

Chapter 11, Solution 49.

$$\begin{aligned} \text{(a)} \quad \mathbf{S} &= 4 + j \frac{4}{0.86} \sin(\cos^{-1}(0.86)) \text{ kVA} \\ \mathbf{S} &= [4 + j2.373] \text{ kVA} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \text{pf} = \frac{P}{S} &= \frac{1.6}{2} 0.8 = \cos \theta \longrightarrow \sin \theta = 0.6 \\ \mathbf{S} &= 1.6 - j2 \sin \theta = [1.6 - j1.2] \text{ kVA} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad \mathbf{S} &= \mathbf{V}_{\text{rms}} \mathbf{I}_{\text{rms}}^* = (208 \angle 20^\circ)(6.5 \angle 50^\circ) \text{ VA} \\ \mathbf{S} &= 1.352 \angle 70^\circ = [0.4624 + j1.2705] \text{ kVA} \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad \mathbf{S} &= \frac{|\mathbf{V}|^2}{\mathbf{Z}^*} = \frac{(120)^2}{40 - j60} = \frac{14400}{72.11 \angle -56.31^\circ} \\ \mathbf{S} &= 199.7 \angle 56.31^\circ = [110.77 + j166.16] \text{ VA} \end{aligned}$$