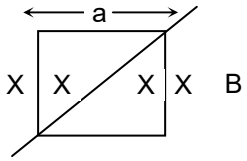
12TH PHYSICS - EMI

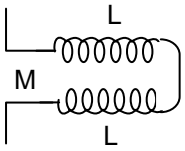
1. A square loop of side a is rotating about its diagonal with angular velocity ω in a perpendicular magnetic field as shown in the figure. The emf induced if it has 10 turns is.



(a) $10\ Ba^2\ \omega \cos \omega t$ **(b)** $10\ Ba^2\ \omega \sin \omega t$

(c) $10\ Ba^2$ **(d)** $5\sqrt{2}\ Ba^2$

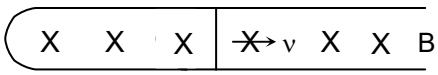
2. A coil is wound on an iron core and looped back on itself so that core has two sets of closely wound coils carrying current in opposite directions. The self inductance is



(a) Zero **(b)** 2L

(c) 2L + M **(d)** 2L + 2M

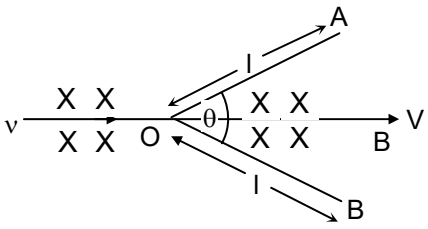
3. A wire of length l has resistance R. It can slide on a U shaped rail of negligible resistance. The resistance of the wire is R. The wire is pulled with a velocity ν. The current induced is



(a) $Bl\nu R$ **(b)** $\dfrac{Bl\nu}{R}$

(c) $\dfrac{Bl^2\nu}{R}$ **(d)** $\dfrac{Bl\nu}{2R}$

4. An angle AOP = θ moves along the angle bisector with velocity ν in a magnetic field B as shown in figure. The emf induced is



(a) $2\ Bl\nu \sin \theta$ **(b)** $2\ Bl\nu \cos \theta$

(c) $2\ Bl\nu \sin \theta/2$ **(d)** zero

5. A helicopter having its length along east west direction rises vertically with a speed of 10 ms^{-1}. It can be assumed to be a horizontal linear conductor of length 10 m. If the horizontal component of the earths magnetic field be 1.5×10^{-3} Wb/m^2, the emf induced between the tip of the nose and the tail of the helicopter in volt is

(a) 0.15 **(b)** 5

(c) 125 **(d)** 130

6. The magnetic flux through each turn of a 100 turn coil is $(t^3 - 2t) \times 10^{-3}$ Wb, where t is in second. The induced emf at t = 2 s is

(a) –4 V **(b)**–1 V

(c) + 1 V **(d)** + 4 V

7. In a circular conducting coil, when current increases from 2 A to 18 A in 0.05 s, the induced emf is 20 V. The self-inductance of the coil is

(a) 62.5 mH **(b)** 6.25 mH

(c) 50 mH **(d)** none of the above

8. The self-induced emf in a 0.1 H coil when the current in it is changing at the rate of 200 ampere / second is

(a) 125 V **(b)** 20 V

(c) 8×10^{-4} V **(d)** 8×10^{-5} V

9. A copper disc of radius 0.1 m is rotated about its centre with 10 revolutions per second in a uniform magnetic field of 0.1 tesla with its plane perpendicular to the field. The emf induced across the radius of disc is

(a) $\frac{\pi}{10}$ volt **(b)** $\frac{2\pi}{10}$ volt

(c) $\pi \times 10^{-2}$ volt **(d)** $2\pi \times 10^{-2}$ volt

10. A coil having an area 2 m^2 is placed in a magnetic field which changes from 1 Wb/m^2 to 4 Wb/m^2 in a interval of 2 second. The emf induced in the coil will be

(a) 4 V **(b)** 3 V

(c) 1.5 V **(d)** 2 V

11. A circular iron core supports N turns. If a current I produces a magnetic flux ϕ with each turn, then the magnetic field energy is

(a) $NI\phi$ **(b)** $\frac{1}{2}NI\phi$

(c) $N^2I\phi$ **(d)** $NI^2\phi$

12. Two coils have mutual inductance 0.005 H. The current changes in the first coil according to equation $I = I_0 \sin \omega t$ where I_o = 10 A and $\omega = 100\ \pi$ radian per second. The maximum value of emf in the second coil (in volt) is

