

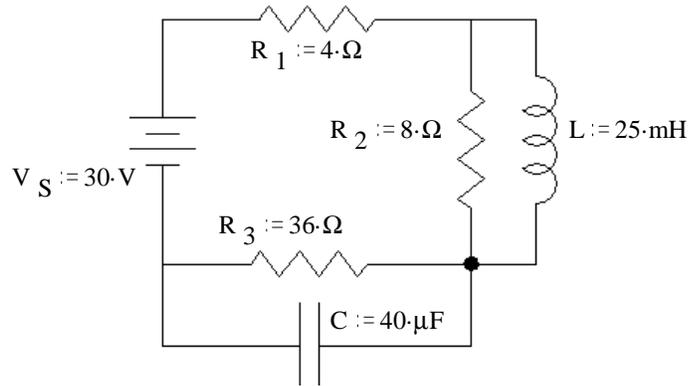
ECE2210 Exam 2 given: Fall 08

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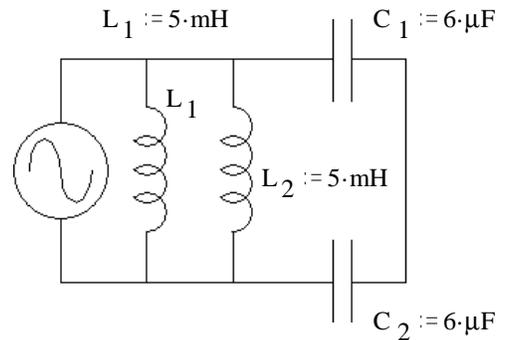
1. (11 pts) The following circuit has been connected as shown for a long time.

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.

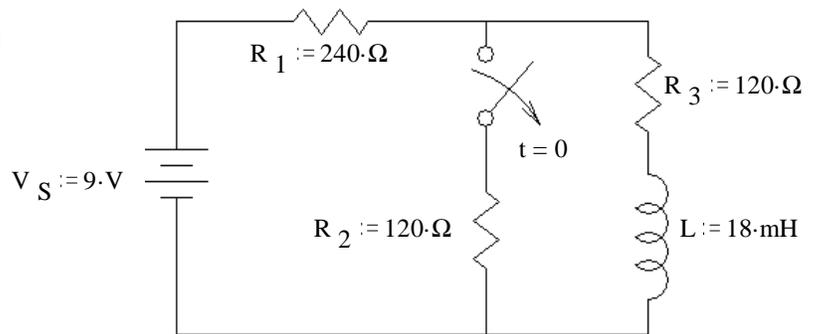


2. (9 pts) Find the resonant frequency (or frequencies) of the circuit shown (in cycles/sec or Hz).



3. (26 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 $i_L(t)$.



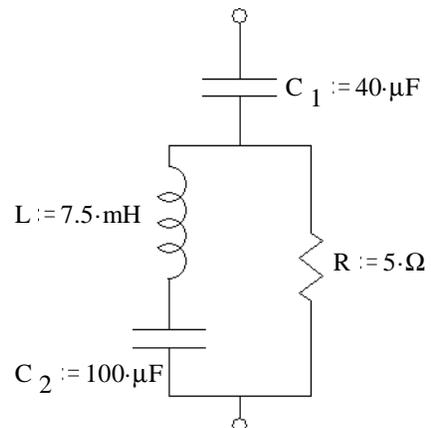
b) What is i_L when $t = 1.2\tau$? $i_L(1.2\tau) = ?$

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

4. (17 pts) Find Z_{eq} in simple polar form (give me numbers).

