Chapter 11, Solution 41.

(a) $$-j2 \,||\, (j5 - j2) = -j2 \,||\, j3 = \frac{(-j2)(j3)}{j} = -j6$$

$$\mathbf{Z}_T = 4 - j6 = 7.211\angle -56.31^\circ$$

$$\text{pf} = \cos(-56.31^\circ) = \mathbf{0.5547} \quad \textbf{(leading)}$$

(b)

$$j2 \,||\, (4 + j) = \frac{(j2)(4 + j)}{4 + j3} = \frac{8.2462\angle 104.036^\circ}{5\angle 36.87^\circ} = 1.64924\angle 67.166^\circ = 0.64 + j1.52$$

$$\mathbf{Z} = 1 \,||\, (0.64 + j1.52 - j) = \frac{0.64 + j0.52}{1.64 + j0.52} = \frac{0.82462\angle 39.094^\circ}{1.72047\angle 17.592^\circ} = 0.4793\angle 21.5^\circ$$

$$\text{pf} = \cos(21.5^\circ) = \mathbf{0.9304} \quad \textbf{(lagging)}$$