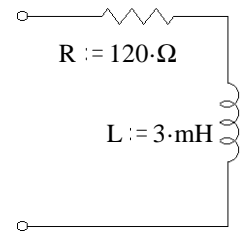


Warning: This homework is longer than normal -- DO NOT put it off until the last minute.
In the week of the exam, lab will be replaced by a video lecture

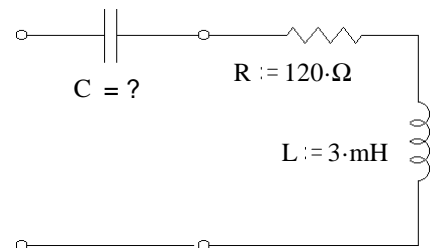
1. For the circuit shown, find the following:

a) At what frequency would the magnitude of the total impedance be 240Ω ?



b) At this frequency, what is the phase angle of the impedance?

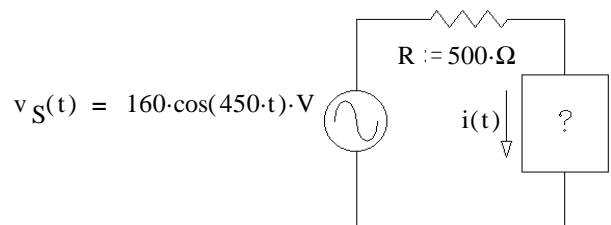
c) At this frequency, you want to add a capacitor in series to make the circuit appear purely resistive (the impedance has no imaginary component). Find the value of the capacitor.



2. You need to design a circuit in which the current $i(t)$ leads the voltage $v_S(t)$ by 36° of phase.

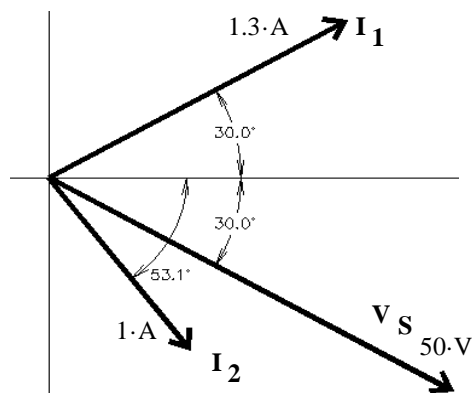
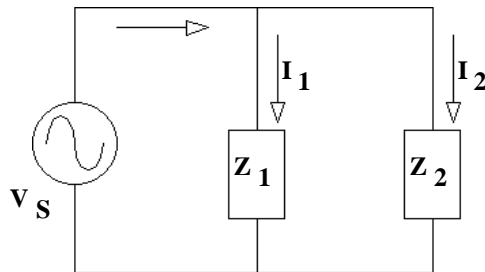
a) What should go in the box: R, L, C?

b) Find its value.

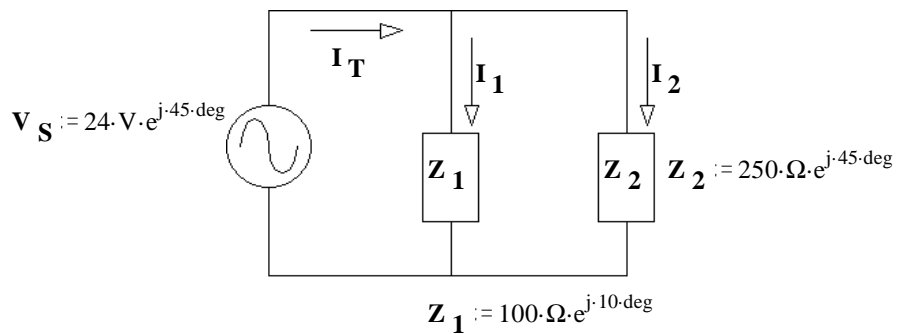


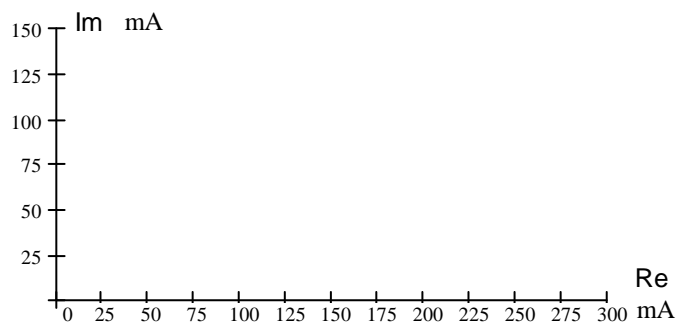
ECE 2210 homework Ph3 p2

3. The phasor diagram at right shows the source voltage and two branch currents of a parallel circuit. Find the impedance of each of the two branches.



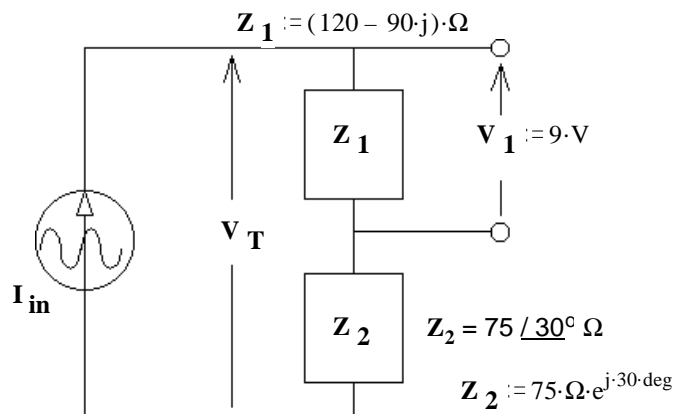
4. a) Find all the currents, I_1 , I_2 , and I_T .





b) Draw a phasor diagram showing I_1 , I_2 , and I_T to scale so that you can show that they obey KCL.

