60.8 \Omega / 9.46^\circ$

4. a) $1.9 \text{k}\Omega / -43^\circ$

b) resistor capacitor

