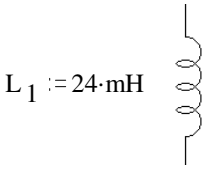
ECE 2210/00 Exam 2 given: Fall 07

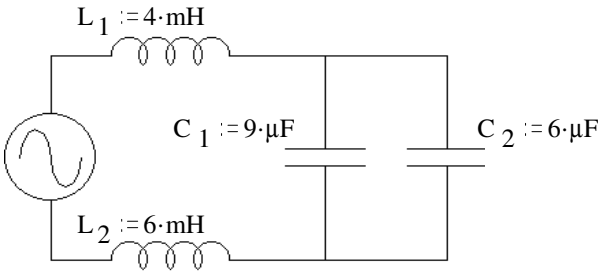
(The space between problems has been removed.)

1. (6 pts) Add another inductor to the one shown to make an equivalent inductance of 8mH. You may add it in series or in parallel, but make sure that it is clear to me what your connection is.



$L_{eq} := 8 \cdot mH$

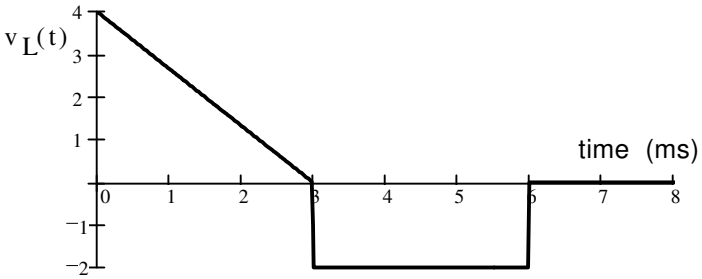
2. (10 pts) Find the resonant frequency (or frequencies) of the circuit shown (in cycles/sec or Hz).

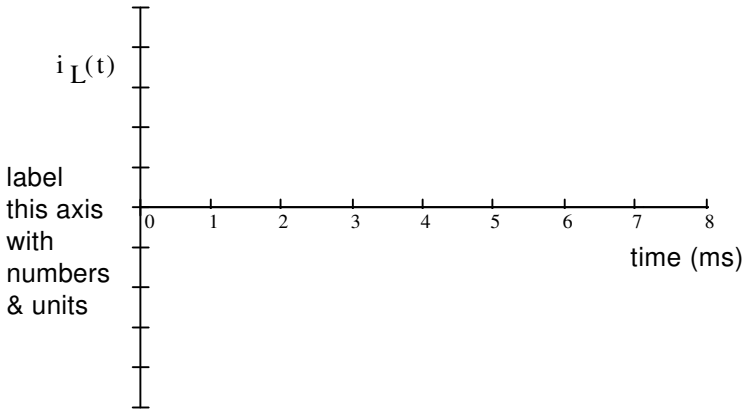


3. (16 pts) The voltage across a $0.06\ \text{H}$ inductor is shown. Make an accurate drawing of the inductor current. Make reasonable assumptions where necessary. Label your graph.

   Note: You will be graded on the accuracy of your plot at $0, 3, 6,$ and $8\ \text{ms}$, so calculate those values and plot or label them carefully. Between those points your plot must simply be the correct shape.

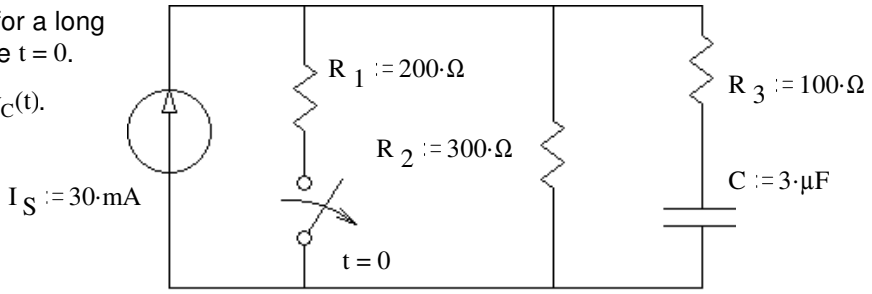
$L := 0.06 \cdot H$ $\quad$ $i_L(0) = 0$





4. (20 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 $v_C(t)$.

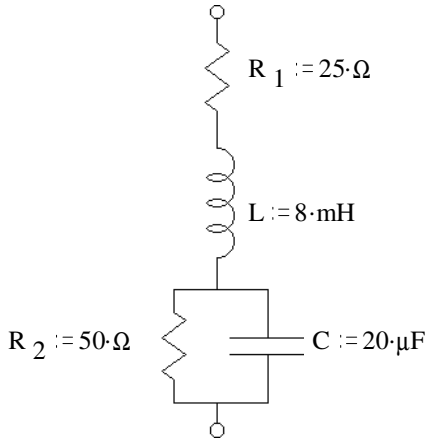


   b) If the switch were closed again, would the time constant be different? If yes, find the new time constant.

