7.2) The resistance of the heating element is
\[ R = \frac{V^2}{P} = \frac{240^2}{1000} = 57.6 \, \Omega \]

7.5) The power dissipated by the circuit is
\[ P = VI \cos \theta = 110 \times 4 \times \cos 60^\circ = 220 \, \text{W} \]
\[ \text{PF} = \cos 60^\circ = 0.5 \]

7.6) The rms current is
\[ I = \frac{P}{\bar{V} \cos \theta} = \frac{1200}{120 \times 0.8} = 12.5 \, \text{A} \]
\[ \theta = \cos^{-1}(0.8) = 36.87^\circ \, \text{(The phase angle)} \]
\[ Z = \frac{\bar{V}}{I} = \frac{120}{12.5} = 9.6 \, \Omega \]
\[ R = Z \cos \theta = 9.6 \times 0.8 = 7.68 \, \Omega \]

7.15 a) The apparent power supplied by the source
\[ S = \frac{\bar{V}^2}{Z} = \frac{\bar{V}^2}{\sqrt{(R + R_L)^2 + X_L^2}} = \frac{230^2}{\sqrt{26^2 + 37.7^2}} = 1.155 \, \text{VA} \]

b) In order to find the power delivered to the load we should find first the current through the load which is same as the current \( I_s \)
\[ I_s^2 = \frac{\bar{V}}{Z} = \frac{230}{26^2 + 37.7^2} = 5 \, \text{A} \]

Now find the apparent power through the load
\[ S_L = I_s^2 Z_L = (5)^2 \times \sqrt{25^2 + 37.7^2} = 1.141 \, \text{kVA} \]

c) The power factor of the load may be calculated from the impedance triangle
\[ \text{PF} = \cos \theta = \frac{R_L}{Z_L} = \frac{25}{45.2} = 0.55 \]

This power factor is quite low!
7.16 a) Find first $X_L$ and $X_C$. Both are equal to 26.6 ohms

$$S = \frac{\bar{V}^2}{Z} = \frac{\bar{V}^2}{\sqrt{(R + R_L)^2 + (X_L - X_C)^2}} = \frac{230^2}{\sqrt{26^2 + (26.5 - 26.5)^2}} = 2 \text{kVA}$$

b) Since $X_L = X_C$

$$P = \frac{\bar{V}^2}{25+1} = \frac{230^2}{26} = 2 \text{kW}$$

c) Since $X_L = X_C$, it means we have a resistive load, accordingly the power factor is 1!

7.17) The apparent power is

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

The real power is

$$P = S \cdot \cos \theta = 75.3 \times \frac{20}{33.2} = 45.36 \text{ W}$$

The reactive power is

$$Q = \sqrt{S^2 - P^2} = \sqrt{75.3^2 - 45.36^2} = -60 \text{ VAR}$$

The angle is

$$\theta = \cos^{-1}\left(\frac{R}{Z}\right) = 53^\circ$$

The power triangle is shown

$$P = 45.36 \text{ W}$$

$$S = 75.3 \text{ VA}$$

$$\theta = 53^\circ$$

$$Q = -60 \text{ VAR}$$