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DPP 04

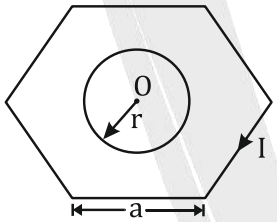
1. A solenoid of length 1 m, area of cross-section 4.0 cm^2 and having 4000 turns is placed inside another solenoid of 2000 turns having a cross-sectional area 6 cm^2 and length 2 m. The mutual inductance between the solenoids is $x\pi \times 10^{-5}$H. Find out value of x.

2. A very small circular loop of radius a is initially coplanar & concentric with a much larger circular loop of radius b(>> a). A constant current I is passed in the large loop which is kept fixed in space & the small loop is rotated with constant angular velocity ω about a diameter. The resistance of the small loop is R & its inductance is negligible.

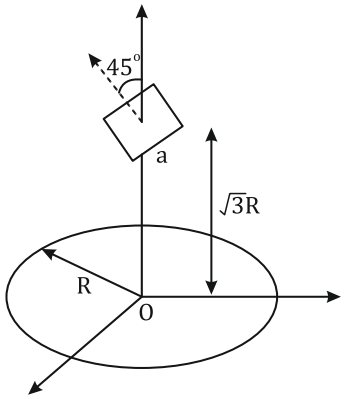
The induced emf in the large loop due to current induced in smaller loop as a function of time is equal to $\frac{1}{x}\left(\frac{\pi a^2 \mu_0 \omega}{b}\right)^2 \frac{I \cos 2\omega t}{R}$. Findout value of x.

3. In a fluorescent lamp choke (a small transformer) 100 V of reverse voltage is produce when the choke current changes uniformly from 0.25 A to 0 in a duration of 0.025 ms. The self -inductance of the choke (in mH) is estimated to be.

4. In the given figure. The expression of mutual Inductance is $\frac{\sqrt{K}\mu_0 r^2}{a}$. then the Value of k is [a >> r]



5. A circular wire loop of radius R is placed in the $x-y$ plane centered at the origin O. A square loop of side a(a << R) having two turns is placed with its center at $z = \sqrt{3}R$ along the axis of the circular wire loop, as shown in figure. The plane of the square loop makes an angle of 45° with respect to the z-axis. If the mutual inductance $\frac{\mu_0 a^2}{2^{p/2}R}$, then the value of p is



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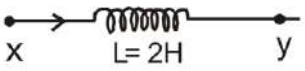
6. The figure shows an inductor of 2H through which a current increasing at the rate of 5 A/sec, is flowing. Find the potential difference $V_X - V_Y$.



7. A wire of fixed length is wound on a solenoid of length ' ℓ ' and radius ' r '. Its self inductance is found to be L. Now if same wire is wound on a solenoid of length $\frac{\ell}{2}$ and radius $\frac{r}{2}$, then the self inductance will be:

(A) 2L (B) L (C) 4 L (D) 8 L

8. Two coils are at fixed locations. When coil 1 has no current and the current in coil 2 increases at the rate 15.0 A/s the e.m.f. in coil 1 in 25.0mV, when coil 2 has no current and coil 1 has a current of 3.6 A, flux linkage in coil 2 is

(A) 16mWb (B) 10mWb (C) 4.00mWb (D) 6.00mWb

9. A rectangular loop of sides ' a ' and ' b ' is placed in xy plane. A very long wire is also placed in xy plane such that side of length ' a ' of the loop is parallel to the wire. The distance between the wire and the nearest edge of the loop is ' d '. The mutual inductance of this system is proportional to:

(A) a (B) b (C) 1/d (D) current in wire

10. Two coils of self inductance 100mH and 400mH are placed very close to each other. Find the maximum mutual inductance between the two when 4 A current passes through them

(A) 200mH (B) 300mH (C) $100\sqrt{2}$mH (D) none of these

11. A long straight wire is placed along the axis of a circular ring of radius R. The mutual inductance of this system is

(A) $\frac{\mu_0 R}{2}$ (B) $\frac{\mu_0 \pi R}{2}$ (C) $\frac{\mu_0}{2}$ (D) 0

12. When the current in a certain inductor coil is 5.0 A and is increasing at the rate of 10.0 A/s, the of potential difference across the coil is 140 V. When the current is 5.0 A and decreasing at the rate of 10.0 A/s, the potential difference is 60 V. The self inductance of the coil is :

(A) 2H (B) 4H (C) 10H (D) 12H

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ANSWER KEY

1.	64	**2.**	4	**3.**	10	**4.**	3	**5.**	7	**6.**	10	**7.**	(A)
8.	(D)	**9.**	(A)	**10.**	(A)	**11.**	(D)	**12.**	(B)				