

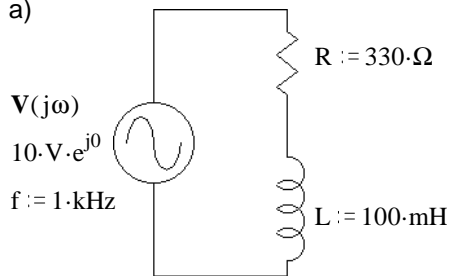
# ECE 3600 homework 2A

1. Express the impedance of a 5.2mH inductor at 60 Hz in polar form.

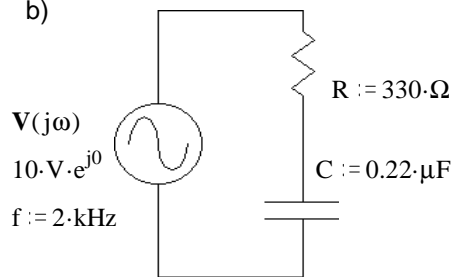
2. A capacitor impedance has a magnitude of  $240\Omega$  at a frequency of 1.8kHz. What is the value of capacitor?

3. Find  $Z_{eq}$  in each case.

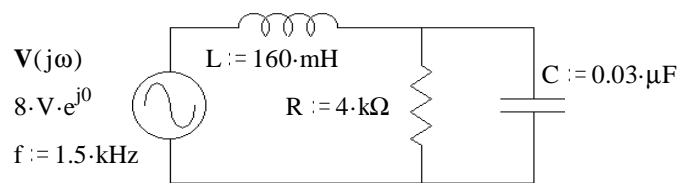
a)



b)



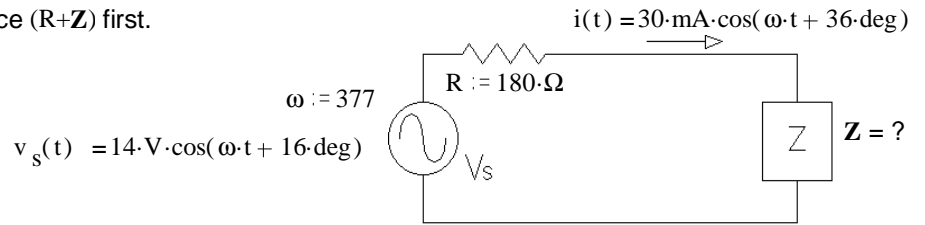
c)



4. Find the current  $I(j\omega)$  in each case above.

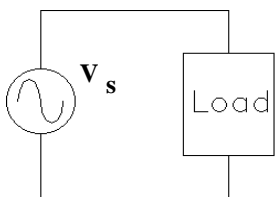
- a)
- b)
- c)

5. a) Find  $Z$ . Hint: Find the total impedance ( $R+Z$ ) first.

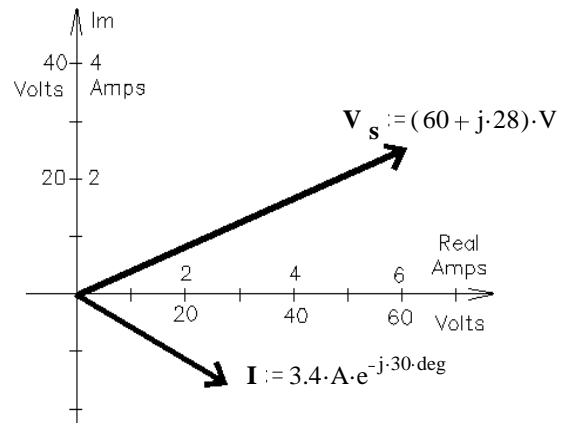


- b) Which leads, current or voltage?
- c) By how much? I.E. what is the phase angle between the voltage and current?

