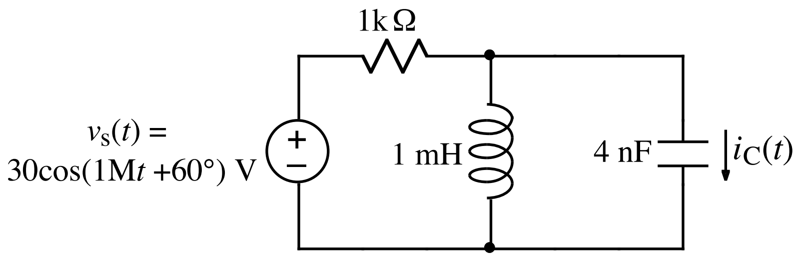
Homework 18

1\.

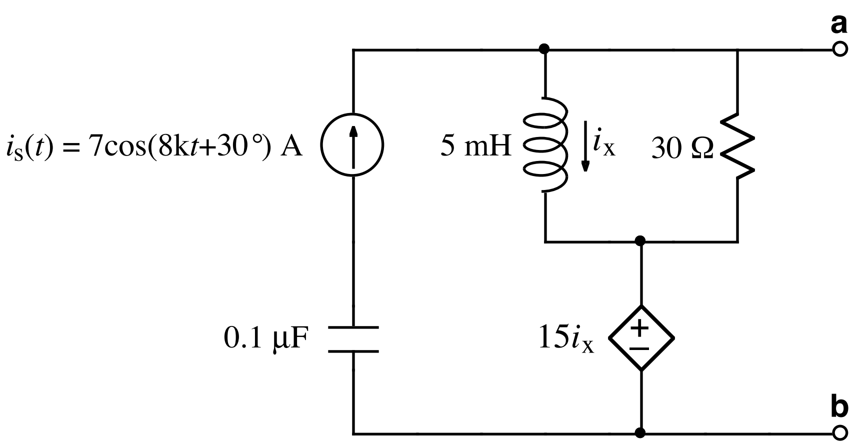


a) Find the phasor value for $v_S(t)$.

b) Draw the frequency-domain circuit diagram, including the phasor value for $v_S(t)$ and impedance values for components.

2\. Find the phasor value for $i_C(t)$.

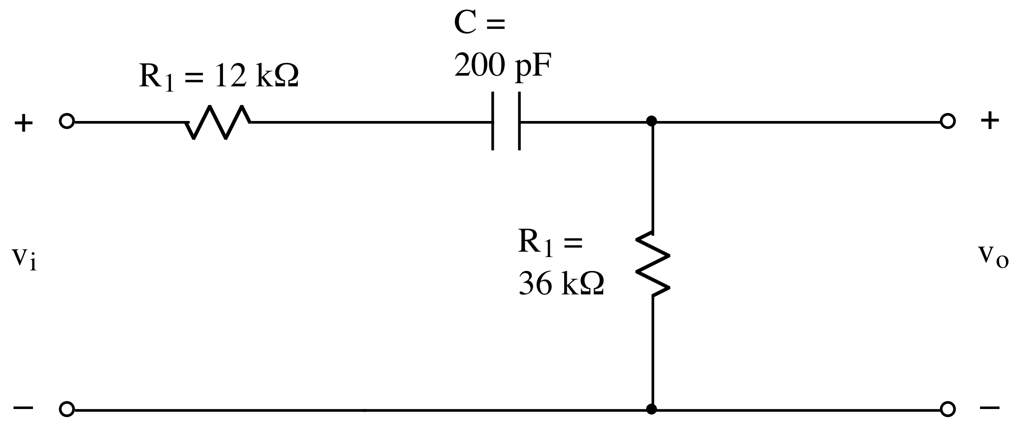
3\.



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.

4\. Find the Thevenin equivalent (in the frequency domain) for the above circuit. Give the numerical phasor value for $\mathbf{V}_{Th}$ and the numerical rectangular form for the impedance value of z_{Th}.

5.



Note: vertical resistor should be labeled R_2.

a) Determine the transfer function V_o/V_i. **Hint:** Reverse the order of R_1 and C, and suppose the output were tapped from the point between C and R_1. Then use a voltage divider.

b) Plot $|V_o/V_i|$ versus ω.

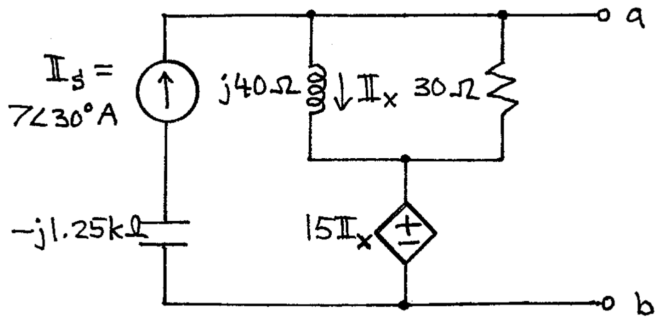
c) Find the cutoff frequency, ω_c.

Answers:

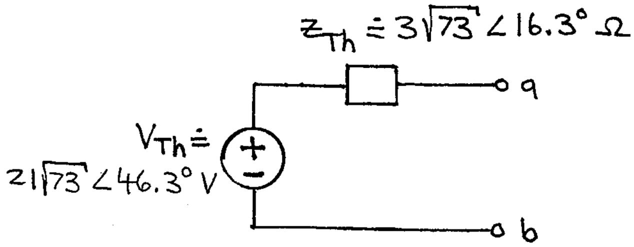
1.a) $\mathbf{V}_{\text{in}} = 30\angle 60°\,\text{V}$ b) $z_C = -250\ \Omega$, $z_L = j1\text{k}\ \Omega$ c) $\mathbf{I}_C = 12\sqrt{10}\angle 78.4°\,\text{mA}$

2. $i_C(t) = 12\sqrt{10}\cos(1\text{M}t + 78.4°)\,\text{mA}$

3.

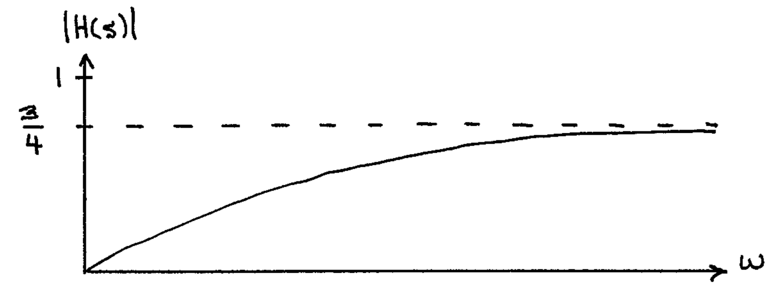


4.



5.a) $$H(j\omega) \equiv \frac{\mathbf{V}_o}{\mathbf{V}_i} = \frac{R_2}{R_1 + R_2} \cdot \frac{1}{1 - j\dfrac{1}{\omega(R_1 + R_2)C}}$$

b)



c) $\omega_C = 104$ kr/s