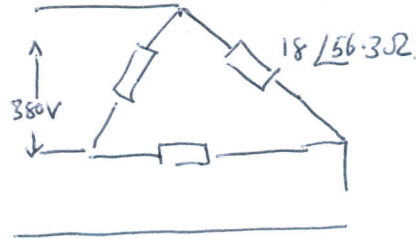
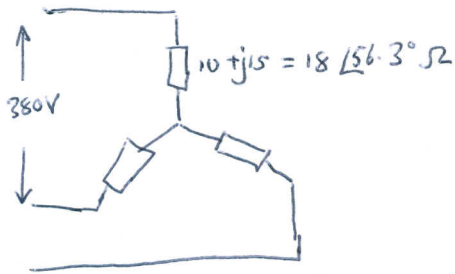


1.



$$\bar{I}_p = \frac{V_p}{Z_p} = \frac{380}{13.18} = 12.17$$

$$\bar{I}_p = \frac{V_p}{Z_p} = \frac{380}{18} = 21.08 \text{ A}$$

$$\bar{I}_L = \sqrt{3} \bar{I}_p = 36.51 \text{ A}$$

$$\bar{I}_L = \bar{I}_p = 12.17 \text{ A}$$

$$P_1 + P_2 = \sqrt{3} 380 12.17 \cos 56.3^\circ = 4444 \text{ W}$$

$$\tan \phi_L = \sqrt{3} \frac{P_1 - P_2}{P_1 + P_2} = 1.5$$

$$\therefore P_2 = 0.0712 P_1$$

$$P_1 + P_2 = \sqrt{3} 380 21.08 \cos 56.3^\circ = 13333 \text{ W}$$

$$P_1 = 4149 \text{ W}$$

$$P_2 = 295 \text{ W}$$

$$P_1 = 12447 \text{ W}$$

$$P_2 = 886 \text{ W}$$

$$2.(a) P_T = 30 \text{ kW}$$

$$\cos \phi_L = 0.447$$

$$P_1 + P_2 = 30$$

$$\sqrt{3} (P_1 - P_2) = 2 (P_1 + P_2)$$

$$P_1 = 32.3 \text{ kW}$$

$$P_2 = -2.3 \text{ kW}$$

$$(b) (i) \phi_L = 30^\circ$$

$$P_1 + P_2 = 10 + 10$$

$$\sqrt{3} (P_1 - P_2) = 0.5774 (P_1 + P_2)$$

$$P_1 = 13.3 \text{ kW}$$

$$P_2 = 6.7 \text{ kW}$$

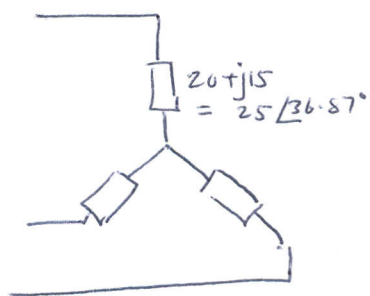
$$(ii) \phi_L = 60^\circ$$

$$\sqrt{3} (P_1 - P_2) = \sqrt{3} (P_1 + P_2)$$

$$P_2 = 0$$

$$P_1 = 20 \text{ kW}$$

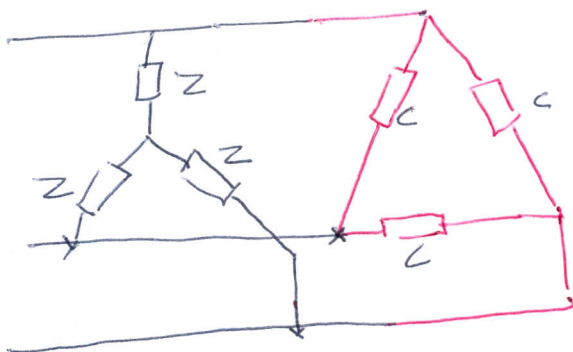
3



$$\bar{I}_L = \bar{I}_P = \frac{400}{\sqrt{3} \cdot 25 \angle 36.87^\circ} = \underline{9.24 \angle -36.87^\circ \text{ A}} \quad (5)$$

$$P_T = \sqrt{3} V_L \bar{I}_L \cos \phi_L = \sqrt{3} \cdot 400 \cdot 9.24 \cos 36.87^\circ = \underline{5120 \text{ W}} \quad (5)$$

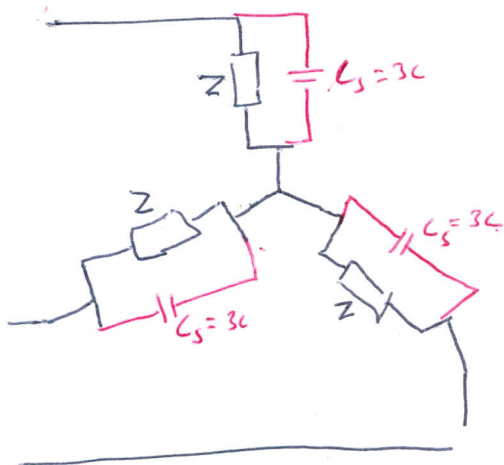
$$P.f = \cos(-36.87^\circ) = \underline{0.8 \text{ lag.}} \quad (5)$$



Δ -Y transformation

$$\frac{1}{C_s} = \frac{\frac{1}{C} \cdot \frac{1}{C}}{\frac{1}{3} \cdot \frac{1}{C}}$$

$$C_s = 3C$$



$$\phi_{L1} = 36.87^\circ$$

$$\phi_{L2} = 18.2^\circ$$

$$\bar{I}_{L2} = \frac{P_T}{\sqrt{3} V_L \cos \phi_{L2}} = \frac{5120}{\sqrt{3} \cdot 400 \cos 18.2^\circ} = \underline{7.78 \text{ A}} \quad (5)$$

$$\frac{Q_{L2}}{P_T} = \tan \phi_{L2}$$

$$\frac{Q_{T1}}{P} = \tan \phi_{L1}$$

$$Q_1 - Q_2 = 5120 [\tan 36.87^\circ - \tan 18.2^\circ] = 2157$$

$$[Q_1 - Q_2]_{\text{phase}} = \frac{2157}{3} = 719 \text{ VAR}$$

$$X_{C_s} = \frac{V_P^2}{Q_P} = \left(\frac{400}{\sqrt{3}} \right)^2 / 719 = 74.2 \Omega$$

$$\frac{1}{\omega C_s} = 74.2 \Rightarrow C_s = 42.9 \mu\text{F}$$

$$C = \underline{14.3 \mu\text{F}}$$

(20)