6. The phasor diagram at right shows the voltage and current in the circuit below



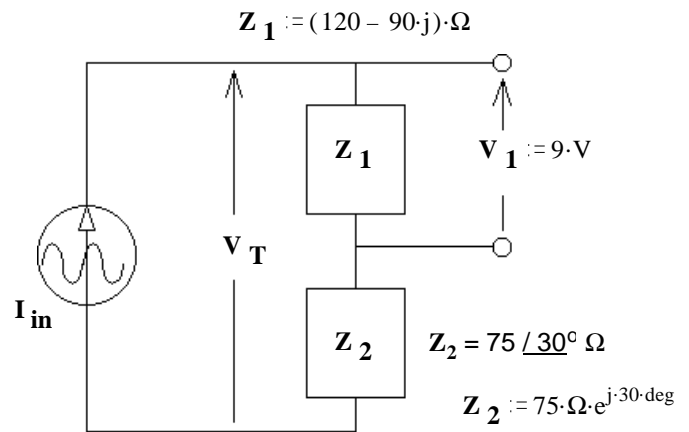
Assume the load consists of a resistor in series with a reactive component and the frequency is 60 Hz.



- a) What is the magnitude of the impedance?
- b) What is the value of the resistor?
- c) What is the reactive component (type and value)?

ECE 3600 homework 2A p3

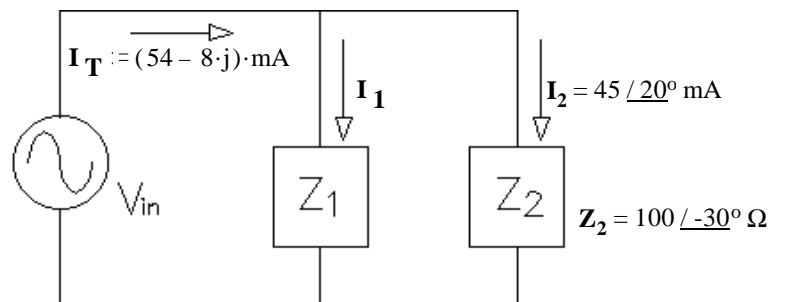
7. a) Find the AC current source,  $I_{in}$  in polar form.



b) Find  $V_T$ .

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

8. a) Find  $Z_1$ .

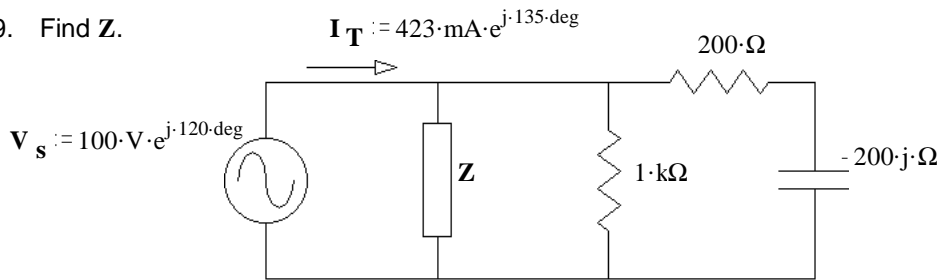


b) To make  $Z_1$  in the simplest way, what part(s) would you need? Just determine the needed part(s) from the list below and state why you made that choice, don't find the values.

- |                   |                   |           |              |                |
|-------------------|-------------------|-----------|--------------|----------------|
| 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  $I_2$

9. Find  $Z$ .



**Answers**

1.  $1.96 \Omega / 90^\circ$     2.  $0.368 \mu\text{F}$
3. a)  $(330 + 628.3 \cdot j) \cdot \Omega = 709.7 \Omega / 62.29^\circ$             b)  $(330 - 361.7 \cdot j) \cdot \Omega = 489.6 \Omega / -47.63^\circ$             c)  $1.82 \text{k}\Omega / -15.2^\circ$
4. a)  $(6.6 - 12.5 \cdot j) \cdot \text{mA} = 14.1 \text{mA} / -62.29^\circ$             b)  $(13.8 + 15.1 \cdot j) \cdot \text{mA} = 20.4 \text{mA} / 47.63^\circ$             c)  $4.4 \text{mA} / 15.2^\circ$
5. a)  $259 - 160 \cdot j$             b) The current leads the voltage            c)  $20^\circ$
6. a)  $19.5 \cdot \Omega$             b)  $11.2 \cdot \Omega$             c) inductor     $42.3 \cdot \text{mH}$
7. a)  $60 / 36.87^\circ \text{ mA}$             b)  $11.54 / 21^\circ \text{ V}$             c) i)
8. a)  $172 / 53.4^\circ \Omega$             b) phase angle  $> 0$ , resistor and inductor
- c) i)            d) ii)            9.  $657 \Omega / 67.4^\circ$