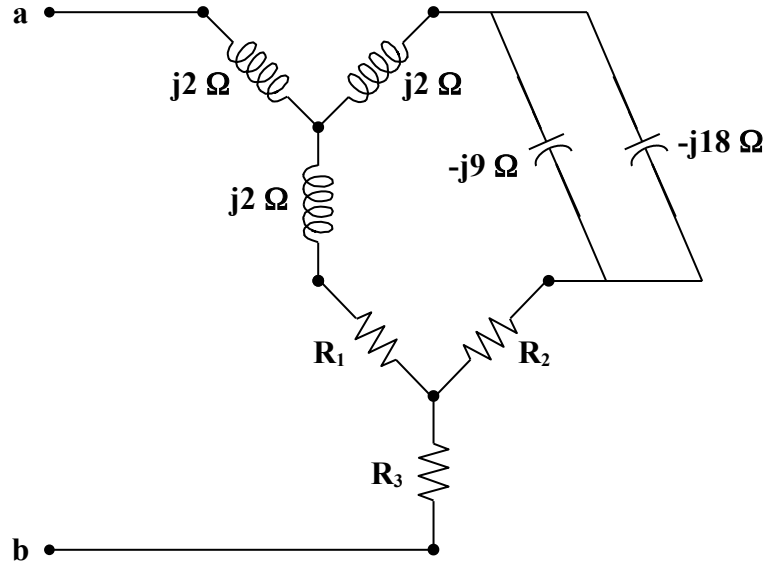


Chapter 9, Solution 73.

Transform the delta connection to a wye connection as in Fig. (a) and then transform the wye connection to a delta connection as in Fig. (b).



$$\mathbf{Z}_1 = \frac{(j8)(-j6)}{j8 + j8 - j6} = \frac{48}{j10} = -j4.8$$

$$\mathbf{Z}_2 = \mathbf{Z}_1 = -j4.8$$

$$\mathbf{Z}_3 = \frac{(j8)(j8)}{j10} = \frac{-64}{j10} = j6.4$$

$$(2 + \mathbf{Z}_1)(4 + \mathbf{Z}_2) + (4 + \mathbf{Z}_2)(\mathbf{Z}_3) + (2 + \mathbf{Z}_1)(\mathbf{Z}_3) =$$

$$(2 - j4.8)(4 - j4.8) + (4 - j4.8)(j6.4) + (2 - j4.8)(j6.4) = 46.4 + j9.6$$

$$\mathbf{Z}_a = \frac{46.4 + j9.6}{j6.4} = 1.5 - j7.25$$

$$\mathbf{Z}_b = \frac{46.4 + j9.6}{4 - j4.8} = 3.574 + j6.688$$

$$\mathbf{Z}_c = \frac{46.4 + j9.6}{2 - j4.8} = 1.727 + j8.945$$

$$j6 \parallel \mathbf{Z}_b = \frac{(6 \angle 90^\circ)(7.583 \angle 61.88^\circ)}{3.574 + j12.688} = 0.7407 + j3.3716$$

$$-j4 \parallel \mathbf{Z}_a = \frac{(-j4)(1.5 - j7.25)}{1.5 - j11.25} = 0.186 - j2.602$$

$$j12 \parallel \mathbf{Z}_c = \frac{(12 \angle 90^\circ)(9.11 \angle 79.07^\circ)}{1.727 + j20.945} = 0.5634 + j5.1693$$

$$\mathbf{Z}_{\text{eq}} = (\text{j}6 \parallel \mathbf{Z}_{\text{b}}) \parallel (-\text{j}4 \parallel \mathbf{Z}_{\text{a}} + \text{j}12 \parallel \mathbf{Z}_{\text{c}})$$

$$\mathbf{Z}_{\text{eq}} = (0.7407 + \text{j}3.3716) \parallel (0.7494 + \text{j}2.5673)$$

$$\mathbf{Z}_{\text{eq}} = 1.508 \angle 75.42^\circ \, \Omega = \mathbf{(0.3796 + \text{j}1.46) \, \Omega}$$