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ACF077BCT020.

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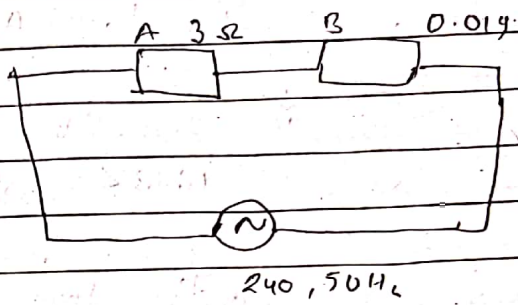
## AC. Portion.

**Q 6)**

Soln,




$R_A = 3\Omega$

$L_B = 0.019\ H$

Active (P) = 4kW

reactive power (Q) = 2KVAR

$L_A = ?$

$R_B = ?$

$V_A = ?$

$V_B = ?$

we know,

$P = VI\cos\phi$

$4\times10^3 = 240\, I\cos\phi$ ——— (i)

$Q = VI\cos\phi$

$2\times10^3 = 240\, I\sin\phi$ ——— (ii)

Dividing (ii) by (i)

$$\frac{2\times10^3}{4\times10^3} = \frac{240\, I\sin\phi}{240\, I\cos\phi}$$

$$\frac{2}{4} = \tan\phi$$

$$\phi = \tan^{-1}\left(\frac{1}{2}\right)$$

$$\phi = 26.56^\circ$$

Now,

$$P = VI\cos\phi$$

$$4\times10^3 = 240\, I \cos(26.56)$$

$$I = 18.63\ A$$

$$\tilde{V} = 240\angle 0^\circ V$$

$$\tilde{I} = 18.63\angle -26.56^\circ A$$

Since inductive load i lags V by angle $\phi$

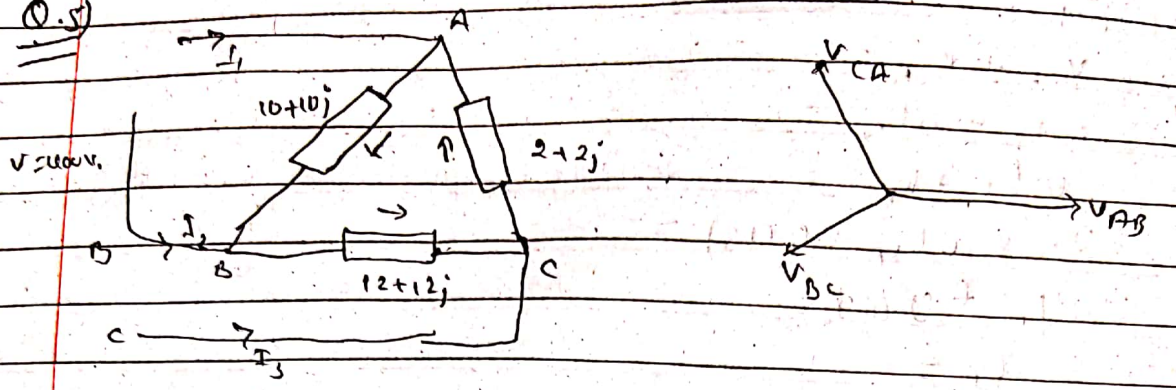
Hence

$$\tilde{V} = \tilde{I}Z$$

$$Z = \frac{\tilde{V}}{\tilde{I}}$$

$$= \frac{240\angle 0^\circ}{18.63\angle -26.56}$$

Q.5)




$Z_{AB} = 10+10j = 14.14 \angle 45\ \Omega$.

$Z_{BC} = 12+12j = 16.97 \angle 45\ \Omega$

$Z_{CA} = 2+2j = 2.82 \angle 45^\circ \Omega$.

$V_{AB} = 400 \angle 0$

$V_{BC} = 400 \angle -120$

$V_{CA} = 400 \angle 120$

i) Phase current & line current

$$I_A = \frac{V_{AB}}{Z_{AB}} = \frac{400 \angle 0}{14.14 \angle 45} = 28.28 \angle -45$$

$$I_B = \frac{V_{BC}}{Z_{BC}} = \frac{400 \angle -120}{16.97 \angle 45} = 23.57 \angle -165$$

$$I_C = \frac{V_{CA}}{Z_{CA}} = \frac{400 \angle 120}{2.82 \angle 45} = 141.42 \angle 75$$

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$\hat{I}_A$, $\hat{I}_B$, $\hat{I}_C$ are phase current.

Then,

for line current

$\hat{I}_1 = \hat{I}_A - \hat{I}_C = 28.28 \angle -45 - 141.42 \angle 75$

$= 157.47 \angle -96.07$ A

$\hat{I}_2 = \hat{I}_B - \hat{I}_A = 23.57 \angle -165 - 28.28 \angle -45$

$= 44.96 \angle 161.99$

$\hat{I}_3 = \hat{I}_C - \hat{I}_B = 141.42 \angle 75 - 23.57 \angle -165$

$= 154.56 \angle 67.41$ A.

support power.

(x) Power in R phase

$\phi_R = 0 - (-45) = 45°$

Active power $(P_R) = V_{RY} I_R \cos\phi_R$

$= 400 \times 28.28 \times \cos 45$

$= 7998.79$ W.

Reactive power $(Q_R) = V_{RY} I_R \sin\phi_R$

$= 400 \times 28.28 \times \cos 45$

$= 7998.79$ VAR

Apparent power $(S_R) = V_{RY} I_R$

$= 400 \times 28.28$

$= 11312$ VA

(y) Powe in y phase

$\phi_Y = -120° - (-165) = 45°$

$P_Y = V_{YB} I_Y \cos\phi_Y = 6666.602$ W

$Q_Y = V_{YB} I_Y \sin\phi_Y = 6666.602$ VAR

$S_Y = V_{YB} I_Y = 9428$ VA

(z) Power in B Phase

$\phi_B = 120 - 75 = 45°$

$P_B = 400 \times 141.42 \times \cos 45 = 39999.61$ W

$Q_B = 400 \times 141.42 \times \sin 45 = 39999.61$ VAR

$S_B = 400 \times 141.42 = 56568$ VA.