1.

Give numerical answers to each of the following questions:

a) Rationalize $\frac{3-j}{1-j2}$. Express your answer in rectangular form, $a + jb$.

Give the numerical values of a and b.

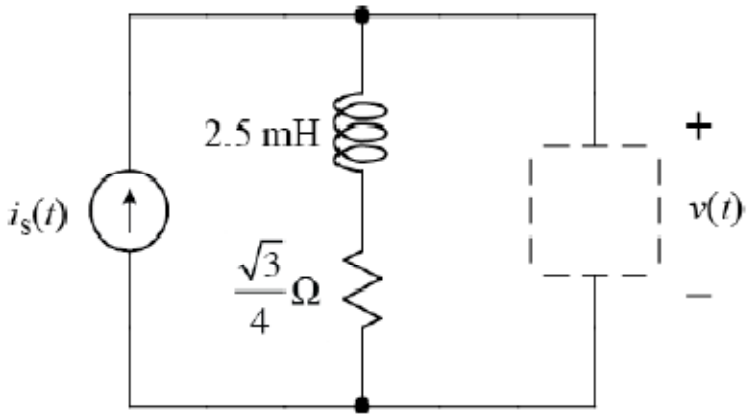
b) Find the rectangular form of $-j10e^{j90^\circ} - 7 - j3\sqrt{3}$.

c) Given $\omega = 120$k r/s, find the inverse phasor of $\frac{1}{1+j}$.

d) Find the magnitude of $\frac{e^{-j15^\circ}(e^{j15^\circ}+4)}{(e^{-j15^\circ}+4)}$.

e) Find the real part of $7 + j3e^{j\pi\cos 60^\circ}$.

2.



a) The current source in the above circuit has a value of

$$i_s(t) = 4\cos(100t)\,\text{A}$$

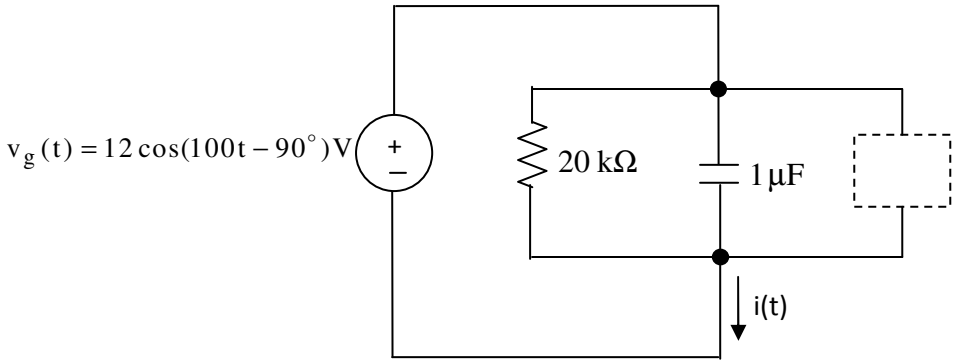
Choose an ***R***, an ***L***, or a ***C*** to be placed in the dashed-line box to make

$$v(t) = V_o\cos(100t - 30^\circ)$$

where V_o is a positive, (i.e., nonzero and non-negative), real constant with units of Volts. State the value of the component you choose.

3. With your component from problem 2 in the circuit, calculate the resulting value of Vo.

4.



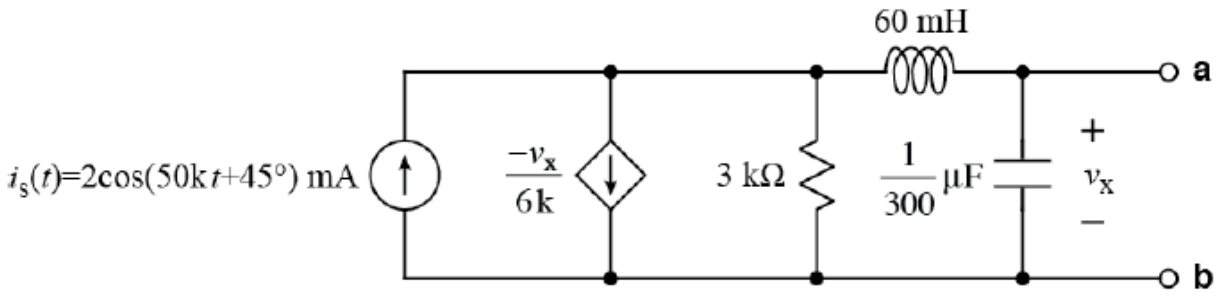
Choose an R, an L, or a C to be placed in the dashed-line box to make

$$i(t) = \mathbf{I}_o \cos(100t - 45^\circ)\text{A}$$

where $\mathbf{I}_o$ is a real constant. State the value of the component you choose.

b. With your component from part (a) in the circuit, calculate the resulting value of $\mathbf{I}_o$.

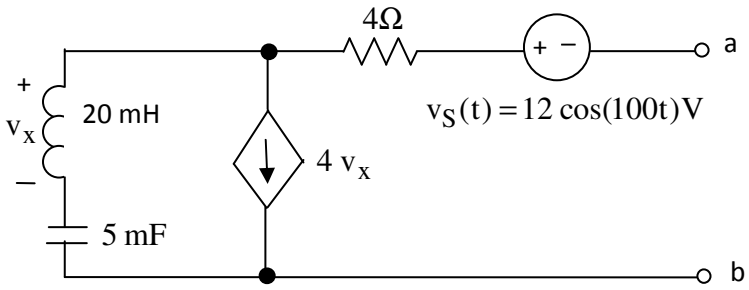
5.



a. Draw a frequency-domain equivalent of the above circuit. Show a numerical phasor value for $i_s(t)$, and show numerical impedance values for R, L, and C. Label the dependent source appropriately.

b. Find the Thevenin equivalent (in the frequency domain) for the circuit from Problem 6. Give the numerical phasor value for $\mathbf{V}_{Th}$ and the numerical impedance value of z_{Th}.

