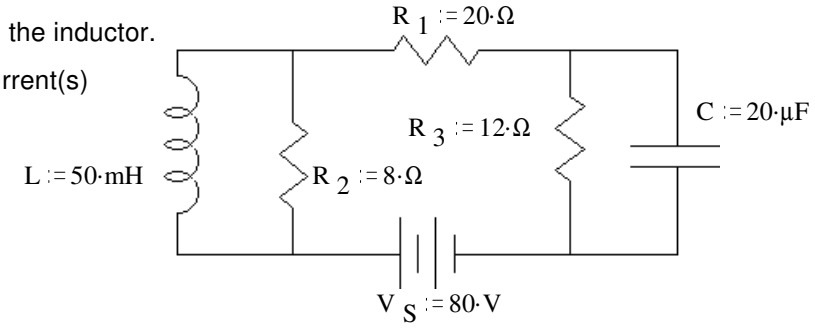
ECE2210/00 Exam 2 given: Spring 07 (The space between problems has been removed.)

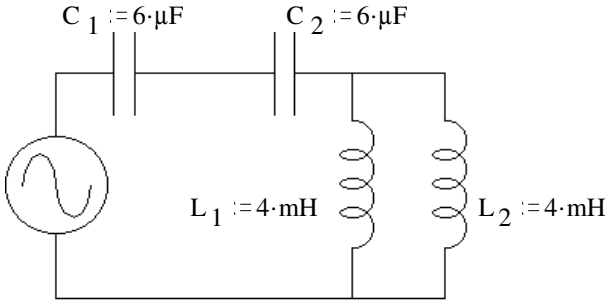
1. (13 pts) The following circuit has been connected as shown for a long time.

   Find the energy stored in the capacitor and in the inductor.

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

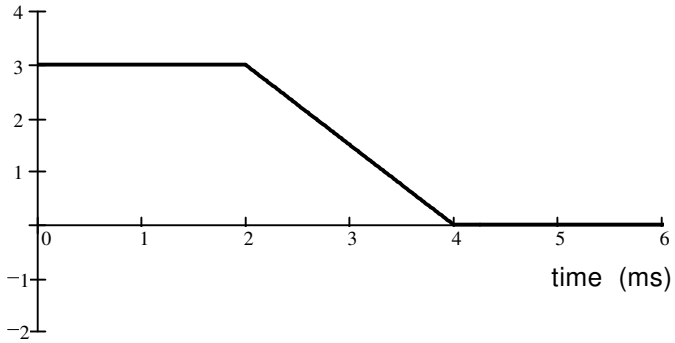


2. (10 pts) Find the resonant frequency (or frequencies) of the circuit shown (in cycles/sec or Hz).

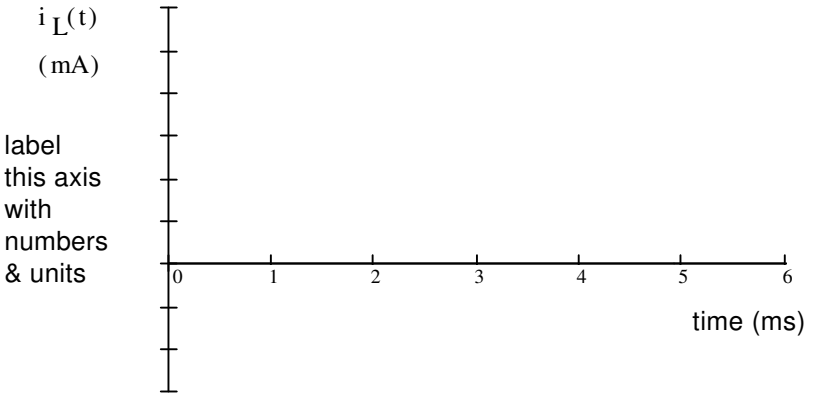


3. (13 pts) The voltage across a 0.2 H inductor is shown below. Make an accurate drawing of the inductor current. Make reasonable assumptions where necessary. Label your graph.

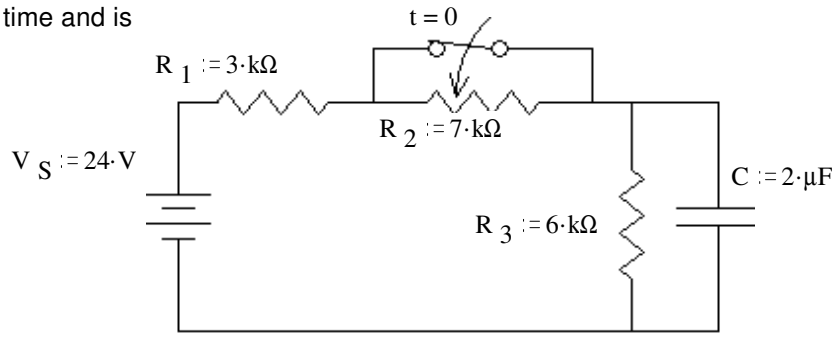
   Note: You will be graded on the accuracy of your plot at 0, 2, 4, and 6 ms, so calculate those values and plot or label them carefully. Between those points your plot must simply be the correct shape.



