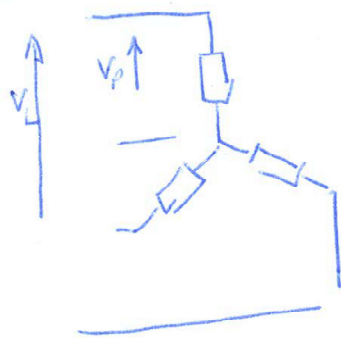


1.



$$S_T = \sqrt{3} V_L I_L$$

$$(a) \left. \begin{aligned} V_L &= \frac{20 \cdot 10^3}{\sqrt{3} \cdot 20} = \underline{577.4 \text{ V}} \\ V_p &= V_L / \sqrt{3} = \underline{333.3 \text{ V}} \end{aligned} \right\} 5$$

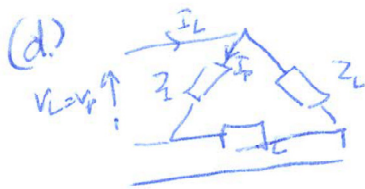
$$(b) Q_T = \sqrt{S_T^2 - P_T^2} = \sqrt{20^2 - 11^2} = \underline{16.7 \text{ kVAr}} \quad 5$$

$$(c) Z_L = R + jX$$

$$|Z_L| = V_p / I_p = 333.3 / 20 = 16.67 \Omega, \quad \text{pf} = 1/20 = 0.55, \quad \theta = 56.63^\circ$$

$$Z_L = 16.67 \angle 56.63^\circ \Omega = 9.17 + j13.92 \Omega; \quad j\omega L = j13.92, \quad L = 13.92 / (2\pi \cdot 50) = 0.044311$$

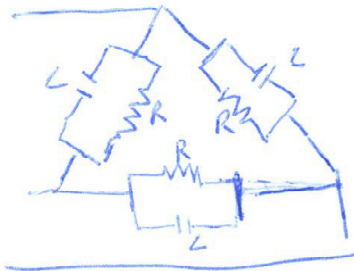
Hence: $R = \underline{9.17 \Omega}, \quad L = \underline{44.3 \text{ mH}}$



$$V_p = V_L = 577.4; \quad I_p = \frac{V_p}{Z_L} = \frac{577.4}{16.67 \angle 56.63^\circ} = 34.65 \angle -56.63^\circ \text{ A}$$

$$(e) I_L = \sqrt{3} I_p = \underline{60 \text{ A}}. \quad P_T = \sqrt{3} V_L I_L \cos \theta = \sqrt{3} \times 577.4 \times 60 \times \cos 56.63^\circ = \underline{33 \text{ kW}}$$

2.



$$P_1 = 1000 \text{ W}$$

$$P_2 = 500 \text{ W}$$

$$V_L = 400 \text{ V}$$

$$f = 50 \text{ Hz}$$

$$I_L = 2.5 \text{ A}$$

$$(a) \cos \phi_L = \frac{P_T}{\sqrt{3} V_L I_L} = \frac{1000 + 500}{\sqrt{3} \cdot 400 \cdot 2.5} = \underline{0.866} \quad 10$$

$$(b) \tan \phi_L = \sqrt{3} \frac{P_1 - P_2}{P_1 + P_2} = \sqrt{3} \frac{500}{1500} = \frac{\sqrt{3}}{3} = 0.577, \quad \phi_L = 30^\circ$$

$$\text{pf} = \cos 30^\circ = \underline{0.866} \quad 10$$

$$(c) \begin{aligned} I_R &= 1.25 \text{ A} \\ I_L &= 2.5 \angle 30^\circ \text{ A}; \quad I_p = \frac{2.5}{\sqrt{3}} \angle 30^\circ = 1.443 \angle 30^\circ = 1.25 + j0.72 \text{ A} \\ I_R &= V_p / R \rightarrow R = 400 / 1.25 = \underline{320 \Omega} \quad 10 \\ I_C &= V_p / X_C \rightarrow X_C = 400 / 0.72 = 555.5 \Omega \\ \omega C &= 555.5 \rightarrow C = \frac{1}{2\pi \cdot 50 \cdot 555.5} = 5.73 \cdot 10^{-6} = \underline{5.73 \mu\text{F}} \quad 10 \end{aligned}$$