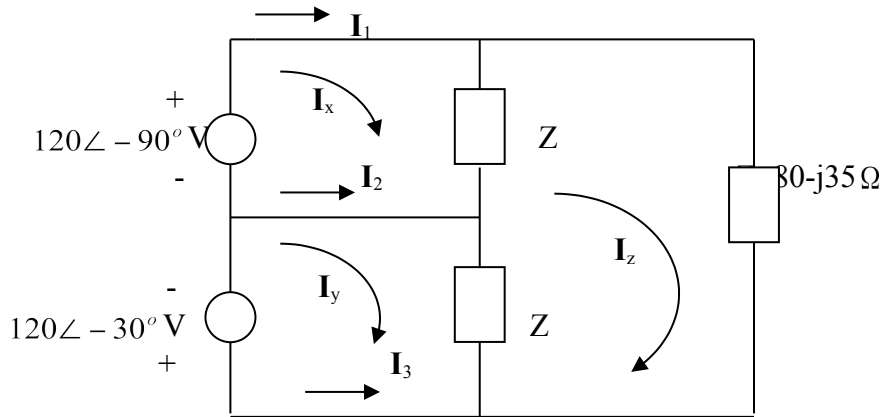


Chapter 10, Solution 37.



For mesh x,

$$ZI_x - ZI_z = -j120 \quad (1)$$

For mesh y,

$$ZI_y - ZI_z = -120\angle 30^\circ = -103.92 + j60 \quad (2)$$

For mesh z,

$$-ZI_x - ZI_y + 3ZI_z = 0 \quad (3)$$

Putting (1) to (3) together leads to the following matrix equation:

$$\begin{pmatrix} (80 - j35) & 0 & (-80 + j35) \\ 0 & (80 - j35) & (-80 + j35) \\ (-80 + j35) & (-80 + j35) & (240 - j105) \end{pmatrix} \begin{pmatrix} I_x \\ I_y \\ I_z \end{pmatrix} = \begin{pmatrix} -j120 \\ -103.92 + j60 \\ 0 \end{pmatrix} \longrightarrow \mathbf{AI} = \mathbf{B}$$

Using MATLAB, we obtain

$$\mathbf{I} = \text{inv}(\mathbf{A}) * \mathbf{B} = \begin{pmatrix} -0.2641 - j2.366 \\ -2.181 - j0.954 \\ -0.815 - j1.1066 \end{pmatrix}$$

$$\mathbf{I}_1 = \mathbf{I}_x = -0.2641 - j2.366 = \underline{2.38\angle -96.37^\circ \text{ A}}$$

$$\mathbf{I}_2 = \mathbf{I}_y - \mathbf{I}_x = -1.9167 + j1.4116 = \underline{2.38\angle 143.63^\circ \text{ A}}$$

$$\mathbf{I}_3 = -\mathbf{I}_y = 2.181 + j0.954 = \underline{2.38\angle 23.63^\circ \text{ A}}$$