



# PHYSICS

## BOOKS - SARAS PUBLICATION

# ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENTS

### Example

1. A charged particle (charge  $q$ ) is moving in a circle of radius  $R$  with uniform speed  $V$ . The

associated magnetic moment is given by

A.  $q v R$

B.  $qvR / 2$

C.  $qvR^2$

D.  $qvR^2 / 2$

**Answer:**



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2. A beam of electron passes undeflected through mutually perpendicular electric and magnetic fields. If the electric field is switched off and the same magnetic field is maintained, the electrons move,

A. along a straight line

B. in an elliptical orbit

C. in a circular orbit

D. \along a parabolic path

**Answer:**



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3. In an a.c circuit the e.m.f(e) and the current

(i) at any instant are given respectively by :

A.  $\frac{E_0 I_0}{2}$

B.  $\frac{E_0 I_0}{2} \sin \phi$

C.  $\frac{E_0 I_0}{2} \cos \phi$

D.  $E_0 I_0$

**Answer:**



4. Power dissipated in an LCR series circuit connected to an a.c source of emf  $\varepsilon$  is :

A. 
$$\frac{\varepsilon^2 \sqrt{R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2}}{R}$$

B. 
$$\frac{\varepsilon^2 \sqrt{R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2}}{R}$$

C. 
$$\frac{\varepsilon^2 R}{\left(\sqrt{R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2}\right)}$$

D. 
$$\frac{\varepsilon^2 R}{R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2}$$

**Answer:**



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5. A thin-ring of radius  $R$  metre has charge  $q$  coulomb uniformly spread on it . The ring rotates about its axis with a constant frequency of  $f$  revolution / s. The value of magnetic induction in  $\omega b m^{-2}$  at the centre of the ring is :

A.  $\frac{\mu_0 q f}{2\pi R}$

B.  $\frac{\mu_0 q}{2\pi f R}$

C.  $\frac{\mu_0 q}{2fR}$

D.  $\frac{\mu_0 q f}{2R}$

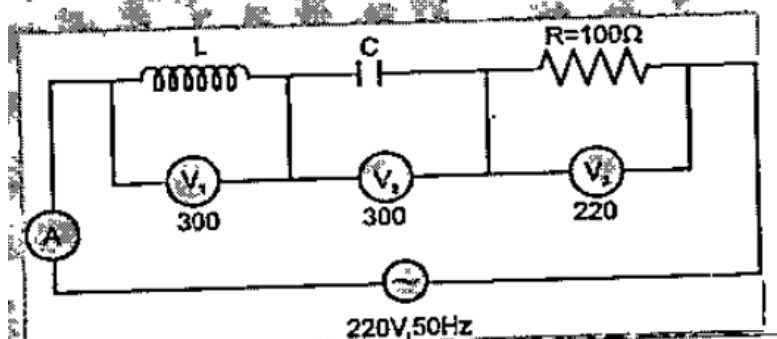
**Answer:**



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**6.** In the given circuit the reading of voltmeter  $V_1$  and  $V_2$  are 300 volts each. The reading of the voltmeter  $V_3$  and ammeter A are

respectively



- A. 150 V, 2.2 A
- B. 220 V, 2.2 A
- C. 220 V, 2.0 A
- D. 100 V, 2.0A

**Answer:**



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7. In an ac circuit an alternating voltage  $e = 200\sqrt{2} \sin 100 t$  volts is connected to capacitor of capacity  $1\mu F$ . The r.m.s. value of the current in the circuit is :

A. 20 mA

B. 10 mA

C. 100 mA

D. 200 mA

**Answer:**



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8. An ac voltage is applied to a resistance  $R$  and inductor  $L$  in series. If  $R$  and the inductive reactance are both equal to  $3\Omega$  the phase difference between the applied voltage and the current in the circuit is :

A. Zero

B.  $\pi/6$

C.  $\pi/4$

D.  $\pi / 2$

**Answer:**



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9. A transistor is operated in common emitter configuration at  $V_e=2$  V such that a change in the base current from  $100\mu A$  to  $300\mu A$  produces change in the collector current from 10 mA to 20 mA. The current gain is :

A. 25

B. 50

C. 75

D. 100

**Answer:**



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**10.** If voltage across a bulb rated 220Volt-100 Watt drops by 2.5% of its rated value, the percentage of the rated value by which the power would decrease is :