(a) $2\ \pi$ **(b)** $5\ \pi$

(c) π **(d)** $4\ \pi$

13. A small magnet is along the axis of a small coil and its distance from the coil is 80 cm. In this position, the flux linked with the coil is 4×10^{-5} weber. If the coil is displaced 40 cm towards the magnet in 0.08 second, then the induced emf produced in the coil will be

(a) 0.5 mV **(b)** 1 mV

(c) 7 mV **(d)** 3.5 mV

14. The momentum in mechanics is expressed as m × v. The analogous expression in electricity is

(a) $I \times Q$ **(b)** $I \times V$

(c) $L \times I$ **(d)** $I \times Q$

15. When a wire loop is rotated in a magnetic field, the direction of induced emf changes once in each

(a) $\frac{1}{4}$ revolution **(b)** $\frac{1}{2}$ revolution

(c) 1 revolution **(d)** 2 revolutions

16. The coil of area A is kept perpendicular in a magnetic field B. If coil is rotated by 180^o, the change in flux will be

(a) BA **(b)** Zero

(c) 2BA **(d)** 4BA

17. A 10 m long copper wire while remaining in the east-west horizontal direction is falling down with a speed of 5.0 ms^{-1}. If the horizontal component of the earth's magnetic field is 0.3×10^{-4} weber/m^2, the emf developed between the ends of the wire is

(a) 0.15 volt **(b)** 1.5 volt

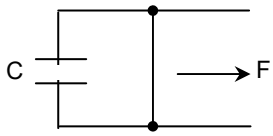
(c) 0.15 millivolt **(d)** 1.5 millivolt

18. A force of 10 newton is required to move conducting loop through a non uniform magnetic field at 2 ms^{-1}. The rate of production of internal energy in watt in loop is

(a) $(10/2) \times 2$ **(b)** 10/2

(c) 10 **(d)** 10×2

19. A wire of mass m and length λ can freely slide on a pair of parallel, smooth horizontal rails placed in a vertical magnetic field B. The rails are connected by a capacitance C as shown. The electrical resistance of the rails and wire is zero. If a constant force F acts on the wire as shown in figure. The acceleration of the wire is



(a) $\frac{F + CB^2\lambda^2}{m}$ **(b)** $\frac{F}{m - CB^2\lambda^2}$

(c) $\frac{F}{CB^2\lambda^2 + m}$ **(d)** $\frac{F - CB^2\lambda^2}{m}$

20. A metal ball of radius r moves at a constant velocity v in a uniform magnetic field of induction B. Find the maximum emf developed if velocity makes an angle α with the magnetic field.

(a) 2Br v sin α **(b)** Br v sinα

(c) 0 **(d)** 2π Br v sin α

Fill in the Blanks

1. At the time of switching on a D.C. circuit an inductance behaves like a _____.

2. Ohm-s is same as _____.

3. Flux leakage is reduced in a transformer by using _____.

4. The property by which a circuit resists a change in the current through is called _____.

5. Mutual inductance between two coils depends on _____.

6. Energy stored in an inductor is proportional to _____ current.

7. Induction furnace utilises _____

8. On inserting an iron core into a solenoid connected in series with a bulb in a d.c. circuit the bulb becomes _____.

9. A magnet falling through a conducting loop falls with an acceleration _____.

10. A transformer works on the principle of _____.

True/False

1. If there is no magnetic field in a certain region then it is sure that electron will not suffer any deflection while passing through that region.

2. When a charged particle having some kinetic energy enter a magnetic field, its kinetic energy remains unchanged

3. An electron projected into a transverse and upward magnetic field moves on a clockwise circular path.

4. Currents flowing in same direction repel each other.
5. Maxwell is a unit of magnetic induction.
6. A time changing magnetic field produces electric field which is conservative in nature.
7. A metal rod moving through a magnetic field develops an induced current.
8. Iron loss in a transformer is reduced by laminating iron core.
9. Efficiency of a d.c. motor is proportional to the back emf developed.
10. An A.C. generator uses split rings or commutator.

ANSWERS

1.	B	6.	B	11.	B	16.	C
2.	A	7.	A	12.	B	17.	D
3.	B	8.	B	13.	D	18.	D
4.	C	9.	C	14.	C	19.	C
5.	A	10.	B	15.	B	20.	A

FILL IN THE BLANKS

1. Open circuit
2. Henry
3. Ferromagnetic core
4. Self induction
5. Self inductance of coils
6. Square of
7. Eddy currents
8. Becomes dim during insertion and then goes back to same brightness
9. Less than g
10. Mutual induction.

TRUE/FALSE

1.	F	2.	T	3.	F	4.	F	5.	F
6.	F	7.	F	8.	T	9.	T	10.	F