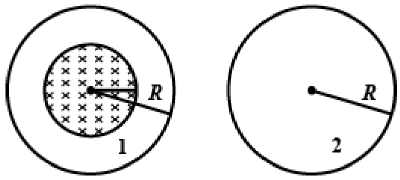
I. Magnetic Flux

1. [NEET] A circular disc of radius 0.2 m is placed in a uniform magnetic field of induction $\frac{1}{\pi}$ (Wb/m^2) in such a way that its axis makes an angle of 60° with B. The magnetic flux linked with the disc is
(a) 0.02 Wb (b) 0.06 Wb (c) 0.08 Wb (d) 0.01 Wb

II. Faraday's Law and Lenz's Law

2. [NEET] A uniform magnetic field is restricted within a region of radius r. The magnetic field changes with time at a rate $\frac{d\boldsymbol{B}}{dt}$. Loop 1 of radius R > r enclose the region r and loop 2 of radius R is outside the region of magnetic field as shown in the figure. Then, the emf generated is



(a) Zero in loop 1 and zero in loop 2
(b) $-\frac{d\boldsymbol{B}}{dt}\pi r^2$ in loop 1 and $-\frac{d\boldsymbol{B}}{dt}\pi r^2$ in loop 2
(c) $-\frac{d\boldsymbol{B}}{dt}\pi R^2$ in loop 1 and zero in loop 2
(d) $-\frac{d\boldsymbol{B}}{dt}\pi r^2$ in loop 1 and zero in loop 2

3. [NEET] A coil of resistance 400 Ω is placed in a magnetic field. If the magnetic flux ϕ (Wb) linked with the coil varies with time t (second) as $\phi=50\,t^2+4$. The current in the coil at t=2 s is
(a) 0.5 A (b) 0.1 A (c) 2 A (d) 1 A

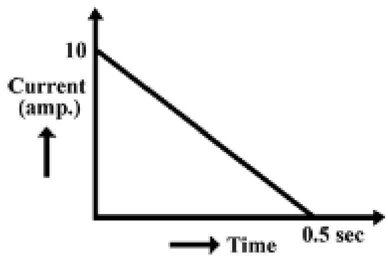
4. [NEET] A conducting circular loop is placed in a uniform magnetic field, B= 0.025 T with its plane perpendicular to the loop. The radius of the loop is made to shrink at a constant rate of 1 mms^{-1}. The induced emf when the radius is 2cm, is
(a) $2\pi\ \mu V$ (b) $\pi\ \mu V$ (c) $\frac{\pi}{2}\ \mu V$ (d) $2\ \mu V$

5. [NEET]The magnetic flux through a circuit of resistance R changes by an amount Δϕ in a time Δt. Then the total quantity of electric charge q that passes any point in the circuit during the time Δt is represented by
(a)$q=\frac{1}{R}.\frac{\Delta\phi}{\Delta t}$ (b) $q=\frac{\Delta\phi}{R}$ (c) $q=\frac{\Delta\phi}{\Delta t}$ (d) $q=R.\frac{\Delta\phi}{\Delta t}$

6. [NEET] A rectangular coil of 20 turns and area of cross- section 25 sq cm has a resistance of 100 Ω. If a magnetic field which is perpendicular to the plane of coil changes at a rate of 1000 T/s, the current in the coil is
(a) 1 A (b) 50 A (c) 0.5 A (d) 5 A

7. [NEET] A magnetic field of 2 x 10^{-2} T acts at right angle to a coil of area 100cm^2, with 50 turns. The average emf induced in the coil is 0.1 V, when it is removed from the field in t second. The value of t is
(a) 10 s (b) 0.1 s (c) 0.01 s (d) 1 s

8. [JEE] In a coil of resistance 100Ω, a current is induced by changing the magnetic flux through it as shown in the figure. The magnitude of change in flux through the coil is



(a) 225 Wb (b) 250 Wb (c) 275 Wb
(d) 200 Wb

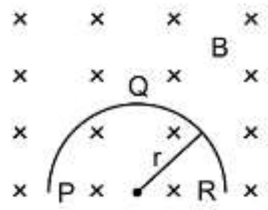
9. [JEE] The flux linked with a coil at any instant t is given by $\phi=10t^2-50t+250$. The induced emf at t= 3 s is
(a) -190 V (b) – 10 V (c) 10 V (d) 190 V