A. 2.5%

B. 5%

C. 10%

D. 20%

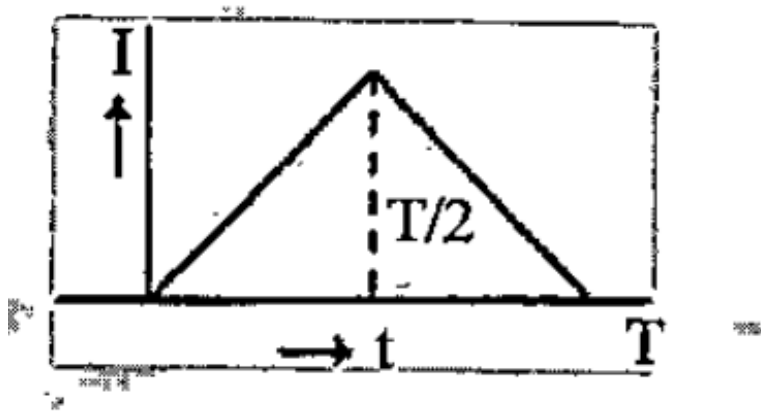
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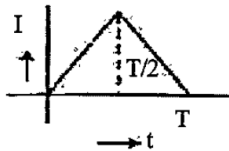
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**11.** The current ( $I$ ) in the inductance is varying with time according to the plot shown in figure Which one of the following is the correct

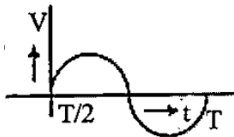
variation of voltage with time in the coil?



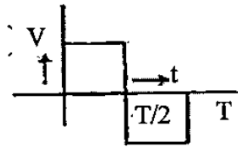
A.



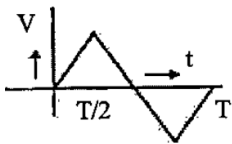
B.



C.



D.

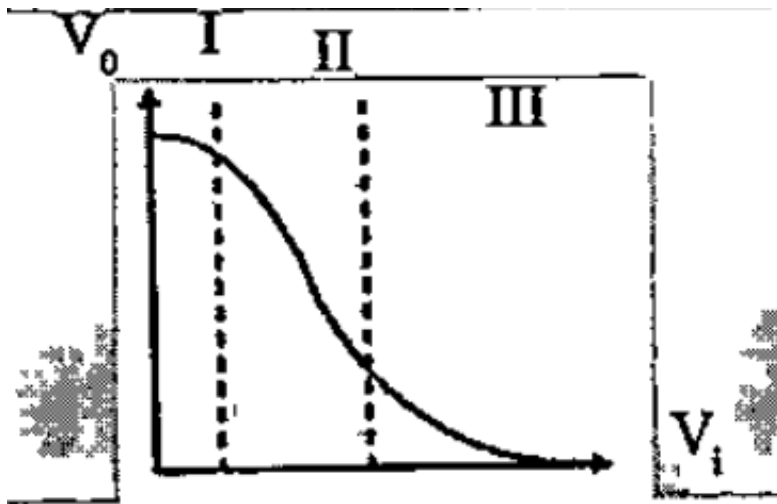


**Answer:**



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12. Transfer characteristics output voltage ( $V_0$ ) vs input voltage ( $V_1$ ) for a base biased transistor in CE configuration is as shown in the figure. For using transistor as a switch, it is used



A. both in region (I) and (III)



B. in region I

C. In region I

D. In region III

**Answer:**



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**13.** In an electrical circuit, R, L, C and AC voltage source are all connected in series. When L is removed from the circuit, the phase difference between the voltage and current in the circuit,

is  $\frac{\pi}{3}$ . Instead, if C is removed from the circuit, the phase difference is again  $\frac{\pi}{3}$ . The power factor of the circuit is

A.  $1/\sqrt{2}$

B. 1

C.  $\sqrt{3}/2$

D.  $1/2$

**Answer:**



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14. A coil of self-inductance  $L$  is connected in series with a bulb  $B$  and an AC source. Brightness of the bulb decreases when

A. Frequency of the AC source is decreased

B. Number of turns in the coil is reduced

C. A capacitance of reactance  $X_c = \frac{1}{\omega C}$  is included in the same circuit

D. An iron rod is inserted in the coil

**Answer:**



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**15.** Ten identical cells connected in series are needed to heat a wire of length one meter and radius 'r' by  $10^{\circ}C$  in time 't'. How many cells will be required to heat the wire of length two meter of the same radius but the same temperature in time 't'?

A. 10

B. 20

C. 30

D. 40

**Answer:**



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**16.** A current of 2.5 A flows through a coil of inductance 5 H The magnetic flux linked with the coil is

A. 2 Wb

B. 0.5Wb

C. 12.5 Wb

D. Zero

**Answer:**



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**17.** The primary of a transformer when connected to dc battery of 10 volt draws a current of 1 mA. The number of turns of the primary and secondary windings are the

current drawn by the circuit in the secondary  
are respectively

A. 20 V and 0.5 mA

B. 20 V and 2.0 mA

C. 10 V and 0.5 mA

D. Zero volt and therefore no current

**Answer:**



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**18.** Two cities are 150 km apart. Electric power is sent from one city to another city through copper wire. The fall of potential per Km is 8 volt and the average resistance per Km is  $0.5\Omega$ . The power loss in the wire is