5. (18 pts) Find $\mathbf{Z_{eq}}$ in simple polar form (give me numbers).

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

$f = 79.577 \cdot Hz$

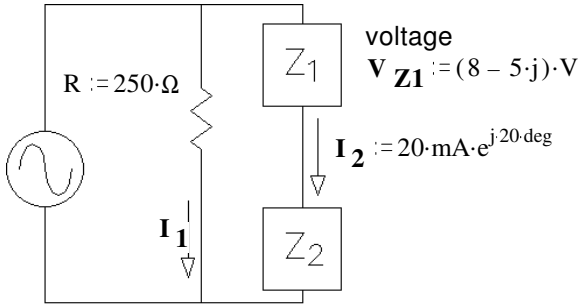


$\mathbf{Z_{eq}}$ = _____ /_____ **Polar Form**

6. (20 pts) For partial credit, you must show work and/or intermediate results.

a) Find $\mathbf{I_1}$

$\mathbf{V_{in}} := 20 \cdot V \cdot e^{j \cdot 30 \cdot deg}$



b) Circle 1:

i) $\mathbf{V_{in}}$ leads $\mathbf{I_2}$ ii) $\mathbf{V_{in}}$ lags $\mathbf{I_2}$

_____ > _____ _____ < _____

Why? Show numbers, or explain by other means.

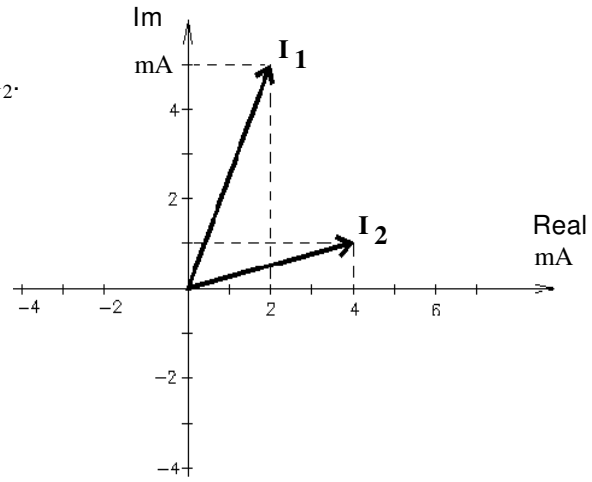
c) Find $\mathbf{Z_2}$ in polar form

7. (10 pts) The two phasors shown represent two currents, i_1 and i_2.

a) Draw the phasor representation for $i_3 = i_2 - i_1$

b) Find the magnitude of i_3.

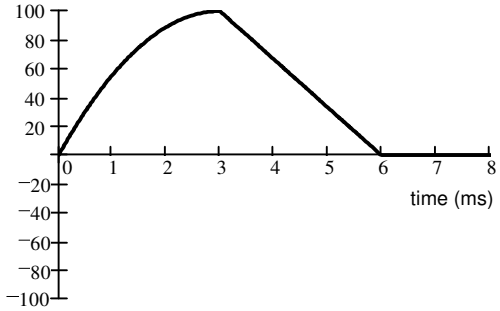
c) Find the phase angle of i_3 (in degrees).



Answers

1. 12·mH 2. 411·Hz

3.



4. a) $9 \cdot V - 5.4 \cdot V \cdot e^{\frac{-t}{1.2 \cdot ms}}$ b) 66·ms

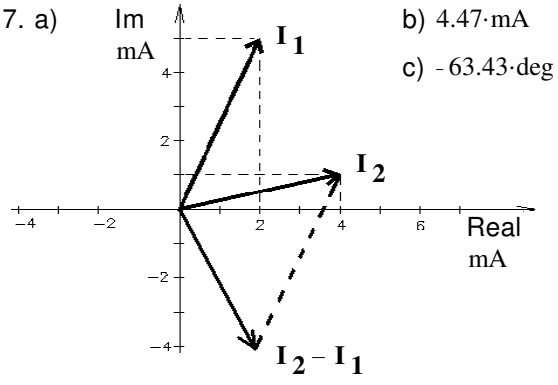
5. 66.9 Ω / -13.8°

6. a) $\mathbf{I_1}$ = 80 mA / 30°

b) i) $\mathbf{V_{in}}$ leads $\mathbf{I_2}$ 30° < 20°

c) $\mathbf{Z_2}$ = 883 / 38.15° Ω

7. a)



b) 4.47·mA

c) - 63.43·deg