Chapter 9, Solution 67.

(a) $20\text{ mH} \longrightarrow j\omega L = j(10^3)(20\times10^{-3}) = j20$

$$12.5\ \mu\text{F} \longrightarrow \frac{1}{j\omega C} = \frac{1}{j(10^3)(12.5\times10^{-6})} = -j80$$

$$\mathbf{Z}_{in} = 60 + j20 \,||\, (60 - j80)$$

$$\mathbf{Z}_{in} = 60 + \frac{(j20)(60 - j80)}{60 - j60}$$

$$\mathbf{Z}_{in} = 63.33 + j23.33 = 67.494\angle 20.22^\circ$$

$$\mathbf{Y}_{in} = \frac{1}{\mathbf{Z}_{in}} = \mathbf{14.8\angle -20.22^\circ\ mS}$$

(b) $10\text{ mH} \longrightarrow j\omega L = j(10^3)(10\times10^{-3}) = j10$

$$20\ \mu\text{F} \longrightarrow \frac{1}{j\omega C} = \frac{1}{j(10^3)(20\times10^{-6})} = -j50$$

$30 \,||\, 60 = 20$

$$\mathbf{Z}_{in} = -j50 + 20 \,||\, (40 + j10)$$

$$\mathbf{Z}_{in} = -j50 + \frac{(20)(40 + j10)}{60 + j10} = -j50 +$$

$20(41.231\angle 14.036^\circ)/(60.828\angle 9.462^\circ)$

$= -j50 + (13.5566\angle 4.574^\circ = -j50 + 13.51342 + j1.08109$

$= 13.51342 - j48.9189 = 50.751\angle -74.56^\circ$

$\mathbf{Z}_{in} = 13.5 - j48.92 = 50.75\angle -74.56^\circ$

$$\mathbf{Y}_{in} = \frac{1}{\mathbf{Z}_{in}} = \mathbf{19.704\angle 74.56^\circ\ mS} = 5.246 + j18.993\text{ mS}$$