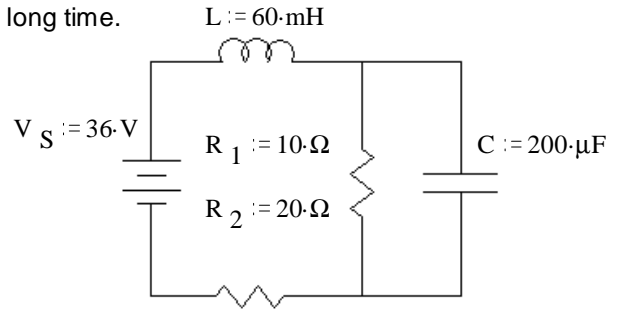# ECE 2210/00 Exam 2 given: Spring 22   (Some space has been removed)

1. (12 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.

$L := 60 \cdot mH$

$V_S := 36 \cdot V$

$R_1 := 10 \cdot \Omega$

$R_2 := 20 \cdot \Omega$

$C := 200 \cdot \mu F$

2. (32 pts) a) The switch has been closed for a long time and is opened (as shown) at time $t = 0$.

   a) Find the initial and final conditions and write the full expression for $v_C(t)$, including all the constants that you find.
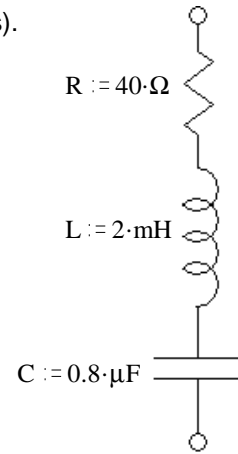
$R_1 := 100 \cdot \Omega$

$R_2 := 50 \cdot \Omega$

$I_S := 200 \cdot mA$

$t = 0$

$C := 0.6 \cdot \mu F$

$R_3 := 80 \cdot \Omega$
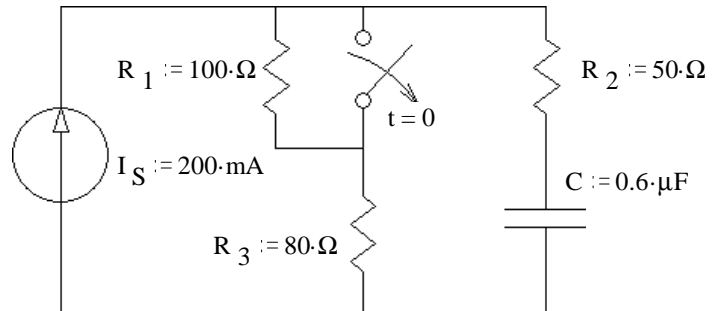
b) What is v_C when $t = 0.8\tau$? $v_C(0.8 \cdot \tau)$ = ?

c) At time $t = 0.8\tau$ 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.

3. (10 pts) Find $\mathbf{Z_{eq}}$ in any complex form (give me numbers & units).

$f := 3 \cdot kHz$

$R := 40 \cdot \Omega$

$L := 2 \cdot mH$

$C := 0.8 \cdot \mu F$

Prob 3 _____/ 10
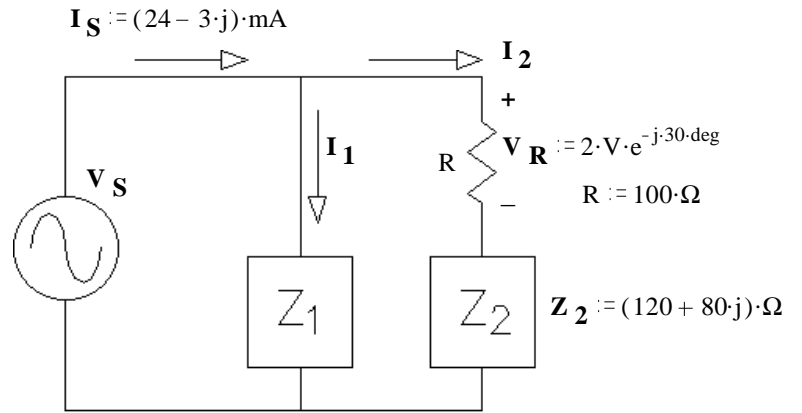
4. (10 pts) Reduce the following to a single complex number in either rectangular or polar form.

$$6 \cdot e^{j \cdot 90 \cdot deg} + \cfrac{1}{\left(\cfrac{1}{50}\right) + \cfrac{1}{\left(-j \cdot \cfrac{1}{0.04}\right)}}$$

Prob 4 _____/ 10

5. (22 pts) For partial credit, you must
   show work and/or intermediate results.
   a) Find I_2 in any form.

$I_S := (24 - 3 \cdot j) \cdot mA$

I_2

$+$

$V_R := 2 \cdot V \cdot e^{-j \cdot 30 \cdot deg}$

$R := 100 \cdot \Omega$

I_1
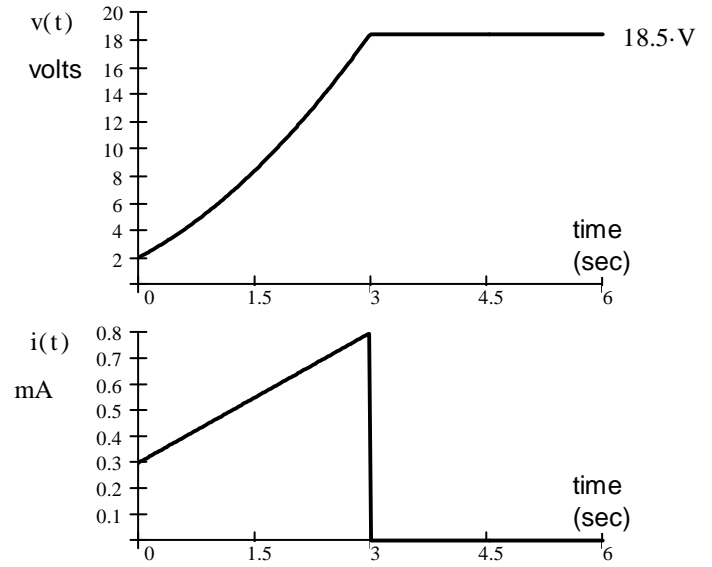
V_S

R

Z_1

Z_2 $Z_2 := (120 + 80 \cdot j) \cdot \Omega$

$-$

b) Find V_S in polar form.

c) Find I_1 in any form.

6. (14 pts) The current through and the voltage across an unknown component are shown below.

a) What type of component is it?
Give a good reson for your choice.

v(t) volts — 18.5·V

i(t) mA

b) What is the value of the component?

Prob 6 _____/ 14

Total _____ / 100