**Chapter 10, Solution 42.**

Using Fig. 10.87, design a problem to help other students to better understand the superposition theorem.

Although there are many ways to work this problem, this is an example based on the same kind of problem asked in the third edition.

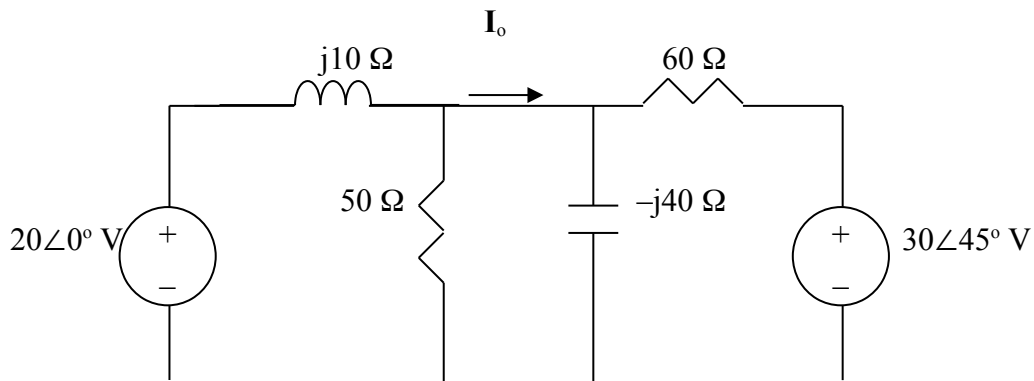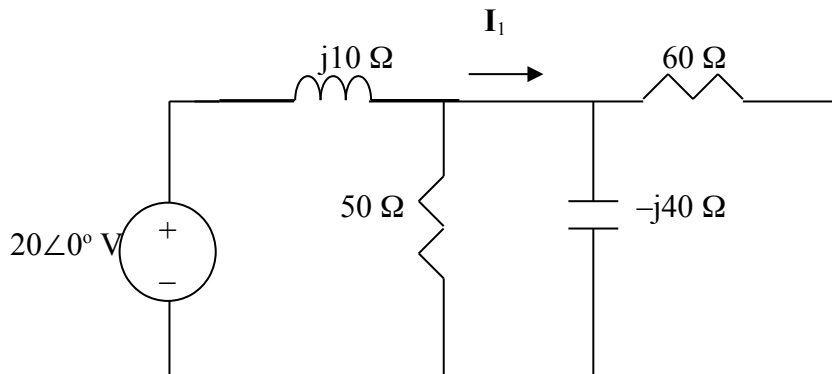**Problem**

Solve for $I_o$ in the circuit of Fig. 10.87.



Figure 10.87   For Prob. 10.42.
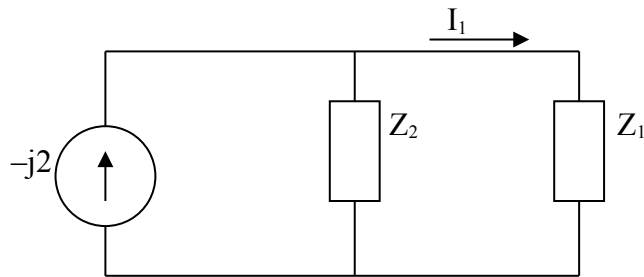
**Solution**

Let   $I_o = I_1 + I_2$

where $I_1$ and $I_2$ are due to 20<0° and 30<45° sources respectively.  To get $I_1$, we use the circuit below.



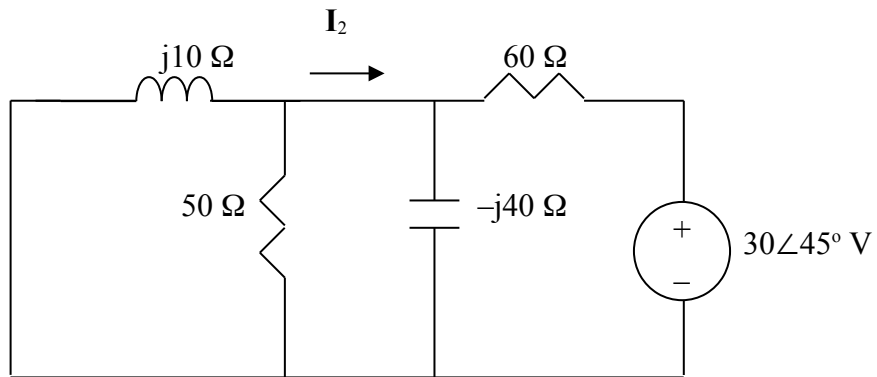Let   $Z_1 = $ -j40//60 $ = 18.4615 - j27.6927$, $Z_2 = $ j10//50=1.9231 + j9.615
Transforming the voltage source to a current source leads to the circuit below.
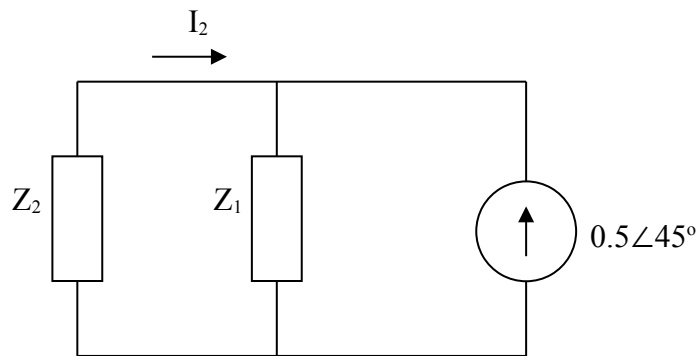
Using current division,
$$I_1 = \frac{Z_2}{Z_1 + Z_2}(-j2) = 0.6217 + j0.3626$$

To get $I_2$, we use the circuit below.



After transforming the voltage source, we obtain the circuit below.



Using current division,
$$I_2 = \frac{-Z_1}{Z_1 + Z_2}(0.5 < 45^o) = -0.5275 - j0.3077$$

Hence, $\mathbf{I_o} = \mathbf{I_1} + \mathbf{I_2} = 0.0942 + j0.0509 = \mathbf{109 \angle 30° \ mA}$.