A. 19.2 W

B. 19.2 kW

C. 19.2 J

D. 12.2 kW

**Answer:**





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**19.** A transformer having efficiency of 90% is working on 200 V and 3 kW power supply. If the current in the secondary coil is 6 A, the voltage across the secondary coil and the current in the primary coil respectively are

A. 300 V, 15 A

B. 450 V, 15 A

C. 450 V, 13.5 A

D. 600 V, 15 A

**Answer:**



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**20.** A resistance 'R' draws power 'P' when connected to an AC source. If an inductance is now placed in series with the resistance, such that the impedance of the circuit becomes 'Z' the power drawn will be :

A.  $P \left( \frac{R}{Z} \right)$

B.  $P\sqrt{\frac{R}{Z}}$

C. P

D.  $P\left(\frac{R}{Z}\right)^2$

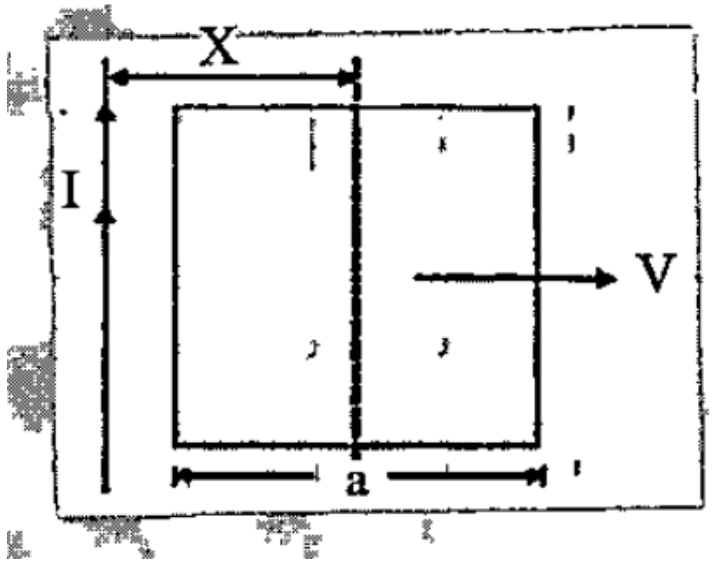
**Answer:**



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21. A conducting square frame of side 'a' and a long straight wire carrying current I are located in the same plane as shown in the figure. The frame moves to the right with a

constant velocity 'V'. The emf induced in the frame will be proportional to :



- A.  $\frac{1}{(2x - a)^2}$
- B.  $\frac{1}{(2x + a)^2}$
- C.  $\frac{1}{(2x - a)(2x + a)}$
- D.  $\frac{1}{x^2}$

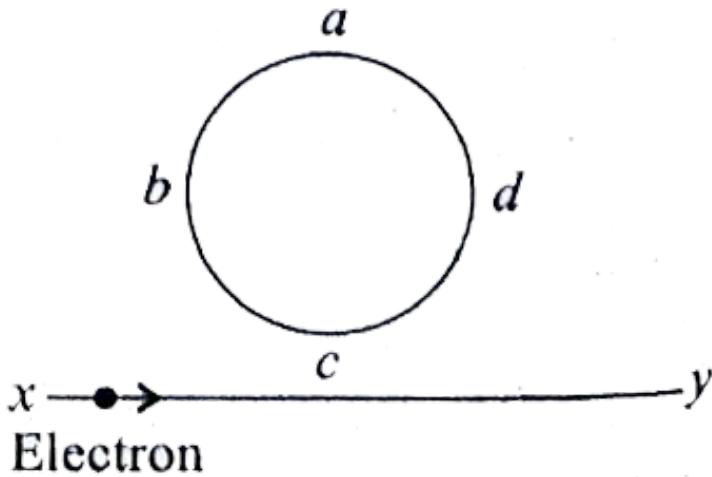
**Answer:**



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**22.** An electron moves on a straight line path XY as shown in the figure. The coil abed is adjacent to the path of the electron. What will be the direction of current, if any, induced in

the coil?