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

$f = 318.31 \cdot \text{Hz}$



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5. (23 pts)

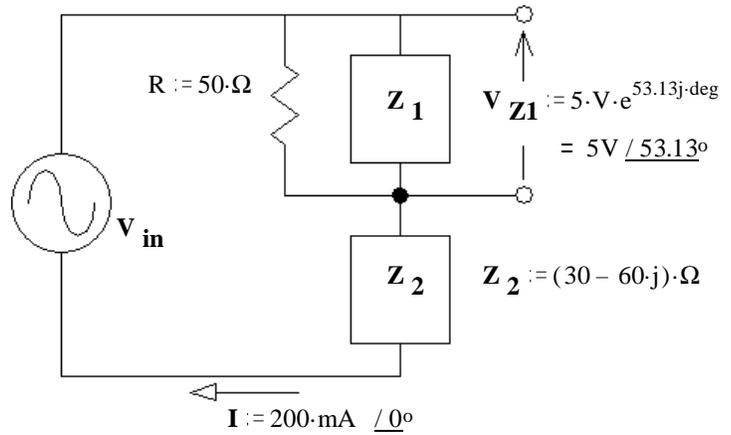
a) Find V_{in} .

b) Find Z_1 in polar form.

c) Circle 1:

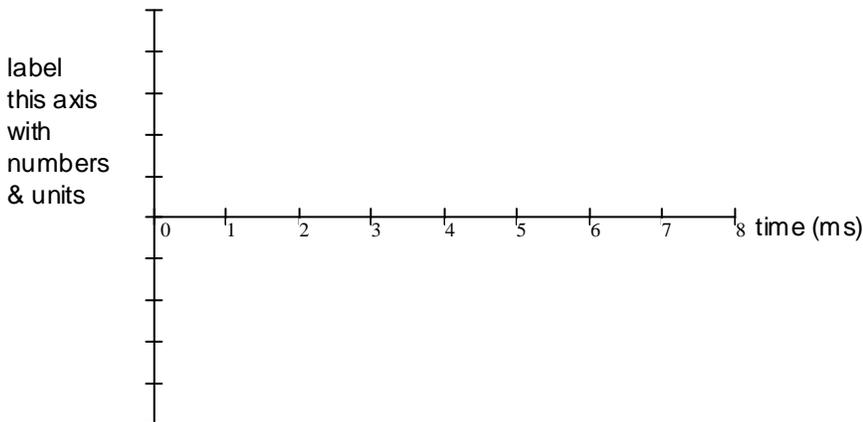
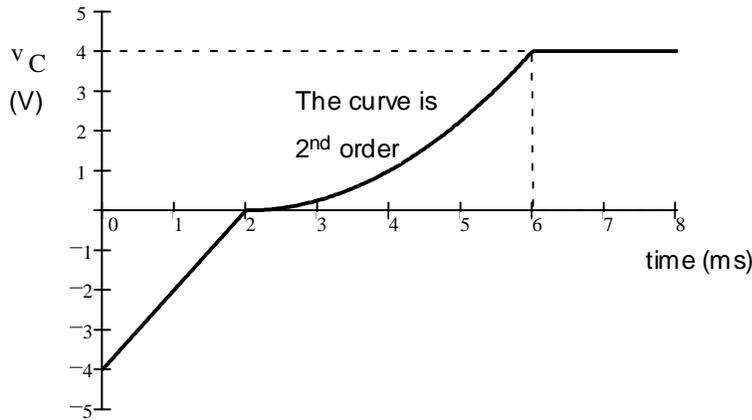
- i) The source current leads the source voltage
- ii) The source voltage leads the source current

d) By how much? I.E. what is the phase angle between the voltage and current?



6. (14 pts) The voltage across a $4 \mu\text{F}$ 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, 2, 6 and 8 ms, so calculate those values and plot or label them carefully. Between those points your plot must simply be the correct shape.



Answers

1. $0.75 \cdot A$ $7.03 \cdot \text{mJ}$ $27 \cdot V$ $14.6 \cdot \text{mJ}$

2. $1838 \cdot \text{Hz}$

3. a) $25 \cdot \text{mA} - 10 \cdot \text{mA} \cdot e^{-\frac{t}{50 \cdot \mu\text{s}}}$

b) $22 \cdot \text{mA}$

c) $15 \cdot \text{mA} + 7 \cdot \text{mA} \cdot e^{-\frac{t}{90 \cdot \mu\text{s}}}$

4. $11.24 \Omega \angle -69.15^\circ$

5. a) $12.04V \angle -41.63^\circ$

b) $31.0 \angle 82.9^\circ \Omega$

c) i) d) 41.63°

6. 0 - 2ms: flat at 8mA

2ms - 6ms: ramps from 0 to 8mA

Beyond 6ms: 0mA