

# Alternating Current

## TRY YOURSELF

## ANSWERS

1. An alternating current is that current which periodically changes in magnitude and in direction. The instantaneous value of it is given by

$$I = I_0 \sin \omega t = I_0 \sin (2\pi f)t$$

where,  $I_0$  is the peak value of current.

2.  $\epsilon_{rms} = \frac{1}{\sqrt{2}} \epsilon_0$ ; where  $\epsilon_0$  is peak value.

3.  $\epsilon_0 = \sqrt{2} \epsilon_{rms} = \sqrt{2} \times 220 = 311 \text{ V}$

4. Capacitive reactance varies inversely with the frequency of a.c., i.e.,  $X_C \propto \frac{1}{f}$

5. Inductive reactance of an inductor is the effective resistance offered by it to flow of current through it.

$$X_L = \omega L = 2\pi fL$$

S.I. unit of it is ohm ( $\Omega$ ).

6. Given :  $\epsilon_v = 110$  volts.

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

$$R = 10 \Omega$$

$$L = 0.02 \text{ H}$$

$$I_v = \frac{\epsilon_v}{\sqrt{R^2 + \omega^2 L^2}} = \frac{110}{\sqrt{100 + (0.02 \times 2\pi \times 50)^2}}$$

$$I_v \cong 10.0 \text{ A}$$

7. The voltage leads the current by a phase difference of

$$\phi = \tan^{-1} \left( \frac{X_L}{R} \right).$$

8. The sharpness of resonance is measured by a coefficient called quality factor of the circuit. It is represented as  $Q$ -factor of the circuit.

$$Q = \frac{\omega_r}{2\Delta\omega}, \text{ where } \omega_r \text{ is resonant frequency and } \Delta\omega \text{ is bandwidth.}$$

9. For  $X_L = X_C$  and  $Z = R$  resonance condition occurs in  $LCR$  series circuit.

10. To reduce the current, choke coil is used in a fluorescent tube

11. The current in a.c. circuit is said to be wattless, if the average power consumed in the circuit is zero.

12. Due to resistance of primary and secondary winding of a transformer, some electrical energy is lost as heat. This energy loss is called copper loss.

13. Iron loss can be reduced by using laminated core in the transformer.

