

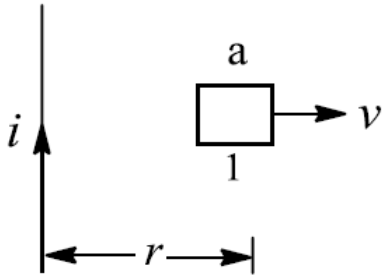
## Topic :-Alternating Current

- The power factor of an AC circuit having resistance  $R$  and inductance  $L$  (connected in series) and an angular velocity  $\omega$  is
  - $R/\omega L$
  - $R/(R^2 + \omega^2 L^2)^{1/2}$
  - $\omega L/R$
  - $R/(R^2 - \omega^2 L^2)^{1/2}$
- A uniformly wound solenoidal coil of self inductance  $1.8 \times 10^{-4}$  H and resistance  $6 \Omega$  is broken up into two identical coils. These identical coils are then connected in parallel across a 12 V battery of negligible resistance. The time constant of the current in the circuit and the steady state current through battery is
  - $3 \times 10^{-5}$  s, 8 A
  - $1.5 \times 10^{-5}$  s, 8 A
  - $0.75 \times 10^{-4}$  s, 4 A
  - $6 \times 10^{-5}$  s, 2 A
- An alternating voltage is connected in series with a resistance  $R$  and an inductance  $L$ . If the potential drop across the resistance is 200 V and across the inductance is 150 V, then the applied voltage is
  - 350 V
  - 250 V
  - 500 V
  - 300 V
- The number of turns in a secondary coil is twice the number of turns in primary. A leclanche cell of 1.5 V is connected across the primary. The voltage across secondary is
  - 1.5 V
  - 3.0 V
  - 240 V
  - Zero
- When the rate of change of current is unity, induced emf is equal to
  - Thickness of coil
  - Number of turns in coil
  - Coefficient of self-induction
  - Total flux linked with coil
- A coil of wire of certain radius has 100 turns and a self inductance of 15 mH. The self inductance of a second similar coil of 500 turns will be

- a) 75 mH                      b) 375 mH                      c) 15 mH                      d) None of these
7. The coefficient of induction of a choke coil is  $0.1H$  and resistance is  $12\Omega$ . If it is connected to an alternating current source of frequency  $60\text{ Hz}$ , then power factor will be

- a) 0.32                      b) 0.30                      c) 0.28                      d) 0.24

8. A square loop of side  $a$  placed in the same plane as a long straight wire carrying a current  $i$ . The centre of the loop is at a distance  $r$  from the wire, where  $r \gg a$ , figure. The loop is moved away from the wire with a constant velocity  $v$ . The induced emf in the loop is



- a)  $\frac{\mu_0 i a v}{2 \pi r}$                       b)  $\frac{\mu_0 i a^3 v}{2 \pi r^3}$                       c)  $\frac{\mu_0 i v}{2 \pi}$                       d)  $\frac{\mu_0 i a^2 v}{2 \pi r^2}$

9. Voltage and current in an ac circuit are given by

$$V = 5 \sin \left( 100 \pi t - \frac{\pi}{6} \right) \text{ and } I = 4 \sin \left( 100 \pi t + \frac{\pi}{6} \right)$$

- a) Voltage leads the current by  $30^\circ$                       b) Current leads the voltage by  $30^\circ$   
c) Current leads the voltage by  $60^\circ$                       d) Voltage leads the current by  $60^\circ$
10. A coil is wound on a core of rectangular cross-section. If all the linear dimensions of core are increased by a factor 2 and number of turns per unit length of coil remains same, the self-inductance increases by a factor of

- a) 16                      b) 8                      c) 4                      d) 2

11. The phase angle between e.m.f. and current in  $LCR$  series as circuit is

- a) 0 to  $\frac{\pi}{2}$                       b)  $\frac{\pi}{4}$                       c)  $\frac{\pi}{2}$                       d)  $\pi$

12. The primary winding of a transformer has 200 turns and its secondary winding has 50 turns. If the current in the secondary winding is 40 A, the current in the primary is

- a) 10 A                      b) 80 A                      c) 160 A                      d) 800 A

13. The initial phase angle for  $i = 10 \sin \omega t + 8 \cos \omega t$  is

- a)  $\tan^{-1}\left(\frac{4}{5}\right)$       b)  $\tan^{-1}\left(\frac{5}{4}\right)$       c)  $\sin^{-1}\left(\frac{4}{5}\right)$       d)  $90^\circ$

14. An inductor is connected to an AC source. When compared to voltage, the current in the lead wires
- a) Is ahead in phase by  $\pi$       b) Lags in phase by  $\pi$   
c) Is ahead in phase by  $\frac{\pi}{2}$       d) Lags in phase by  $\frac{\pi}{2}$
15. An ac supply gives 30 V r.m.s. which passes through a  $10\ \Omega$  resistance. The power dissipated in it is
- a)  $90\sqrt{2}\ W$       b)  $90\ W$       c)  $45\sqrt{2}\ W$       d)  $45\ W$
16. In a series LCR circuit, operated with an ac of angular frequency  $\omega$ , the total impedance is
- a)  $[R^2 + (L\omega - C\omega)^2]^{1/2}$       b)  $\left[R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2\right]^{1/2}$   
c)  $\left[R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2\right]^{-1/2}$       d)  $\left[(R\omega)^2 + \left(L\omega - \frac{1}{C\omega}\right)^2\right]^{1/2}$
17. An LCR series circuit is at resonance. Then
- a) The phase difference between current and voltage is  $90^\circ$   
b) The phase difference between current and voltage is  $45^\circ$   
c) Its impedance is purely resistive  
d) Its impedance is zero
18. The voltage of domestic ac is 220 volt. What does the represent
- a) Mean voltage      b) Peak voltage  
c) Root mean voltage      d) Root mean square voltage
19. In an ideal transformer, the voltage is stepped down from 11 kV to 220 V. If the primary current be 100 A, the current in the secondary should be
- a) 5 kA      b) 1 kA      c) 0.5 kA      d) 0.1 Ka
20. If an  $8\ \Omega$  resistance and  $6\ \Omega$  reactance are present in an ac series circuit then the impedance of the circuit will be
- a)  $20\ ohm$       b)  $5\ ohm$       c)  $10\ ohm$       d)  $14\sqrt{2}\ ohm$

PE