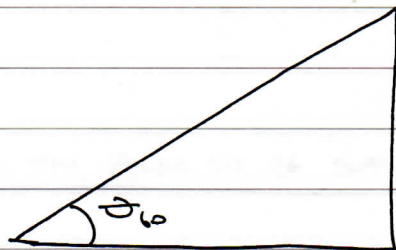


3. USING $S = \frac{P}{\text{PF}}$ $C = \frac{P}{S}$ $T = \frac{Q}{P}$ $r = \frac{Q}{S}$

CALCULATE THE PHASE ANGLE OF EACH POWER FACTOR

@ 60% PF



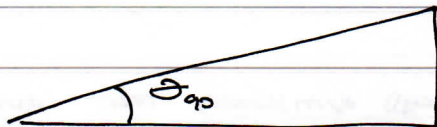
$$60\% \text{ PF} = 0.6$$

$$\therefore \cos \theta_{60} = 0.6$$

$$\therefore \theta_{60} = \cos^{-1}(0.6)$$

$$\therefore \theta_{60} = 53.13^\circ$$

@ 90% PF



$$90\% \text{ PF} = 0.9$$

$$\therefore \cos \theta_{90} = 0.9$$

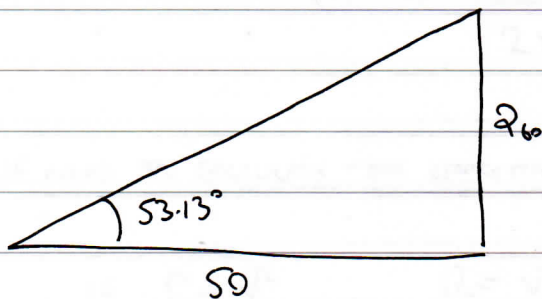
$$\therefore \theta_{90} = \cos^{-1}(0.9)$$

$$\therefore \theta_{90} = 25.84^\circ$$

CALCULATE THE REACTIVE POWER AT EACH PHASE ANGLE.

$$T = \frac{Q}{P}$$

@ 60% PF



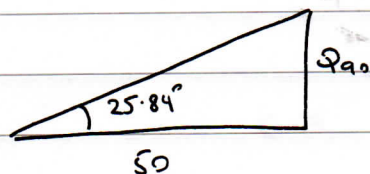
$$\text{USING } T = \frac{Q}{P}$$

$$\tan(53.13) = \frac{Q_{60}}{50}$$

$$\therefore Q_{60} = \tan(53.13) \times 50$$

$$\therefore Q_{60} = 66.67 \text{ KVAR}$$

@ 90% PF



$$\text{USING } T = \frac{D}{A}$$

$$\tan(25.84) = \frac{Q_{90}}{50}$$

$$\therefore Q_{90} = \tan(25.84) \times 50$$

$$Q_{90} = 24.21 \text{ Kvar}$$

CALCULATE THE POWER TO BE "SUPPLIED" BY THE CAPACITOR

$$\begin{aligned} \text{Power to be supplied} &= Q_{60} - Q_{90} \\ &= 66.67 - 24.21 \text{ Kvar} \\ &= 42.46 \text{ Kvar} \end{aligned}$$

WE KNOW THAT CAPACITIVE REACTANCE (X_c) =

$$X_c = \frac{1}{2\pi fC}$$

$$\therefore \text{CAPACITANCE (C)} = \frac{1}{2\pi f X_c}$$

WE NEED TO CALCULATE THE CAPACITIVE REACTANCE FROM THE VOLTAGE / POWER VALUES

$$\text{If } P = \frac{V^2}{R}, \quad R = \frac{V^2}{P}$$

$$\therefore X_c = \frac{10,000^2}{42,460}$$

$$2355$$

using CAPACITANCE $(C) = \frac{1}{2\pi f x_c}$

$$C = \frac{1}{2\pi \times 60 \times 2355}$$

$$C = 1.124 \mu F$$