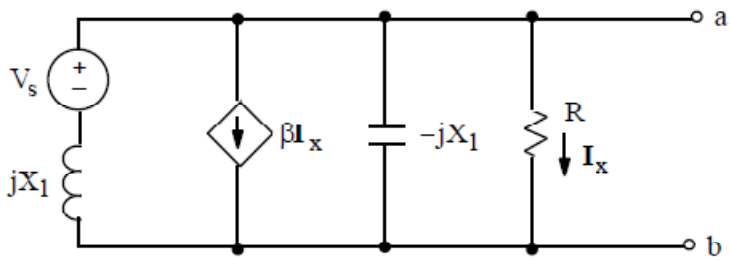
6.



a. Draw a frequency-domain equivalent of the above circuit. Show a numerical phasor value for $v_S(t)$, and show numerical impedance values for R, L, and C. Label the dependent source appropriately.

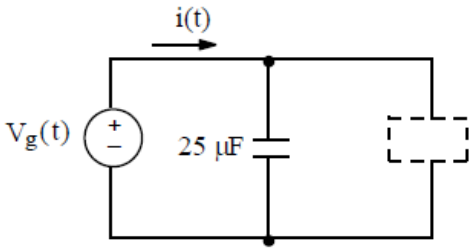
b. Find the Thevenin equivalent (in the frequency domain) for the above circuit. Give the numerical phasor value for V_{Th} and the numerical impedance value of z_{Th}.

7.



Construct a frequency-domain Thevenin equivalent circuit with respect to terminals a-b. Note that the L and C have impedances with equal magnitudes but opposite signs. Also, $\mathbf{I}_x$ must not appear in your answer.

8.



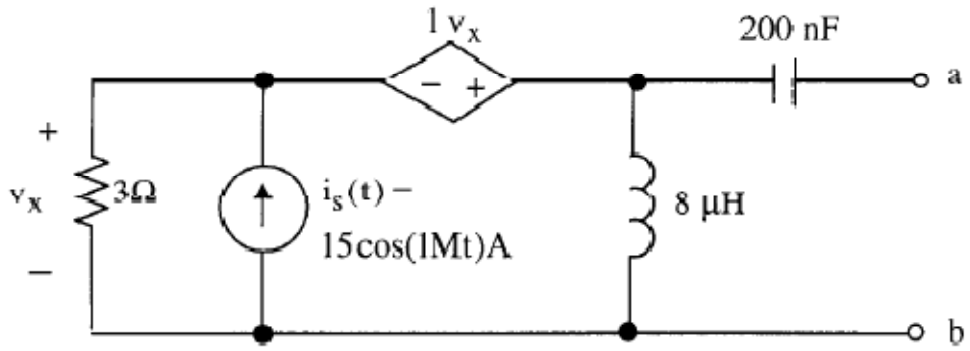
$V_g(t) = 120 \sin(2000\,t + 45°)$ V

Choose one R, one L, or one C to be placed in the dashed-line box to make

$$i(t) = 2 \cos(2000\,t + 45^\circ)\ \text{A}\ .$$

State the type and value of the component you choose.

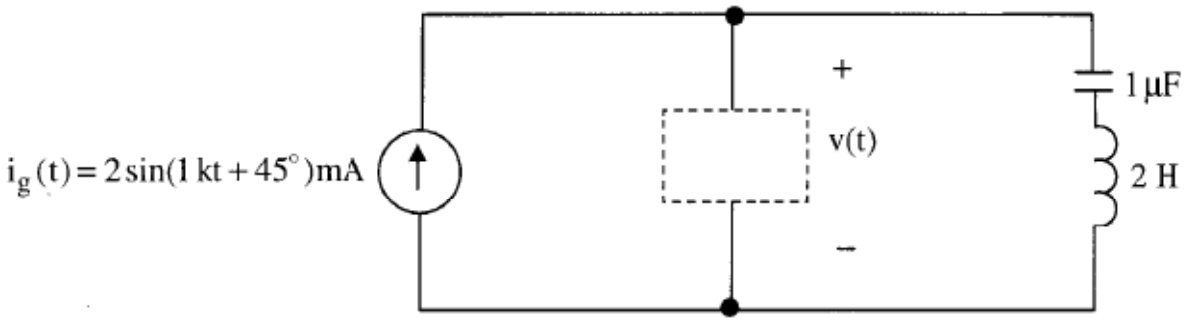
9.



a) Draw a frequency-domain equivalent of the above circuit. Show a numerical phasor value for $i_S(t)$, and show numerical impedance values for R, L, and C. Label the dependent source appropriately.

b) Find the Thevenin equivalent (in the frequency domain) for the above circuit. Give the numerical phasor value for V_{Th} and the numerical impedance value of Z_{Th}.

10.



a. Choose an *R*, an *L*, or a *C* to be placed in the dashed-line box to make

$$V(t) = V_o \cos(1k\,t)$$

where V_o is a positive, (i.e., nonzero and non-negative), real constant with units of Volts. State the value of the component you choose.

b. Calculate the resulting value of V_o.