5. a) Find the AC current source, I_{in} in polar form.

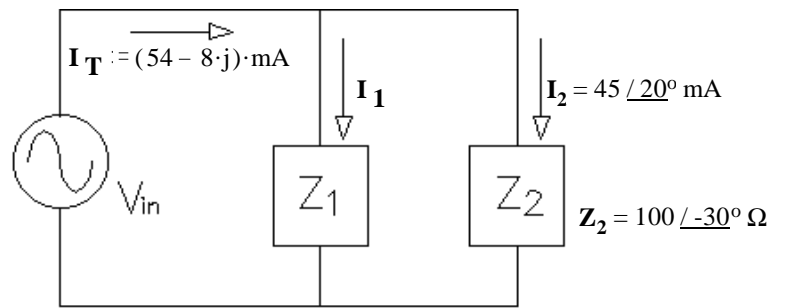


b) Find V_T .

- c) Choose one: i) The source current leads the source voltage.
 ii) The source current lags the source voltage.

ECE 2210 homework Ph3 p4

6. a) Find Z_1 .



b) To make Z_1 in the simplest way, what part(s) would you need? Just determine the needed part(s) from the list below and state why you made that choice, don't find the values.

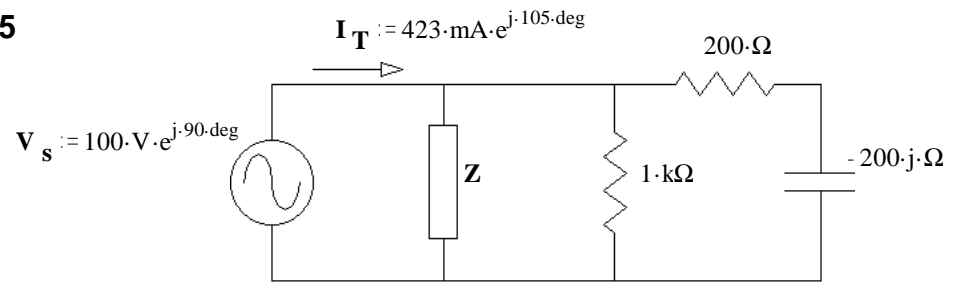
- | | | | | |
|-------------------|-------------------|-----------|--------------|----------------|
| resistor | capacitor | inductor | power supply | current source |
| Thevenin resistor | Ideal transformer | voltmeter | ammeter | scope |

c) Choose one: i) I_2 leads the source voltage (V_{in}) ii) I_2 lags the source voltage (V_{in})

d) Choose one: i) I_1 leads I_2 ii) I_1 lags I_2

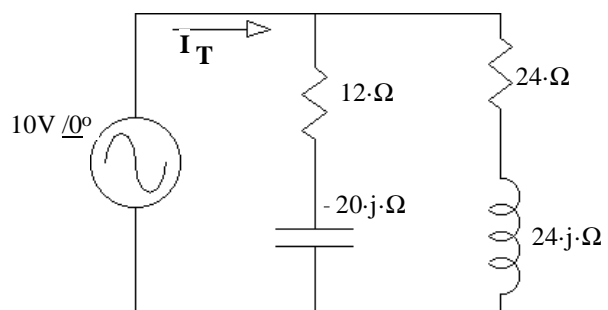
ECE 2210 homework Ph3 p5

7. Find Z.



ECE 2210 homework Ph3 p6

8. a) Find the total impedance of the circuit.

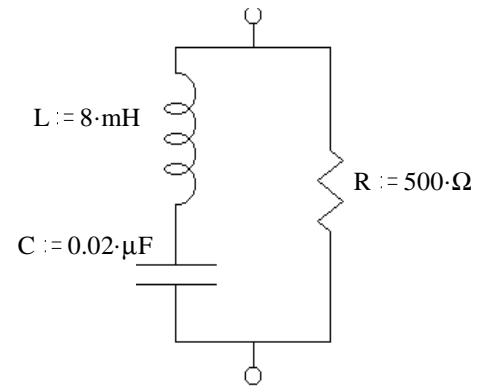


b) Find $\mathbf{I_T}$.

ECE 2210 homework Ph3 p7

9. Find Z_{eq} in simple polar form.

$$f := 8000 \cdot \text{Hz}$$



Answers

1. a) 11·kHz b) 60° c) $0.0694 \cdot \mu\text{F}$
2. a) C b) $6.12 \cdot \mu\text{F}$
3. $Z_1 = (19.2 - 33.3j) \cdot \Omega$ $Z_2 = (46.0 + 19.6j) \cdot \Omega$
4. a) $(0.197 + 0.138j) \cdot \text{A} + 0.096 \cdot \text{A} = 0.293 + 0.138j \cdot \text{A}$
5. a) $60 / \underline{36.87^\circ} \text{ mA}$ b) $11.54 / \underline{21^\circ} \text{ V}$ c) i)
6. a) $172 / \underline{53.4^\circ} \Omega$ b) phase angle > 0 , resistor and inductor
c) i) d) ii)
7. $657 \Omega / \underline{67.4^\circ}$ 8. a) $21.86 \Omega / \underline{-20.38^\circ}$ b) $0.457 \text{ A} / \underline{20.38^\circ}$
9. $382 \Omega / \underline{-40.2^\circ}$

