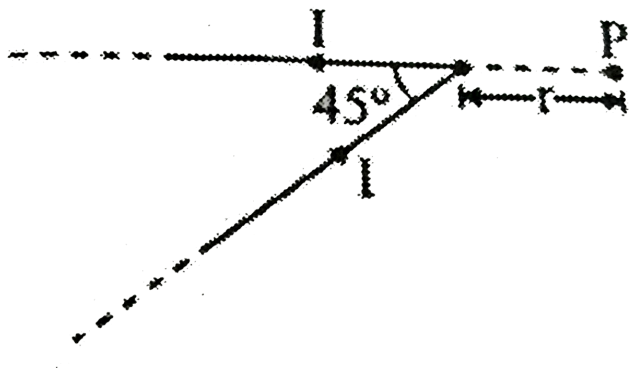
PHYSICS

BOOKS - CAREER POINT

UNIT TEST 8

Physics

1. Magnetic induction at point P from shown current-carrying long conductors is given by-



A. $\frac{5\mu_0 I}{2\sqrt{2}\pi r}(\sqrt{2}-1)$

B. $\frac{\mu_0 I}{\sqrt{2}\pi r}(\sqrt{2}-1)$

C. $\frac{8\mu_0 I}{2\pi r}(\sqrt{2}-1)$

D. $\frac{\mu_0 I}{4\pi r}(\sqrt{2}-1)$

Answer: D

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2. The B-H curves (a) and (b) drawn below are associated with :

A. a diamagnetic and a ferromagnetic substance respectively

B. a paramagnetic and a ferromagnetic substance respectively

C. soft iron and steel respectively

D. steel and soft iron respectively

Answer: C

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3. A long straight wire along the z-axis carries a current I in the negative z-direction. The magnetic vector field $\overrightarrow{B}$ at a point having coordinnates (x, y) in the z = 0 plane is

A. $\frac{\mu_0 I\left(y\hat{i} - x\hat{j}\right)}{2\pi(x^2 + Y^2)}$

B. $\frac{\mu_0 I\left(x\hat{i} + y\hat{j}\right)}{2\pi(x^2 + Y^2)}$

C. $\frac{\mu_0 I\left(x\hat{j}-y\hat{i}\right)}{2\pi(x^2+Y^2)}$

D. $\frac{\mu_0 I\left(x\hat{i}-y\hat{j}\right)}{2\pi(x^2+Y^2)}$

Answer: A

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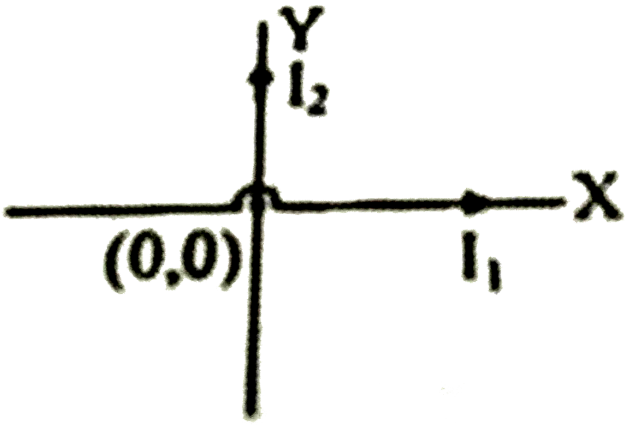
4. Two long straight conductors with corrents I_1 and I_2 are placed along X and Y axes. The equation of locus of points of zero magnetic

induction is :



A. $Y = X$

B. $Y = \frac{I_2 X}{I_2}$

C. $Y = \frac{I_1}{I_2} X$

D. $Y = \frac{X}{I_1 I_2}$

Answer: C

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5. An iron rod of length L and magnetic moment M is bent in the form of a semicircle. Now its magnetic moment will be

A. M

B. $\frac{2M}{\pi}$

C. $\frac{M}{\pi}$

D. $M\pi$

Answer: B

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6. The time of vibration of a dip needle vibration in the vertical plane in the magnetic needle is made to vibrate in the horizontal plane, the time of vibration is $3\sqrt{2}s$. Then angle of dip will be-

