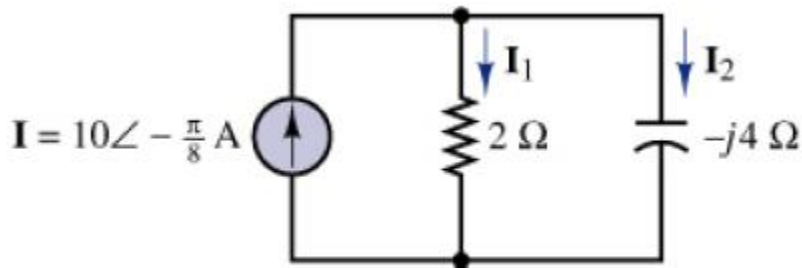


ELG2336 Assignment 1 Solutions

4.56

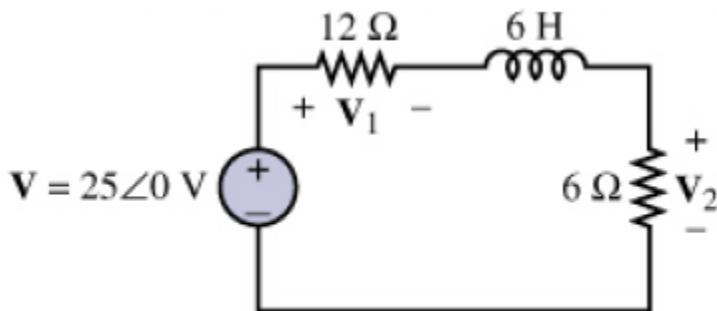


$$Z_{eq} = \frac{1}{\frac{1}{2} + \left(\frac{1}{-j4}\right)} = 1.79 \angle 26.56^\circ \Omega$$

$$V_S = I_S Z_{eq} = (10 \angle -22.5^\circ) \text{ A} \cdot (1.79 \angle 26.56^\circ) \Omega = 17.9 \angle 4.06^\circ \text{ V}$$

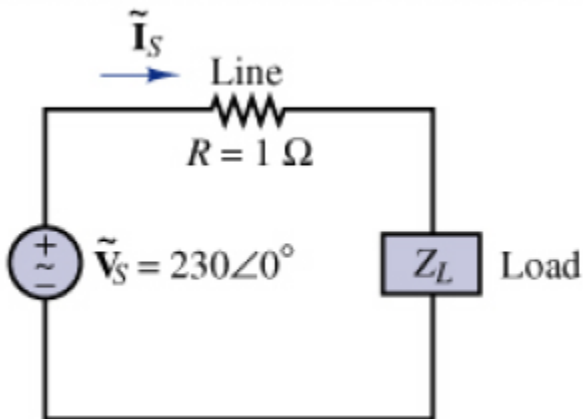
$$I_1 = \frac{V_S}{R} = 8.95 \angle 4.06^\circ \text{ A}$$

4.57



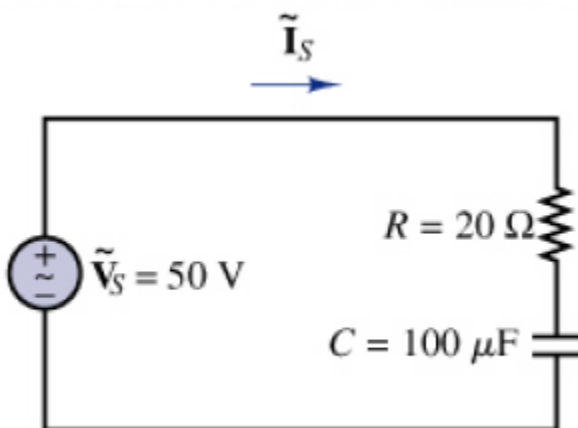
$$V_2 = \frac{R_{6\Omega}}{R_{12\Omega} + Z_L + R_{6\Omega}} V = \frac{6 \Omega}{(12 + j12 + 6) \Omega} 25 \angle 0^\circ \text{ V} = \frac{150 \angle 0^\circ \Omega}{18 + j12 \Omega} \text{ V} = 6.93 \angle -33.7^\circ \text{ V}$$

7.28



- a) $pf_{source} = \frac{R}{Z} = \frac{R_{line} + R_{load}}{\sqrt{(R_{line} + R_{load})^2 + X_C^2}} = \frac{26}{\sqrt{676 + 7.036e^8}} = 0.00098$ Leading
- b) $\tilde{I}_S = \frac{\tilde{V}_S}{Z} = \frac{230}{26525 \angle -90^\circ} = 8.67 \text{ mA}$. Therefore, $\mathbf{I}_S = 8.67 \angle -90^\circ \text{ mA}$
- c) $S_{load} = \sqrt{P_{load}^2 + Q_{load}^2} = \tilde{I}_S^2 \sqrt{R_{load}^2 + X_C^2} = 1.994 \text{ VA}$
- d) $S_{source} = \tilde{I}_S \tilde{V}_S = 1.994 \text{ VA}$
- e) $pf_{load} = \frac{R_{load}}{Z_{load}} = \frac{25}{26525} = 0.00094$

7.31



$$S = \frac{\tilde{V}^2}{\sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2}} = \frac{50^2}{\sqrt{20^2 + 26.5^2}} = \frac{2500}{33.2} = 75.3 \text{ VA}$$

$$P = S \cdot \cos(\theta) = S \cdot \frac{R}{Z} = 75.3 \frac{20}{33.2} = 45.36 \text{ W}$$

$$Q = \sqrt{S^2 - P^2} = -60 \text{ VAR}$$

For the power triangle, $\theta = \cos^{-1}\left(\frac{R}{Z}\right) = 53^\circ$

