

$$1. \bar{S} = (100,000 + j 48,432) + (100,000 + j 0) + (0 - j 100,000) = 200,000 - j 51,567$$

Watts Vars

$$\bar{S} = 206,541 \angle -14^\circ = 2400 \angle 0^\circ \bar{I}^*, \quad |\bar{I}| = 86 \text{ A}$$

$$\text{PF} = \cos(-14^\circ) = 0.968 \text{ lead}$$

$$2. \quad 4500 = \sqrt{3} 480 I \quad I = 5.4 \text{ A} \quad X_L = 256 \Omega$$

$$Q = \sqrt{3} 480 \times 5.4 \sin 37^\circ = 2701 \text{ vars}, \quad \frac{3 \times 480^2}{X_L} = 2701, \quad C = 10 \mu\text{F}$$

$$P = 4500 \times 0.8 = 3600 \text{ W} = \sqrt{3} 480 I, \quad I = 4.33 \text{ A}$$

$$3. (a) VA_{3\phi} = 150 \text{ KVA}, \quad VA_{\text{open } \Delta} = 0.57 \times 150 = 85.5 \text{ KVA}$$

$$(b) \text{ Assume } v_{A1} = V \cos \omega t, \quad v_{B1} = V \cos(\omega t - 120^\circ)$$

$$i_{A1} = \frac{V}{\omega} \sin \omega t, \quad i_{B1} = \frac{V}{\omega} \sin(\omega t - 120^\circ)$$

$$\left. \begin{aligned} i_{A1} &= I_0 \sin \omega t + I_3 \sin 3\omega t \\ -i_{C1} &= I_0 \sin(\omega t - 120^\circ) + I_3 \sin 3\omega t \end{aligned} \right\} i_{B1} = -i_{A1} - i_{C1}$$

$$4. (a) \quad S_{PL} = \frac{1200 - 1080}{1200} = 0.1 \quad f_r = 0.1 \times 60 = 6 \text{ Hz}$$

$$(b) \quad T_{FL} = \frac{5 \times 746 \text{ W}}{1080 \frac{2\pi}{60} \frac{\text{mR}}{\text{sec}}} = 33 \text{ mR}$$

$$(c) \quad 33 = \frac{3 \times \left(\frac{230}{\sqrt{3}}\right)^2 \times 0.1}{1200 \frac{2\pi}{60} r_2'} \quad r_2' = 1.28 \Omega$$