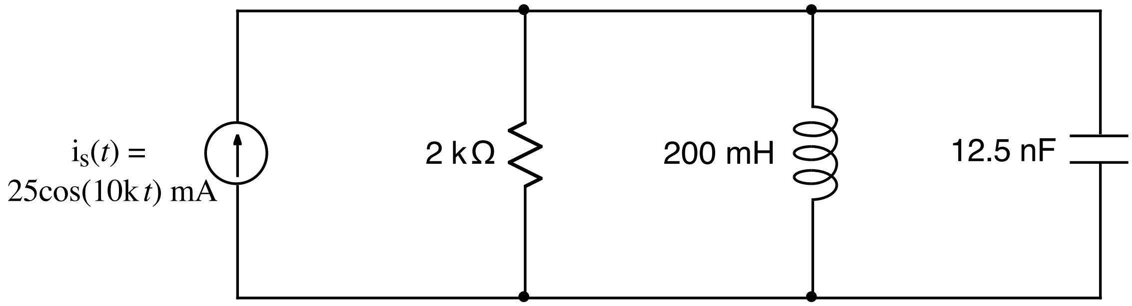
Ex:



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

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

c) Find the phasor value for $i_L(t)$.

Sol'n: a) The phasor for $A\cos(\omega t + \phi)$ is $Ae^{j\phi}$.

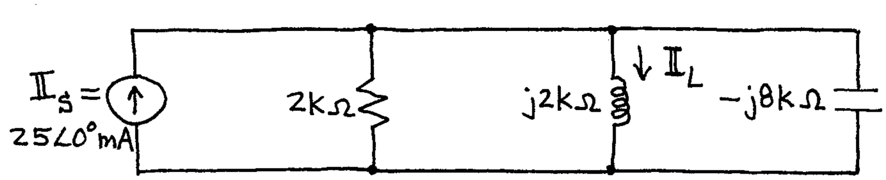
$\therefore\ \mathbb{I}_S = 25\,e^{j0°}$ mA or $25\angle 0°$ mA

b) From $i_S(t)$, we see that $\omega = 10$k rad/s.

Impedance $Z_L = j\omega L = j\,10\text{k}\,200\text{mH} = j2\text{k}\Omega$

$$Z_C = \frac{-j}{\omega C} = \frac{-j}{10\text{k}\;12.5\text{nF}} = \frac{-j\ \Omega}{125\,\mu}$$

$$Z_C = \frac{-j\ 8\text{k}\ \Omega}{8\text{k}\cdot 125\,\mu} = -j8\text{k}\Omega$$



c) The value for $\mathbb{I}_L$ is given by the current divider formula:

$$\mathbb{I}_L = \mathbb{I}_S \cdot \frac{R \| Z_C}{R \| Z_C + Z_L}$$

$$= \mathbb{I}_S \frac{1}{1 + \dfrac{Z_L}{R \| Z_C}}$$

$$= \mathbb{I}_S \frac{1}{1 + Z_L\left(\dfrac{1}{R} + \dfrac{1}{Z_C}\right)}$$

$$= 25\angle 0^\circ \text{ mA} \frac{1}{1 + j2\text{k}\Omega\left(\dfrac{1}{2\text{k}\Omega} + \dfrac{1}{-j8\text{k}\Omega}\right)}$$

$$= 25\angle 0^\circ \text{ mA} \frac{4}{4} \frac{1}{1 + j - \dfrac{1}{4}}$$

$$= 25\angle 0^\circ \text{ mA} \frac{4}{3 + j4}$$

$$= 25\angle 0^\circ \text{ mA} \frac{4}{3 + j4} \cdot \frac{3 - j4}{3 - j4}$$

$$= \cancel{25}\angle 0^\circ \text{ mA} \frac{12 - j16}{\cancel{3^2 + 4^2}}$$

$$= 1\angle 0^\circ \text{ mA} \cdot 20\angle -53.1^\circ$$

$$\mathbb{I}_L = 20 \text{ mA} \angle -53.1^\circ$$