Chapter 9, Solution 90.

Let $\mathbf{V}_s = 145\angle 0°$, $\quad X = \omega L = (2\pi)(60)L = 377L$

$$\mathbf{I} = \frac{\mathbf{V}_s}{80 + R + jX} = \frac{145\angle 0°}{80 + R + jX}$$

$$\mathbf{V}_1 = 80\mathbf{I} = \frac{(80)(145)}{80 + R + jX}$$

$$50 = \left| \frac{(80)(145)}{80 + R + jX} \right| \tag{1}$$

$$\mathbf{V}_o = (R + jX)\mathbf{I} = \frac{(R + jX)(145\angle 0°)}{80 + R + jX}$$

$$110 = \left| \frac{(R + jX)(145)}{80 + R + jX} \right| \tag{2}$$

From (1) and (2),

$$\frac{50}{110} = \frac{80}{|R + jX|}$$

$$|R + jX| = (80)\left(\frac{11}{5}\right)$$

$$R^2 + X^2 = 30976 \tag{3}$$

From (1),

$$|80 + R + jX| = \frac{(80)(145)}{50} = 232$$

$$6400 + 160R + R^2 + X^2 = 53824$$

$$160R + R^2 + X^2 = 47424 \tag{4}$$

Subtracting (3) from (4),

$$160R = 16448 \longrightarrow R = \mathbf{102.8\ \Omega}$$

From (3),

$$X^2 = 30976 - 10568 = 20408$$

$$X = 142.86 = 377L \longrightarrow L = \mathbf{378.9\ mH}$$