

Alternating Current

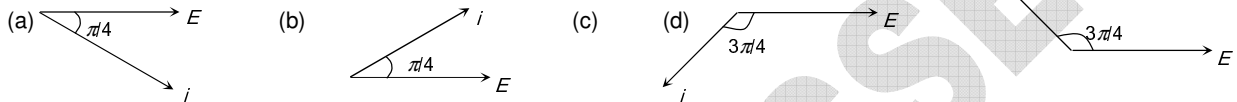
1. A group of electric lamps having a total power rating of 1000 watt is supplied by an ac voltage $E = 200 \sin(310t + 60^\circ)$. Then the r.m.s. value of the circuit current is

(a) 10 A (b) $10\sqrt{2}$ A (c) 20 A (d) $20\sqrt{2}$ A

2. The instantaneous values of alternating current and e.m.f. in an ac circuit are $i = \frac{1}{\sqrt{2}} \sin 314t$ A and $E = \sqrt{2} \sin(314t - \frac{\pi}{6})$ volt respectively. The phase difference between E and i will be

(a) $\frac{\pi}{6}$ radian (b) $-\frac{\pi}{6}$ radian (c) $\frac{\pi}{3}$ radian (d) $-\frac{\pi}{3}$ radian

3. In a certain circuit $E = 200 \cos(314t)$ and $i = \sin(314t + \pi/4)$. Their vector representation is



4. The ac current through a capacitor $C = \frac{10^{-4}}{314}$ farad is given by $i = 25 \cos(314t + 30^\circ)$ mA then the e.m.f. across the capacitor will be given by

(a) $e = 250 \cos(314t - 60^\circ)$ volt (b) $e = 250 \sin(314t + 30^\circ)$ volt
(c) Both of the above (d) None of the above

5. One 10 V, 60 W bulb is to be connected to 100 V line. The required induction coil has self inductance of value ($f = 50$ Hz)

(a) 0.052 H (b) 2.42 H (c) 16.2 mH (d) 1.62 mH

6. An LCR series circuit with a resistance of 100 ohm is connected to an ac source of 200 V (r.m.s.) and angular frequency 300 rad/s. When only the capacitor is removed, the current lags behind the voltage by 60° . When only the inductor is removed the current leads the voltage by 60° . The average power dissipated is

(a) 50 W (b) 100 W (c) 200 W (d) 400 W

7. A $2.5/\pi \mu F$ capacitor and a 3000 ohm resistance are joined in series to an ac source of 200 volt and 50 sec^{-1} frequency. The power factor of the circuit and the power dissipated in it will respectively be

(a) 0.6, 0.06 W (b) 0.06, 0.6 W (c) 0.6, 4.8 W (d) 4.8, 0.6 W

8. A virtual current of 4A and 50 Hz flows in an ac circuit containing a coil. The power consumed in the coil is 240 W. If the virtual voltage across the coil is 100 V its inductance will be

(a) $\frac{1}{3\pi}$ H (b) $\frac{1}{5\pi}$ H (c) $\frac{1}{7\pi}$ H (d) $\frac{1}{9\pi}$ H

9. A bulb and a capacitor are connected in series to a source of alternating current. If its frequency is increased, while keeping the voltage of the source constant, then

(a) Bulb will give more intense light (b) Bulb will give less intense light
(c) Bulb will give light of same intensity as before (d) Bulb will stop radiating light

10. A 110 V, 60 W lamp is run from a 220 V ac mains using a capacitor in series with the lamp, instead of a resistor then the voltage across the capacitor is about

(a) 110 V (b) 190 V (c) 220 V (d) 311 V

11. Consider two cables A and B. In A, a single copper wire of cross-sectional area x is used, while in B, a bunch of 15 wires each of cross-sectional area $\frac{x}{15}$ is used. Then for the flow of high frequency ac, the

(a) Cable A is more suitable than B (b) Cable B is more suitable than A
(c) Both cables are equally suitable (d) Nothing specific can be predicted

12. The current in LCR series circuit will be maximum when ω is

(a) As large as possible (b) Equal to natural frequency of LCR system

(c) \sqrt{LC} (d) $\sqrt{\frac{1}{LC}}$

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13. A coil has $L = 0.04 \text{ H}$ and $R = 12\Omega$. When it is connected to 220 V , 50 Hz supply the current flowing through the coil, in amperes is
- (a) 10.7 (b) 11.7 (c) 14.78 (d) 12.7
14. In an ac circuit the reactance of a coil is $\sqrt{3}$ times its resistance, the phase difference between the voltage across the coil to the current through the coil will be
- (a) $\pi/3$ (b) $\pi/2$ (c) $\pi/4$ (d) $\pi/6$
15. Power factor is maximum in an LCR circuit when
- (a) $X_L = X_C$ (b) $R = 0$ (c) $X_L = 0$ (d) $X_C = 0$

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