A. No current induced

B. *abcd*

C. *adcd*

D. The current will reverse its direction as

the electron goes part the coil

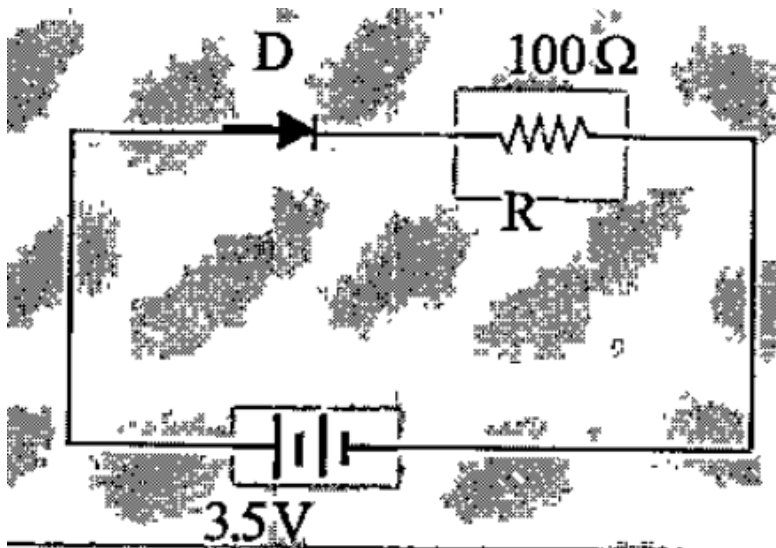
**Answer:**



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**23.** In the given figure, a diode D is connected to an external resistance  $R=100\Omega$  and e.m.f. of 3.5 V. If the barrier potential developed across the

diode is 0.5 V, the current in the circuit will be



- A. 35 mA
- B. 30 mA
- C. 40 mA
- D. 20 mA

**Answer:**





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24. Two metal wires of identical dimensions are connected in series if  $\sigma_1$  and  $\sigma_2$  are the conductivity of the metal wire respectively the effective conductivity of the combination is

A.  $\frac{\sigma_1\sigma_2}{\sigma_1 + \sigma_2}$

B.  $\frac{2\sigma_1\sigma_2}{\sigma_1 + \sigma_2}$

C.  $\frac{\sigma_1 + \sigma_2}{2\sigma_1\sigma_2}$

D.  $\frac{\sigma_1 + \sigma_2}{\sigma_1\sigma_2}$

**Answer:**



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**25.** A circuit contains an ammeter, a battery of 30 V and a resistance 40.8 ohm all connected in series . If the ammeter has coil of 480 ohm and a shunt of 20 ohm, the reading in the ammeter will be

A. 1A

B. 0.5A

C.  $0.25A$

D.  $2A$

**Answer:**



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**26.** Which of the following combinations should be selected for better tuning of an L-C-R circuit used for communication?

A.  $R = 15\Omega, L = 3.5H, C = 30\mu F$

B.  $R = 25\Omega$ ,  $L = 1.5H$ ,  $C = 45\mu F$

C.  $R = 20\Omega$ ,  $L = 1.5H$ ,  $C = 35\mu F$

D.  $R = 25\Omega$ ,  $L = 2.5H$ ,  $C = 45\mu F$

**Answer:**



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27. The potential differences across the resistance capacitance and inductance are 80 V, 40 V and 100 V respectively in an L-C-R circuit. The power factor of this circuit is

A. 0.8

B. 1.0

C. 0.4

D. 0.5

**Answer:**



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**28.** In a common emitter transistor amplifier the audio signal voltage across the collector is  $3K\Omega$ . If current gain is 100 and the base

resistance is  $2K\Omega$ , the voltage and power gain of the amplifies is :

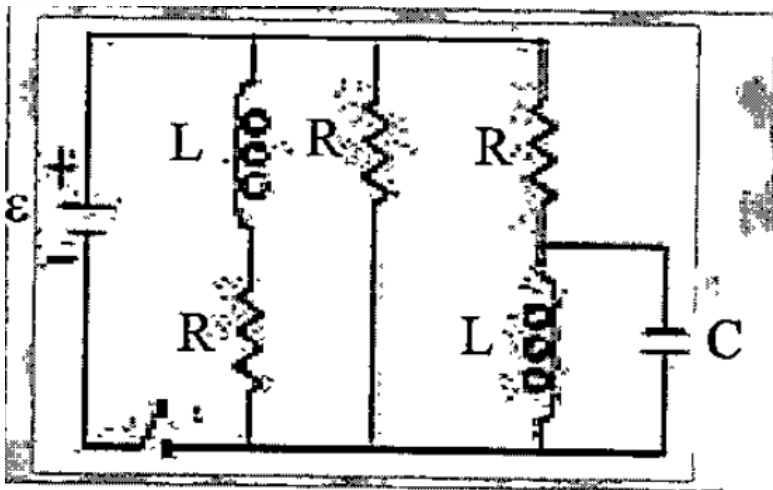
- A. 15 and 200
- B. 150 and 15000
- C. 20 and 2000
- D. 200 and 1000

**Answer:**



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29. Figure shows a circuit that contains three identical resistor with resistance  $R = 9.0\Omega$  each,two identical inductors with inductance  $L = 2.0 \text{ mH}$  each,and an ideal battery with emf = 18V.The current ' I ' through the battery just after the switch closed is,.....



A. 0.2 A

B.  $2A$

C. 0 ampere

D. 2 mA

**Answer:**



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