A. 90°

B. 60°

C. 45°

D. 30°

Answer: B

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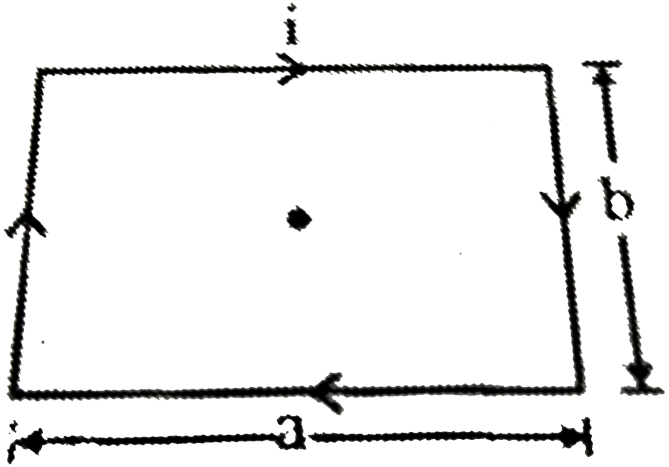
7. Shown in the figure is a rectangular loop of conductor carrying a current i. The length and breath of the loop are respectively a and b.

The magnetic field at the centre of loop is -



A. $\frac{\mu_0 i(a+b)}{2\pi\sqrt{a^2+b^2}}$

B. $\frac{\mu_0 iab}{2\pi\sqrt{a^2+b^2}}$

C. $\frac{\mu_0 i(a+b)}{\pi\sqrt{a^2+b^2}}$

D. $\frac{2\mu_0 i\sqrt{a^2+b^2}}{\pi ab}$

Answer: D

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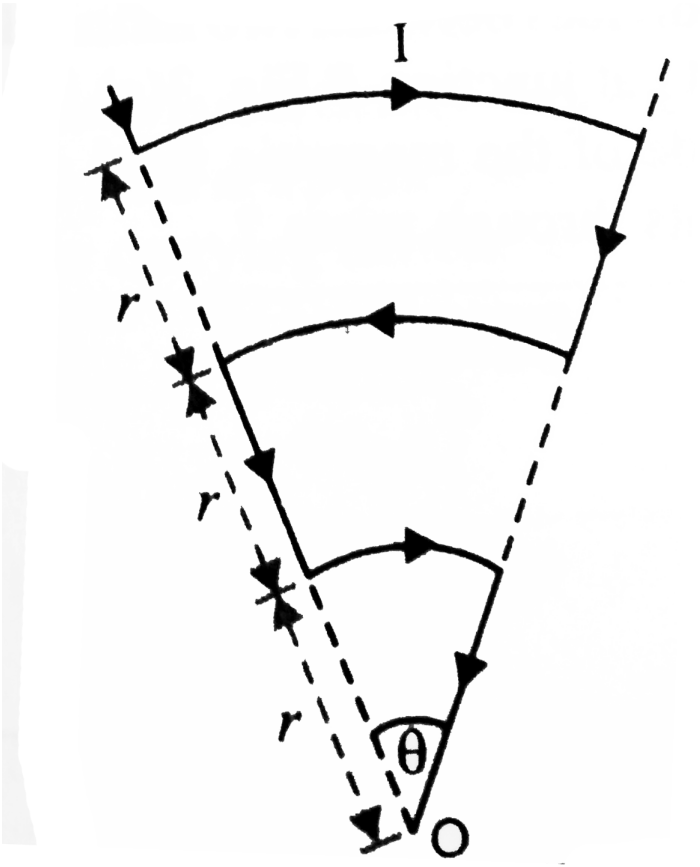
8. A conductor carrying current I is of the type as shown in figure. Find the magnetic field induction at the common centre O of all the

three arcs.



A. $\frac{5\mu_0 I\theta}{24\pi r}$

B. $\frac{\mu_0 I\theta}{24\pi r}$

C. $\frac{11\mu_0 I\theta}{24\pi r}$

D. zero

Answer: A

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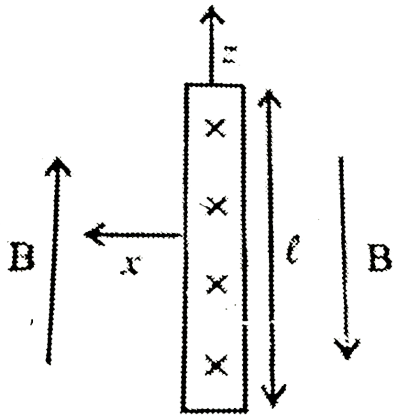
9. A thin infinitely large sheet lying in yz plane carries a current of linear current density λ. The current is in negative y direction and λ represents current per unit length measured along z-axis. Find the magnetic field near the sheet : (Magnetic field due to the sheet will be

parallel to sheet)



