

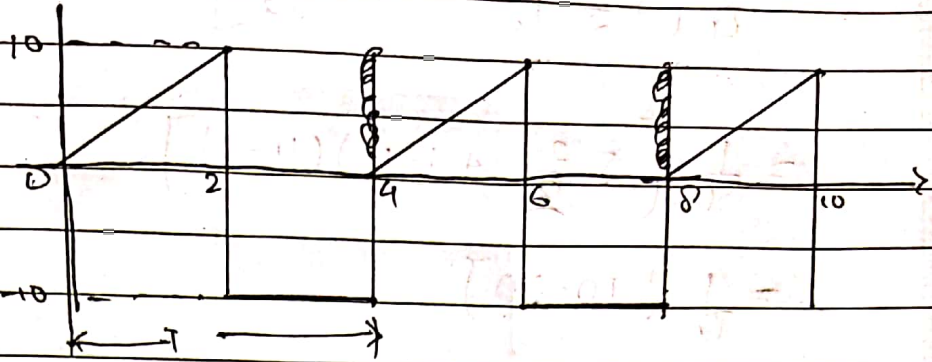
[AC - Portion]

classmate

Date _____

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Q. A1.4



⇒ soln,

$$i(t) = \begin{cases} 5t & ; 0 < t < 2 \\ -10 & ; 2 < t < 4 \end{cases}$$

$$I_{rms} = \sqrt{\frac{1}{T} \int_0^T i^2 dt}$$

$$I_{rms}^2 = \frac{1}{4} \left[\int_0^2 (5t)^2 dt + \int_2^4 (-10)^2 dt \right]$$

$$= \frac{1}{4} \left[25 \frac{t^3}{3} \Big|_0^2 + 100t \Big|_2^4 \right]$$

$$= \frac{1}{4} \left[25 \frac{2^3}{3} + 100(4-2) \right]$$

$$= \frac{1}{4} \left[25 \times \frac{8}{3} + 100 \times 2 \right]$$

$$= \frac{200}{3}$$

$$I_{rms} = 8.165 \text{ A}$$

now,

$$I_{average} = \frac{1}{4} \left[\int_0^2 5t dt + \int_2^4 (-10) dt \right]$$

$$= \frac{1}{4} \left[5 \frac{t^2}{2} \Big|_0^4 + (-10)t \Big|_0^4 \right]$$

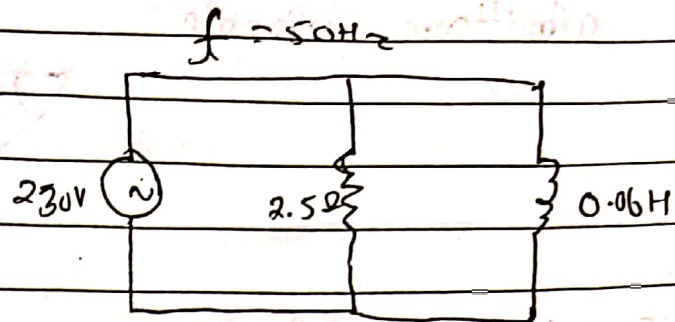
$$= \frac{1}{4} \left[5 \frac{2^2}{2} + (-10)(4-2) \right]$$

$$= \frac{1}{4} [10 - 20]$$

$$= \frac{-5}{2}$$

$$= -2.5 \text{ A} \underline{\underline{\text{H}}}$$

-ve sign indicate the average value line below the reference line.

Q.N.5

⇒ given

$$R = 2.5 \Omega$$

$$f = 50 \text{ Hz}$$

$$L = 0.06 \text{ H}$$

$$V = 230 \text{ V} = 230 \angle 0^\circ$$

$$X_L = 2\pi fL$$

$$= 2\pi \times 50 \times 0.06$$

$$= 18.84 \Omega$$

$$G = \frac{1}{R} = \frac{1}{2.5} = 0.4 \angle 0^\circ = 0.4 + 0j^\circ$$

$$B_L = \frac{1}{X_L} = 0.05 \angle -90^\circ = -0.053j^\circ$$

now,

$$Y = \sqrt{G^2 + B_L^2}$$

$$= 0.403 \angle 7.52^\circ$$

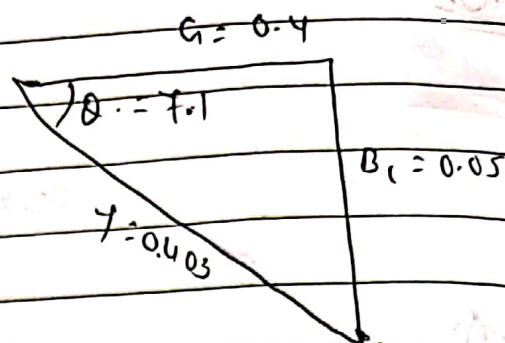
For admittance

$$\tan \phi = \frac{B_L}{G}$$

$$\Rightarrow \phi = \tan^{-1} \left(\frac{-0.05}{0.4} \right)$$

$$= -7.1^\circ$$

Admittance triangle



now
Impedance (Z) = $\frac{1}{Y} = 2.48 \angle 7.125$

Admittance triangle

total current (I_{total}) = $\frac{V}{Z} = \frac{230 \angle 0}{2.48 \angle 7.12} = 92.74 A \angle -7.85$

$I_R = \frac{V}{R} = 92 A \angle 0$

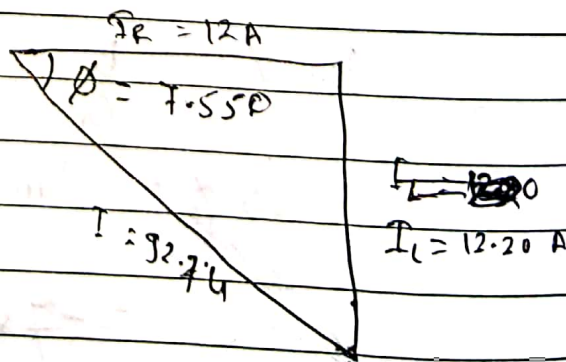
$I_C = \frac{V}{X_C} = 12.20 A \angle -90$

now, for current triangle

$\tan \phi = \frac{I_C}{I_R}$

$\Rightarrow \phi = \tan^{-1} \left(\frac{-12.20}{92} \right)$

$= -7.55^\circ$



Current triangle