10. [JEE] A conducting circular loop is made of a thin wire has area 3.5 x 10^{-3} m^2 and resistance 10 Ω. It is placed perpendicular to a time dependent magnetic field $B(t)=(0.4T)\sin(0.5\,\pi t)$. The field is uniform in space. Then the net charge flowing through the loop during t= 0s and t=10 ms is close to
(a) 6 mC (b) 21 mC (c) 7 mC (d) 14 mC

III. Motional EMF (Straight Rods)

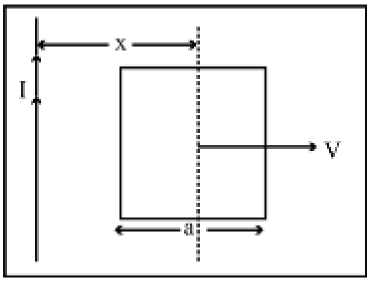
11. [NEET] A conductor of length 0.4 m is moving with a speed of 7 m/s perpendicular to a magnetic field of intensity 0.9 Wb/m^2. The induced emf across the conductor is
(a) 1.26 V (b) 2.52 V (c) 5.04 V (d) 25.2 V

12. [NEET] A thin semicircular conducting ring (PQR) of radius r is falling with its plane vertical in a horizontal magnetic field B, as shown in figure. The potential difference developed across the ring when its speed is v, is



(a) zero
(b) $Bv\pi r^2/2$ and P is at higher potential
(c) πrBv and R is at higher potential
(d) 2rBv and R is at higher potential

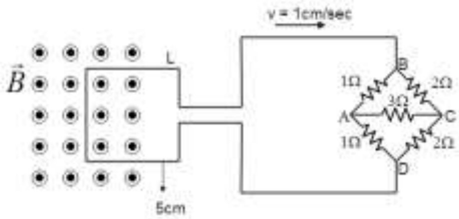
13. [NEET] A conducting square frame of side 'a' and a long straight wire carrying current I are located in the same plane as shown in the figure. The frame moves to the right with a constant velocity 'v'. The emf induced in the frame will be proportional to



(a) $\frac{1}{x^2}$ (b) $\frac{1}{(2x-a)^2}$

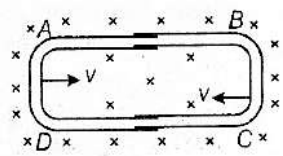
(c) $\frac{1}{(2x+a)^2}$ (d) $\frac{1}{(2x-a)(2x+a)}$

14. [JEE] A figure shows a square loop L of side 5 cm which is connected to a network of resistances. The whole setup is moving towards right with a constant speed of 1 cm s^{-1}. At some instant, a part of L is in a uniform magnetic field of 1 T, perpendicular to the plane of the loop. If the resistance of L is 1.7 Ω, the current in the loop at the instant will be close to



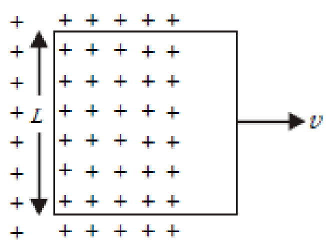
(a) 60 μA (b) 170 μA (c) 150 μA (d) 115 μA

15. [JEE] One conducting U-tube can slide inside another as shown in figure, maintaining electrical contacts between the tubes. The magnetic field B is perpendicular to the plane of the figure. If each tube moves towards the other at a constant speed v, then the emf induced in the circuit in terms of B, l and v, where l is the width of each tube, will be



(a) Blv (b) – Blv (c) zero (d) 2 Blv

16. [JEE] A conducting square loop of side L and resistance R moves in its plane with a uniform velocity v perpendicular to one of its sides. A magnetic induction B constant in time and space, pointing perpendicular and into the plane at the loop exists everywhere with half the loop outside the field, as shown in the figure. The induced emf is



(a) zero (b) RvB (c) $\frac{vBL}{R}$ (d) vBL