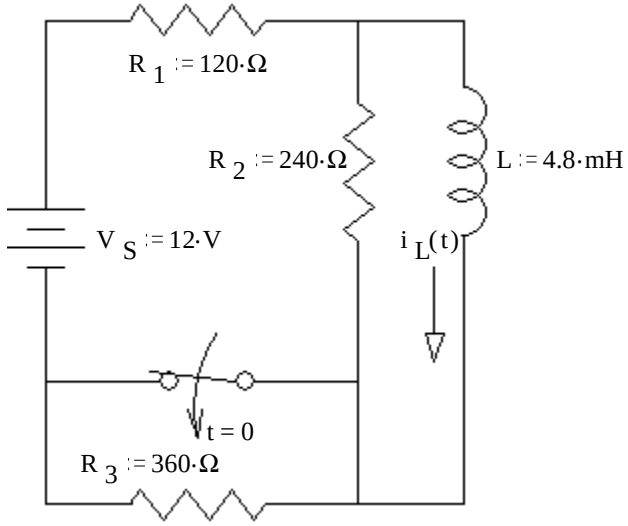
ECE 2210/00 Exam 2 given: Fall 20

(Some space between problems has been removed.)

1. (33 pts) The switch has been open for a long time and is closed (as shown) at time $t = 0$.

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



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

   c) At time $t = 1.2\tau$ the switch is opened 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.

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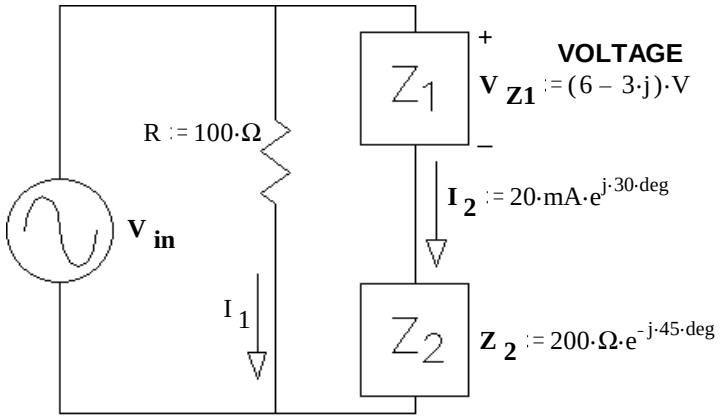
Problems are out-of-order

3. (30 pts) For partial credit, you must show work and/or intermediate results.

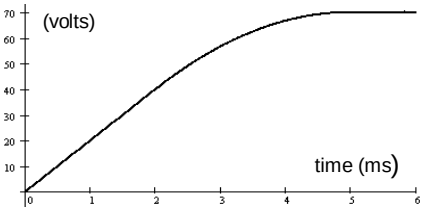
a) Find $\mathbf{Z_1}$



b) Find $\mathbf{V_S}$

c) Find $\mathbf{I_1}$ in polar form.

Answers

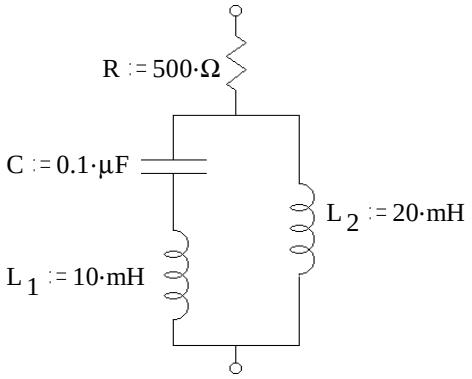
1. a) $100\cdot mA - 75\cdot mA\cdot e^{\frac{-t}{60\cdot \mu s}}$
   b) $77.4\cdot mA$
   c) $25\cdot mA + 52.4\cdot mA\cdot e^{\frac{-t'}{30\cdot \mu s}}$
2. $1300\Omega \angle -67.38^o$
3. a) $184.8 - 279.9\cdot j\ \Omega = 335.4 \angle -56.6^o\ \Omega$
   b) $3.864 - 1.035\cdot j\ V = 4\ V \angle -15^o\ V$
   c) $106.6 \angle -22.25^o\ mA$
4. 

2. (20 pts) $\mathbf{Z_{eq}}$ is the total impedance between the two terminals.

   Find $\mathbf{Z_{eq}}$ in simple **polar form** (give me numbers).

   For partial credit, you must show work and/or intermediate results.

   $f := 3183.1 \cdot Hz$



4. (17 pts) The graph below shows the current through a $20\ \mu F$ capacitor. Make an accurate drawing of the capacitor voltage. Make reasonable assumptions where necessary. $v_c(0) = 0$. Label your graph (numbers).

   Note: You will be graded on the accuracy of your plot at 0, 2, 5, and 6 ms, so calculate those values and plot 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!

capacitor current (A)