(Long sheet with $\lambda = \frac{\text{current}}{\text{length}}$)

(Long sheet with $\lambda = \frac{\text{current}}{\text{length}}$)

A. $B = \frac{\mu_0 \lambda}{2}$

B. $B = \mu_0 2\lambda$

C. $B = \mu_0 \lambda$

D. $B = \frac{\mu_0 \lambda}{4}$

Answer: A

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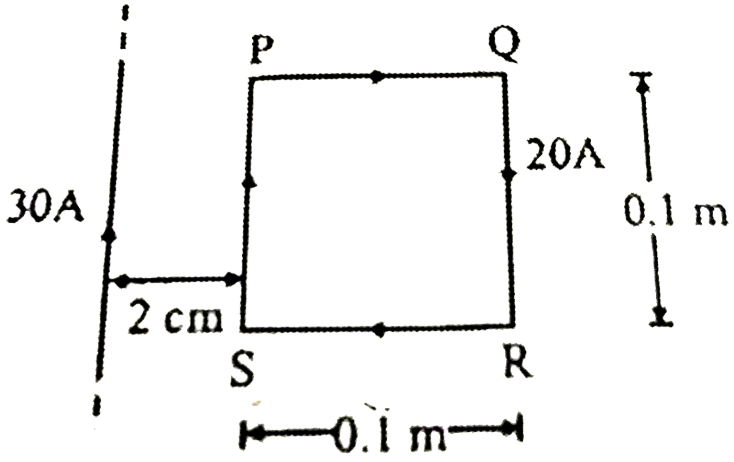
10. The resultant force on a square current loop PQRS due to a long current carrying conductor will be (if the current flow in the loop is clockwise)



A. zero

B. $0.36 \times 10^{-3} N$

C. $2.5 \times 10^{-3} N$

D. $5 \times 10^{-4} N$

Answer: D

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11. The real angle of dip, if a magnet is suspended at an angle of 30° to the magnetic

meridian and the dip needle makes an angle of 45° with horizontal, is:

A. $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

B. $\tan^{-1}(\sqrt{3})$

C. $\tan^{-1}\left(\sqrt{\frac{3}{2}}\right)$

D. $\tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$

Answer: A

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12. The relative permeability is represented by μ_r and susceptibility is denoted by χ for a magnetic substance then for a paramagnetic substance.

A. $\mu_r > 1, \chi < 0$

B. $\mu_r > 1, \chi > 0$

C. $\mu_r < 1, \chi < 0$

D. $\mu_r < 1, \chi > 0$

Answer: B

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13. In a uniform magneitc field of induced B a wire in the form of a semicircle of radius r rotates about the diameter of hte circle with an angular frequency ω. The axis of rotation is perpendicular to hte field. If the total resistance of hte circuit is R, the mean power generated per period of rotation is

A. $\frac{B\pi r^2\omega}{2R}$

B. $\frac{\left(B\pi r^2\omega\right)^2}{8R}$

C. $\frac{(B\pi r\omega)^2}{2R}$

D. $\frac{\left(B\pi r\omega^2\right)^2}{8R}$

Answer: B

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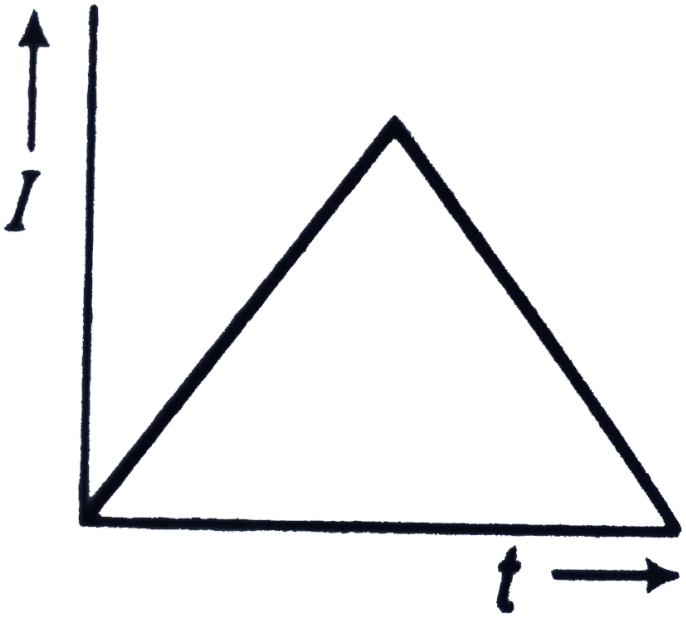
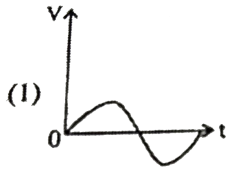
14. An alternating current I in an inductance coil varies with time t according to the graph as shown: Which one of the following graph

