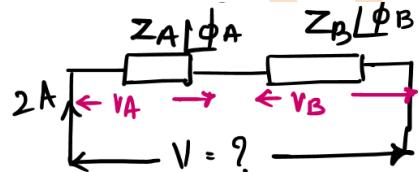
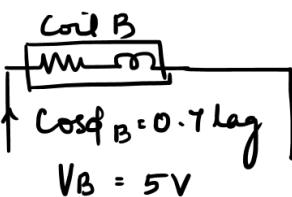
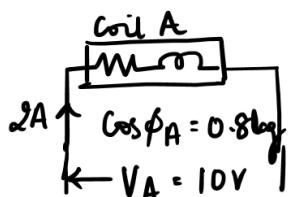


## Lecture 28

2. A coil A takes a current of 2A at a power factor of 0.8 lagging when applied voltage is 10V. A second coil B takes a current of 2A at a power factor of 0.7 lagging when applied voltage is 5V. What voltage will be required to produce a total current of 2A when coils A and B are connected in series? Find the power factor in this case. Consider supply frequency to be same in all cases.



$$Z_A = \frac{V_A}{I} = \frac{10}{2} = 5 \Omega$$

$$\phi_A = 36.86^\circ$$

$$Z_A L \phi_A = 5 \angle 36.86^\circ$$

$$Z_B = \frac{V_B}{I} = \frac{5}{2} = 2.5 \Omega$$

$$\phi_B = 45.57^\circ$$

$$Z_B L \phi_B = 2.5 \angle 45.57^\circ$$

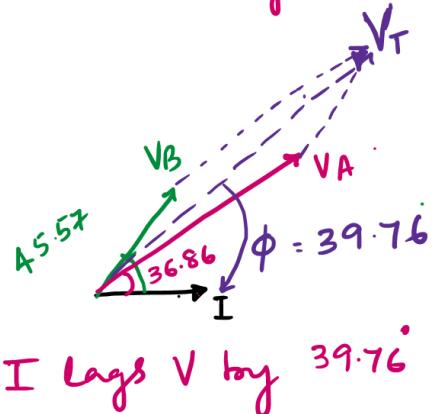
$$V = I Z_T L \phi$$

$$\begin{aligned} Z_T L \phi &= Z_A L \phi_A + Z_B L \phi_B \\ &= 5 \angle 36.86^\circ + 2.5 \angle 45.57^\circ \\ &= 7.48 \angle 39.76^\circ \end{aligned}$$

$$V = 2 \times 7.48 \angle 39.76^\circ$$

$$V = 14.96 \angle 39.76^\circ$$

Phasor diagram



$$V_A = 10 \angle 36.86^\circ$$

$$V_B = 5 \angle 45.57^\circ$$

$$V_T = 14.96 \angle 39.76^\circ$$

$$I = 2 \angle 0^\circ \text{ (ref)}$$

$$\rightarrow \text{OR} \quad V = V_A + V_B$$

$$= 10 \angle 36.86^\circ + 5 \angle 45.57^\circ$$

$$V L \phi = 14.96 \angle 39.76^\circ$$