Chapter 9, Solution 46.

If $i_s = 5\cos(10t + 40°)$ A in the circuit in Fig. 9.53, find i_o.

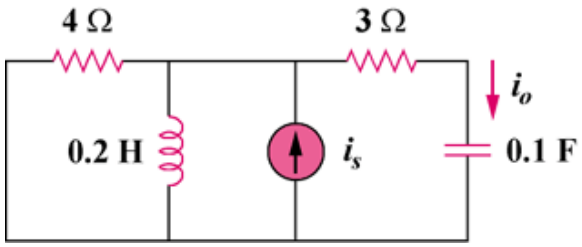

Figure 9.53
For Prob. 9.46.

Solution

$$i_s = 5\cos(10t + 40°) \longrightarrow \mathbf{I}_s = 5\angle 40°$$

$$0.1\text{ F} \longrightarrow \frac{1}{j\omega C} = \frac{1}{j(10)(0.1)} = -j$$

$$0.2\text{ H} \longrightarrow j\omega L = j(10)(0.2) = j2$$

Let $\mathbf{Z}_1 = 4 \,\|\, j2 = \dfrac{j8}{4 + j2} = 0.8 + j1.6$, $\mathbf{Z}_2 = 3 - j$

$$\mathbf{I}_o = \frac{\mathbf{Z}_1}{\mathbf{Z}_1 + \mathbf{Z}_2}\mathbf{I}_s = \frac{0.8 + j1.6}{3.8 + j0.6}(5\angle 40°)$$

$$\mathbf{I}_o = \frac{(1.789\angle 63.43°)(5\angle 40°)}{3.847\angle 8.97°} = 2.325\angle 94.46°$$

Thus,

$$i_o(t) = \mathbf{2.325\cos(10t + 94.46°)\text{ A}}$$