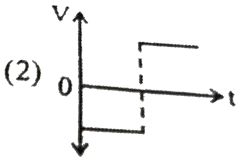
gives the variation of voltage with time?



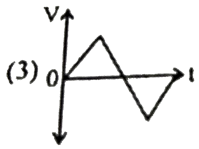
A.



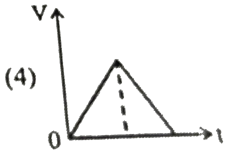
B.



C.



D.



Answer: B

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15. The self inductance of a solenoid of length L, area of cross-section A and having N turns is-

A. $\mu_0 Nl$

B. $\mu_0 NAl$

C. $\mu_0 \frac{NA}{l}$

D. $\mu_0 \frac{N^2 A}{l}$

Answer: D

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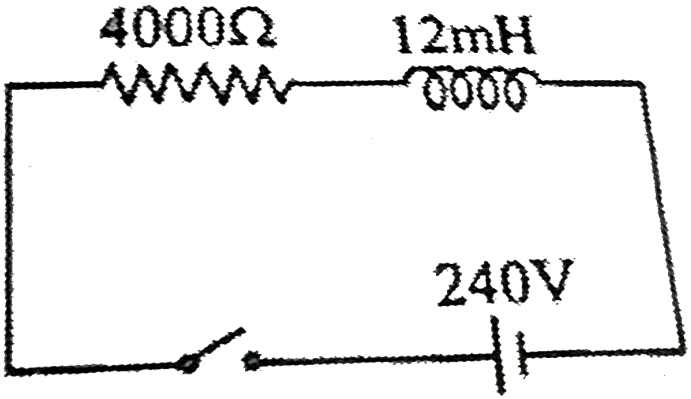
16. In the inductive circuit given in the figure, the current rises after the switch is closed. At instant when the current is 15 mA, then

potential difference across the inductor will be-



A. zero

B. 240 V

C. 180 V

D. 60 V

Answer: C

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17. A current $I = 10\sin(100\pi t)$ amp. Is passed in first coil, which induces a maximum e.m.f of 5π volt in second coil. The mutual inductance between the coils is-

A. 10 mH

B. 15 mH

C. 25 mH

D. 5 mH

Answer: D

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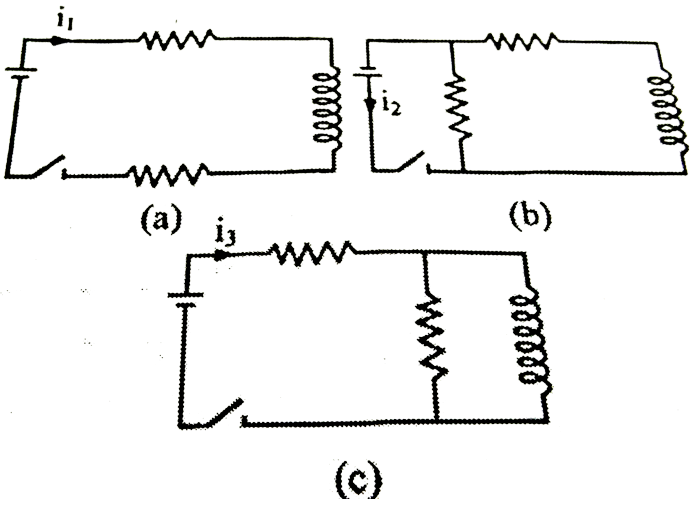
18. The figure shows three circuits with identical batteries, inductors and resistance, Rank the circuits according to the currents through the battery just after the switch is

closed, greatest first :



A. $i_2 > i_3 > i_1$

B. $i_2 > i_1 > i_3$

C. $i_1 > i_2 > i_3$

D. $i_1 > i_3 > i_2$

Answer: A

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19. A small square loop of wire of side l is placed inside a large square loop of wire of side $L(L > > l)$. The loops are coplanar and their centre coincide. What is the mutual inductance of the system ?