$L := 0.2 \cdot H$



4. (21 pts) The switch has been open for a long time and is closed (as shown) at time $t = 0$.
   Find the complete expression for $v_C(t)$.



   b) What is v_C when $t = 2\tau$? $v_C(2 \cdot \tau) = ?$

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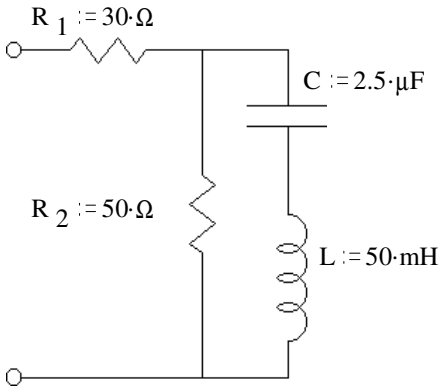
5. (16 pts) Find $\mathbf{Z_{eq}}$ in simple polar form (give me numbers).

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

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

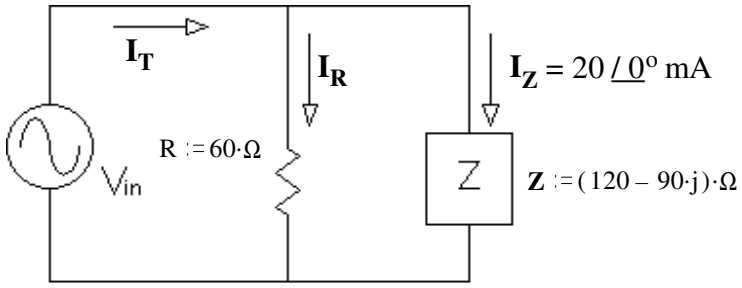


$\mathbf{Z_{eq}}$ = _____ / _____ ^{o}

Polar Form

6. (19 pts)

a) Find $\mathbf{V_{in}}$ in polar form.



b) Circle 1: i) $\mathbf{V_{in}}$ leads $\mathbf{I_Z}$ ii) $\mathbf{V_{in}}$ lags $\mathbf{I_Z}$

Why? Show numbers: _____ > _____ _____ < _____

Or explain by other means:

c) Find $\mathbf{I_T}$ in any form.

7. (8 pts) $\mathbf{Z} := 400 \cdot \Omega \cdot e^{-j \cdot 60\,deg}$ To make $\mathbf{Z}$ in the simplest way, what part(s) would you need?

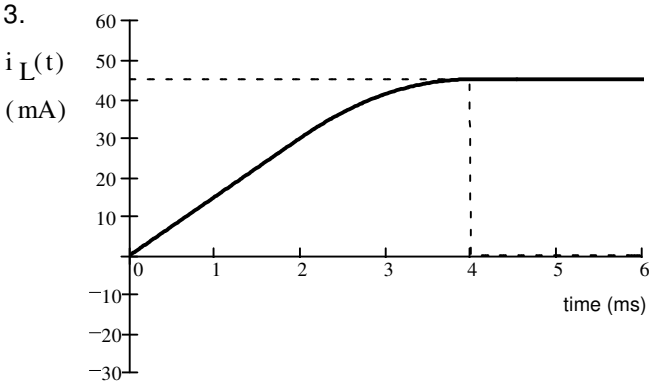
$f := 500 \cdot Hz$ Draw the parts and find the values.

Answers

1. $W_L := 156 \cdot mJ$ $W_C := 9 \cdot mJ$

2. $f_o = 2055 \cdot Hz$

3.



4. a) $v_C(t) = 16 \cdot V - 7 \cdot V \cdot e^{-\frac{t}{4 \cdot ms}}$

b) $15.05 \cdot V$

5. $Z_{eq} = 72.8\Omega \angle -15.95^{o}$

6 a) $\mathbf{V_{in}} = 3V \angle -36.9^{o}$

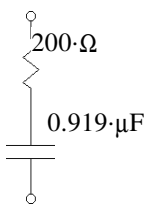
b) ii) __-37__ < ___0___

$\mathbf{V_{in}}$ has negative imaginary part ,
$\mathbf{I_Z}$ has no phase angle

OR

c) $\mathbf{I_T} = 60 - 30j\ mA = 67.1mA \angle -26.6^{o}$

7.



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Name _____

Scores:

Page 1&2 _____ of a possible 36 pts

Page 3&4 _____ of a possible 37 pts

Page 5&6 _____ of a possible 27 pts

Total _____ of a possible 100 pts