

Chapter 10, Solution 40.

Find i_o in the circuit shown in Fig. 10.85 using superposition.

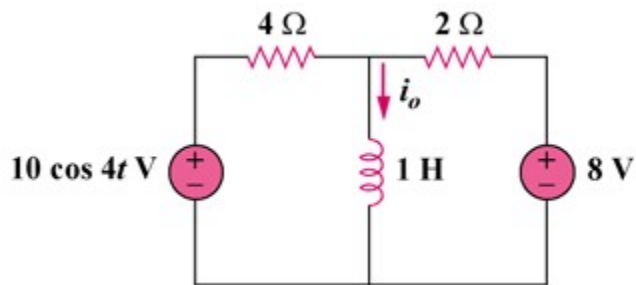
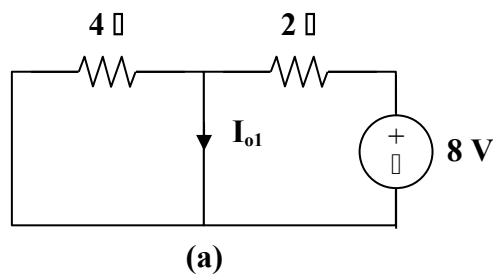


Figure 10.85
For Prob. 10.40.

Solution

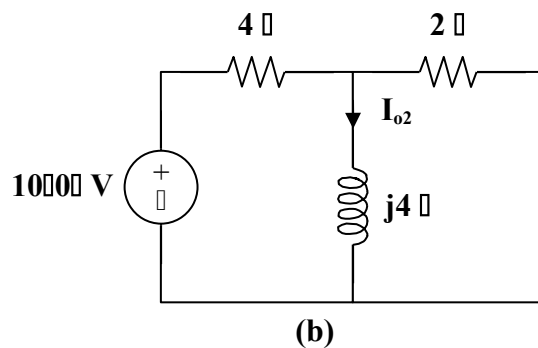
Let $I_o = I_{o1} + I_{o2}$, where I_{o1} is due to the dc source and I_{o2} is due to the ac source. For I_{o1} , consider the circuit in Fig. (a).

Clearly,

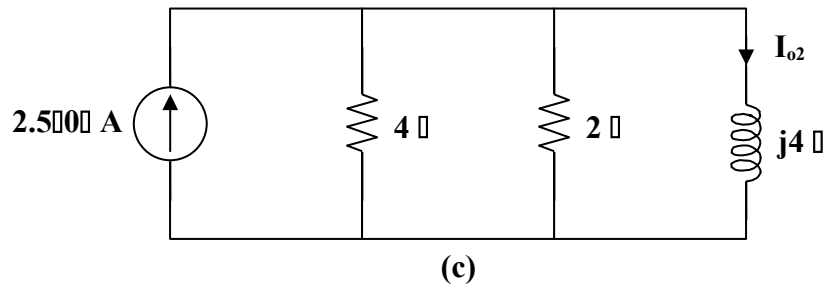


$$I_{o1} = 8/2 = 4 \text{ A}$$

For I_{o2} , consider the circuit in Fig. (b).



If we transform the voltage source, we have the circuit in Fig. (c), where $4 \parallel 2 = 4/3 \Omega$.



By the current division principle,

$$\mathbf{I}_{o2} = \frac{4/3}{4/3 + j4} (2.5\angle 0^\circ)$$

$$\mathbf{I}_{o2} = 0.25 - j0.75 = 0.79\angle -71.56^\circ$$

$$I_{o2} = 0.79 \cos(4t - 71.56^\circ) \text{ A}$$

Thus,

Therefore,

$$\mathbf{I_o} = \mathbf{I_{o1}} + \mathbf{I_{o2}} = [4 + 0.79\cos(4t - 71.56^\circ)] \text{ A}$$