A. $\mu_0 L^2 l$

B. $2\sqrt{2}\frac{\mu_0 l^2}{\pi L}$

C. $2\sqrt{2}\frac{\mu_0 L^2}{\pi l}$

D. $\mu_0 l^2 L$

Answer: B

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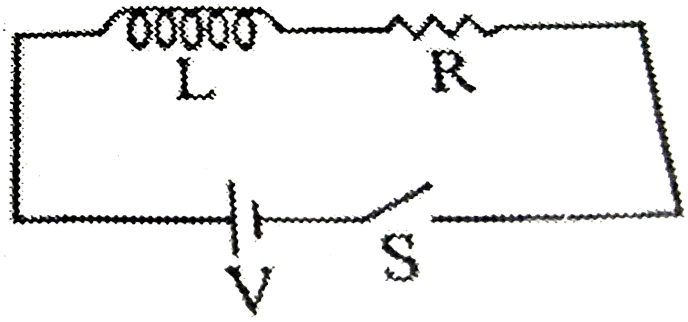
20. In adjacent circuit, switch S is closed at t = 0. The time at which current in the circuit becomes half of the steady current is



A. $\tau \ln 2$

B. $\frac{\ln 2}{\tau}$

C. $2\tau \ln 2$

D. $\frac{\tau}{2} \ln 2$

Answer: A

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21. A generator at a utility company produces 100 A of current at 4000 V. The voltage is stepped up to 240000 V by a transformer

before it is sent on a high voltage transmission line. The current in transmission line is

A. 3.67 A

B. 2.67 A

C. 1.67 A

D. 2.40 A

Answer: C

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

A. 0.052 H

B. 2.42 H

C. 16.2 mH

D. 1.62 mH

Answer: A

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23. An AC source of angular frequency ω is fed across a resistor R and a capacitor C in series. The current registered is I. If now the frequency of source is changed to $\omega/3$ (but maintaining the same voltage), the current in the circuit is found to be halved. The ratio of reactance to resistance at the original frequency ω will be.

A. $\sqrt{\frac{3}{5}}$

B. $\sqrt{\frac{2}{5}}$

C. $\sqrt{\frac{1}{5}}$

D. $\sqrt{\frac{4}{5}}$

Answer: A

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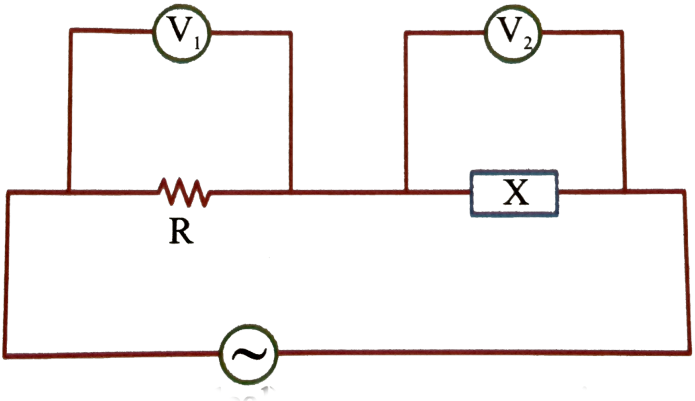
24. If the reading of the voltmeters vary with time as: $V_1 = 20\sin\omega t$ and $V_2 = -20\cos\left(\omega t + \frac{\pi}{6}\right)$ then the unknown

circuit element x is a:



A. pure (or ideal) inductor

B. practical inductor

C. pure (or ideal) capacitor

D. practical capacitor

Answer: D

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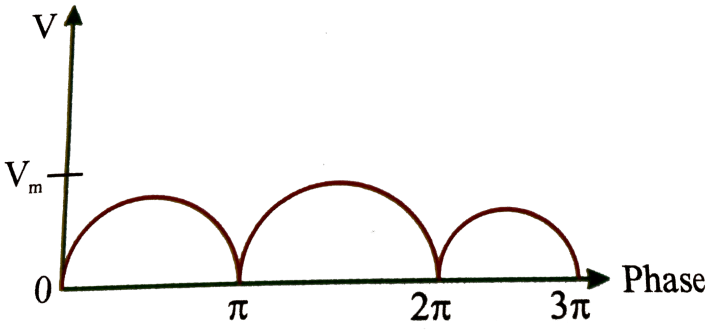
25. The average and effective values for the waveshaphe shown in figure are:



