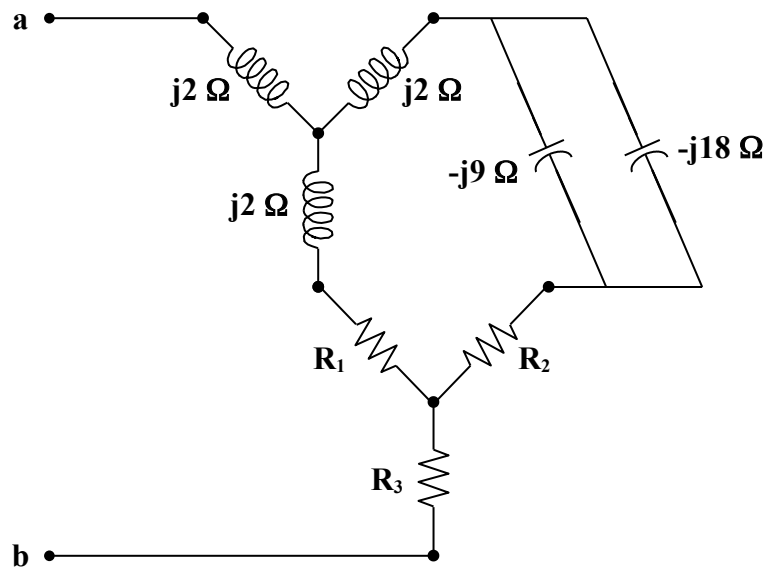## Chapter 9, Solution 72.

Transform the delta connections to wye connections as shown below.

$- j9 \parallel -j18 = -j6$,

$$R_1 = \frac{(20)(20)}{20 + 20 + 10} = 8\ \Omega, \qquad\qquad R_2 = \frac{(20)(10)}{50} = 4\ \Omega,$$

$$R_3 = \frac{(20)(10)}{50} = 4\ \Omega$$

$\mathbf{Z}_{ab} = j2 + (j2 + 8) \parallel (j2 - j6 + 4) + 4$

$\mathbf{Z}_{ab} = 4 + j2 + (8 + j2) \parallel (4 - j4)$

$\mathbf{Z}_{ab} = 4 + j2 + \dfrac{(8 + j2)(4 - j4)}{12 - j2}$

$\mathbf{Z}_{ab} = 4 + j2 + 3.567 - j1.4054$

$\mathbf{Z}_{ab} = \mathbf{(7.567 + j0.5946)\ \Omega}$