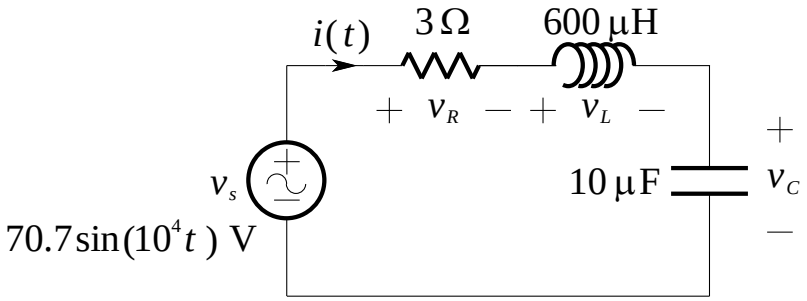
11 Sinusoidal Steady-State Analysis

1.

Consider the circuit shown below:



Find:

a) The total impedance $\mathbf{Z}_T$.

b) The expression for $i(t)$, as a cosine function.

c) The expressions for $v_R(t)$, $v_L(t)$ and $v_C(t)$ as cosine functions.

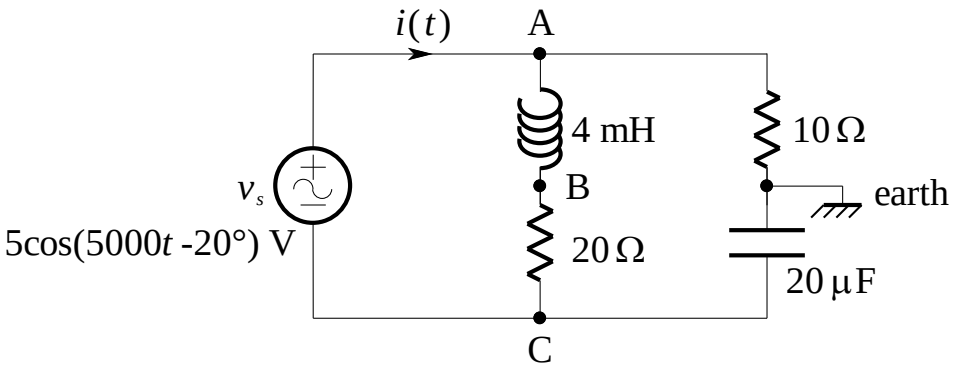
d) The value of an extra element that can be added in series with the circuit without changing the peak value of the current.

e) If the frequency of the voltage source is doubled, describe the effect on the total impedance magnitude, peak value of current, and phase angle between the current and voltage.

11.2

2.

Consider the circuit shown below:



Find:

a) The total current as a phasor, $\mathbf{I}$.

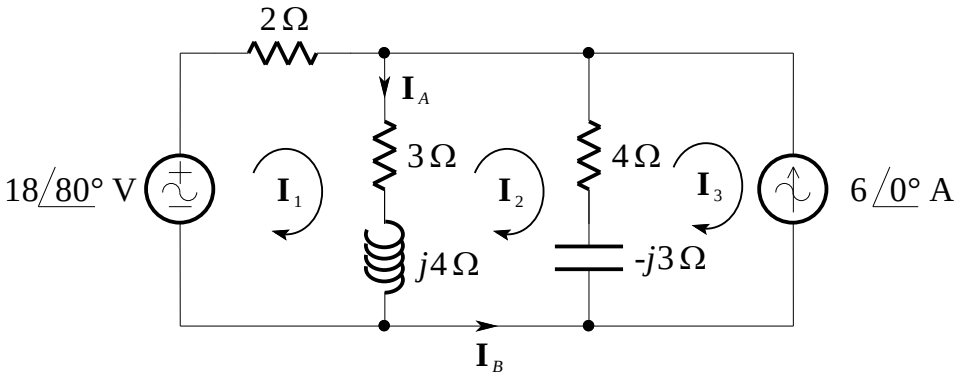
b) The voltage of terminal (B) with respect to the earthed terminal.

c) The phase angle between the voltage (A) with respect to the earthed terminal and the voltage (C) with respect to the earthed terminal.

d) The equivalent simple two element series circuit at this frequency.

3.

Consider the circuit shown below:



Find:

a) Write the three mesh current equations in terms of $\mathbf{I}_1$, $\mathbf{I}_2$ and $\mathbf{I}_3$.

b) Reduce the equations in (a) to two simultaneous equations in $\mathbf{I}_1$ and $\mathbf{I}_2$.

c) Solve for $\mathbf{I}_1$ and $\mathbf{I}_2$ using determinants.

d) Find the current $\mathbf{I}_A$ in the impedance $(3+j4)\Omega$.

e) If $\omega = 314$ rads^{-1}, write the expressions for $i_1(t)$ and $i_2(t)$.

f) Find the current $i_B(t)$.