A. $\frac{2}{\pi}V_m$ and $\frac{V_m}{2}$

B. $\frac{V_m}{\pi}$ and $\frac{V_m}{\sqrt{2}}$

C. $\frac{2}{\pi}V_m$ and $\frac{V_m}{\sqrt{2}}$

D. $\frac{V_m}{\pi\sqrt{2}}$ and $\frac{V_m}{\sqrt{2}}$

Answer: C

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26. An alternating current is given by $\left(\sqrt{3}\sin\omega t + \cos\omega t\right)$. The rms current is :

A. 2

B. $\sqrt{2}$

C. $2\sqrt{2}$

D. 4

Answer: B

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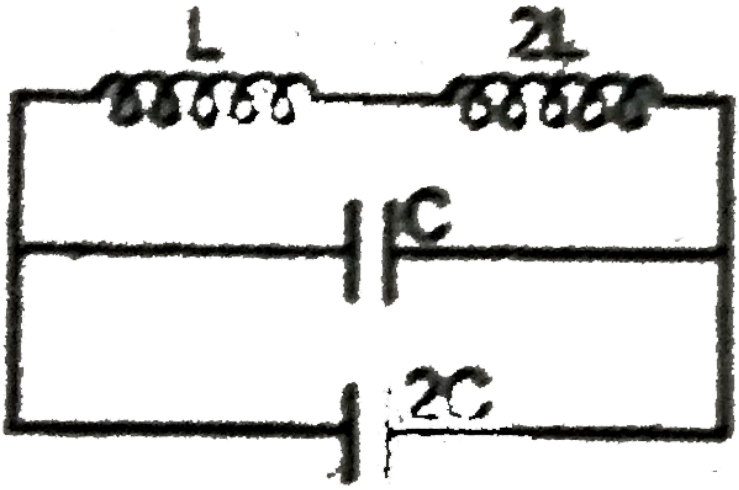
27. The frequency of oscillation of current in the inductor is:



A. $\frac{1}{3\sqrt{LC}}$

B. $\frac{1}{6\pi\sqrt{LC}}$

C. $\frac{1}{\sqrt{LC}}$

D. $\frac{1}{2\pi\sqrt{LC}}$

Answer: B

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28. A coil has an inductance of $0.7H$ and is joined in series with a resistance of 220Ω. When an alternating e.m.f of $220V$ at 50 c.p.s.

is applied to it, then the wattless component of the current in the circuit is

A. 5 ampere

B. 0.5 ampere

C. 0.7 ampere

D. 7 ampere

Answer: B

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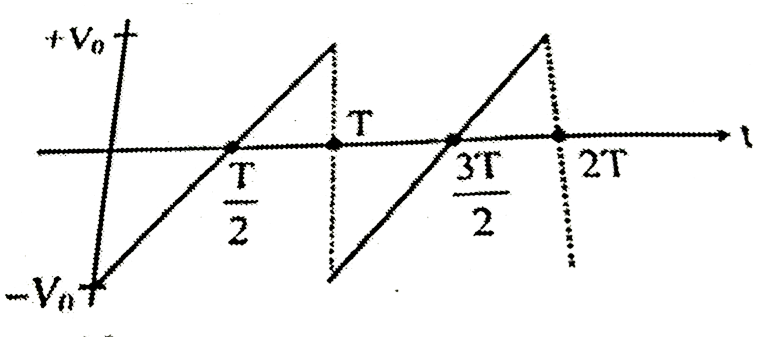
29. Rms value of the saw-tooth voltage of peak value V_0 as shown in-



A. $\frac{V_0}{2}$

B. $\frac{V_0}{\sqrt{2}}$

C. $\frac{V_0}{3}$

D. $\frac{V_0}{\sqrt{3}}$

Answer: D

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

A. 0.6, 0.06W

B. 0.06, 0.6W

C. 0.6, 4.8W

D. 4.8, 0.6W

Answer: C

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