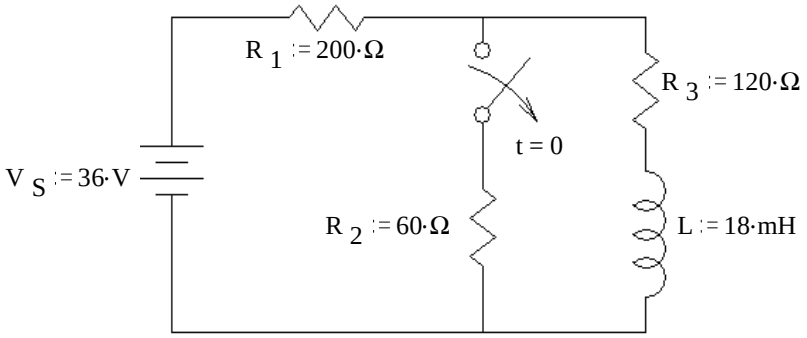
ECE 2210/00 Exam 2 given: Spring 17 (The space between problems has been removed.)

1. (32 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 $i_L(t)$.



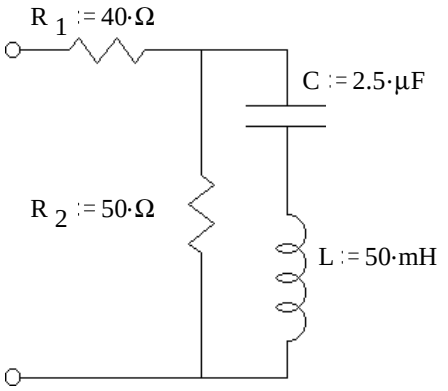
   b) Find i_L at time $t = 1.5\tau$. $i_L(1.5\cdot\tau) = ?$

   c) At time $t = 1.5\tau$ the switch is closed again. Find the complete expression for $i_L(t')$, where t' starts when the switch closes. Be sure to clearly show the time constant.

3. (21 pts) Find $\mathbf{Z_{eq}}$ in simple polar form (give me numbers).

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

$\omega := 2000\cdot\frac{rad}{s}$

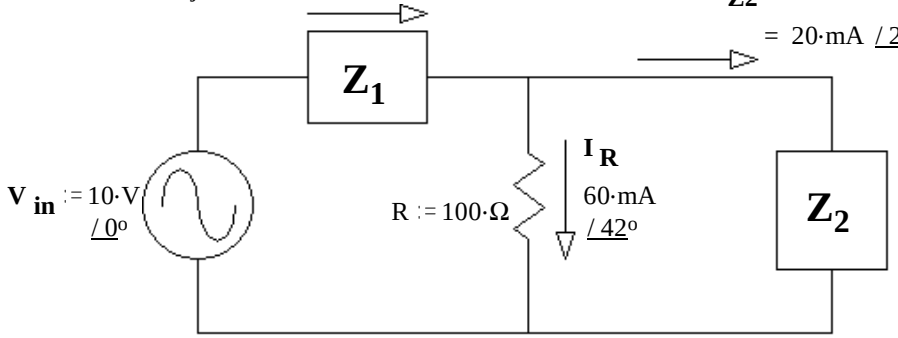


3. (26 pts)

   a) Find $\mathbf{Z_2}$

$\mathbf{I_{Z1}} = 63.383 + 46.988j$ •mA = 78.9·mA ∠36.55°

$\mathbf{I_{Z2}} = 18.794 + 6.84j$ •mA = 20·mA ∠20°



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

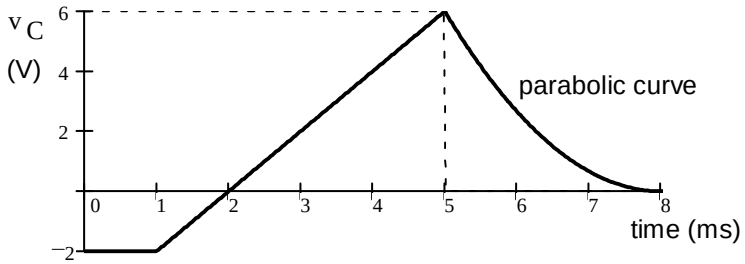
3. c) Circle the best, most comprehensive answer:
   i) $\mathbf{Z_1}$ must contain a capacitor
   ii) $\mathbf{Z_1}$ must contain a resistor and a capacitor
   iii) $\mathbf{Z_1}$ must contain an inductor
   iv) $\mathbf{Z_1}$ must contain a resistor and an inductor

4. 21 pts) The voltage across a capacitor is shown below. Make an accurate drawing of the capacitor current. Make reasonable assumptions where necessary. Label your graph.

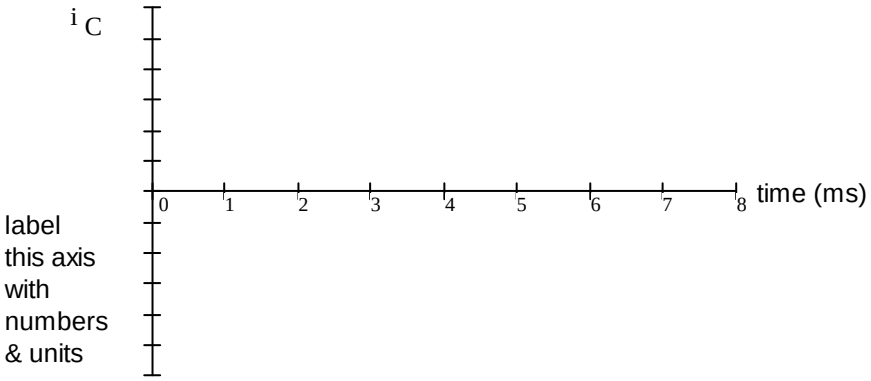
   Note: You will be graded on the accuracy of your plot at $0, 1, 5$ and 8 ms, so calculate those values and plot or label them carefully. Between those points your plot must simply be the correct shape.

   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!



$C := 1.5 \cdot \mu F$



Answers Folder Number _____

1. a) $112.5 \cdot mA - 62.5 \cdot mA \cdot e^{\frac{-t}{56.25 \cdot \mu s}}$
   b) $98.6 \cdot mA$
   c) $50 \cdot mA + 48.6 \cdot mA \cdot e^{\frac{-t'}{108.3 \cdot \mu s}}$
2. $82.5\ \Omega$ /-14.0°
3. a) $300\ \Omega$ / 22° b) $86.7\ \Omega$ / -72.5° c) ii)
4.