#420436

Topic: Purely inductive circuit

A 44 mH inductor is connected to 220 V, 50 Hz ac supply. Determine the rms value of the current in the circuit.

Solution

We know that $X_L = \omega L = 2\pi f L = 2 \times 3.14 \times 50 \times 44 \times 10^{-3} = 13.82\Omega$

Therefore, $I_{rms} = \dfrac{E}{X_L} = \dfrac{220}{13.82} = 15.92A$

#420521

Topic: LCR circuits

A coil of inductance 0.50 H and resistance 100Ω is connected to a 240 V, 50 Hz ac supply.

(a) What is the maximum current in the coil?

(b) What is the time lag between the voltage maximum and the current maximum?

Solution

(a)

Peak velocity $V_0 = \sqrt{2}V = 339.41$

$\omega = 2\pi f = 100\pi\ rad/s$

$I_o = \dfrac{V_o}{\sqrt{R^2 + \omega^2 L^2}} = 1.82\ A$

(b)

The voltage is given as $V = V_o cos\omega t$

The current is given as $I = I_o cos(\omega t - \phi)$

ϕ is the phase angle between the voltage and current.

The time lag is given as ϕ/ω.

Now phase angle is given as $tan\phi = \omega L/R = 2\pi \times 50 \times 0.5/100 = 1.57$

So $\phi = tan^{-1}1.57 = 57.5^o = 57.5\pi/180\ radians$

time lag is $t = \phi/\omega = 57.5\pi/180 \times 2\pi \times 50 = 3.19 \times 10^{-3}\ s$