CHAPTER-6

Electromagnetic Induction

ASSIGNMENT-3

1-MARK QUESTIONS

Q1. In electromagnetic induction, the induced charge in a coil is independent of

(a) Change in the flux (b)Time (c)Resistance in the circuit (d) None of the above

Q2. A coil of 40 Ω resistance has 100 turns and radius 6 mm is connected to ammeter of resistance of 160 ohms. Coil is placed perpendicular to the magnetic field. When coil is taken out of the field, 32 μ C charge flows through it. The intensity of magnetic field will be

(a) 6.55 T (b) 5.66 T (c) 0.655 T (d) 0.566 T

Q3. A coil having n turns and resistance R Ω is connected with a galvanometer of resistance $4R\Omega$. This combination is moved in time t seconds from a magnetic field W_1 weber to W_2 weber. The induced current in the circuit is

(a) $-\frac{W_2 - W_1}{5\ Rnt}$ (b) $-\frac{n(W_2 - W_1)}{5\ Rt}$ (c) $-\frac{(W_2 - W_1)}{Rnt}$ (d) $-\frac{n(W_2 - W_1)}{Rt}$

Q4. An infinitely long cylinder is kept parallel to an uniform magnetic field B directed along positive z axis. The direction of induced current as seen from the z axis will be

(a) Clockwise of the +ve z axis

(b) Anticlockwise of the +ve z axis

(c) Zero

(d) Along the magnetic field

Q5. A coil has an area of 0.05 m^2 and it has 800 turns. It is placed perpendicularly in a magnetic field of strength $2 \times 10^{-5}\ Wb/m^2$, it is rotated through 90^o in 0.1 sec. The average e.m.f. induced in the coil is

(a) 0.056 V (b) 0.046 V (c) 0.026 V (d) 0.016 V

ASSERTION AND REASON

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

(c) If assertion is true but reason is false.

(d) If the assertion and reason both are false.

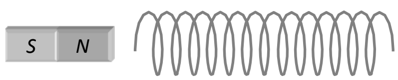
Q6. **Assertion**: The quantity L/R possesses dimensions of time.

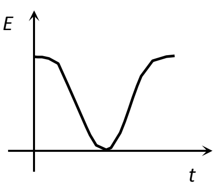
Reason : To reduce the rate of increases of current through a solenoid should increase the time constant (L/R).

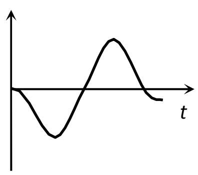
Q7. **Assertion** : When two coils are wound on each other, the mutual induction between the coils is maximum.

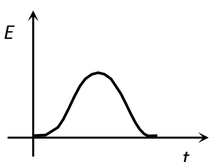
Reason: Mutual induction does not depend on the orientation of the coils.

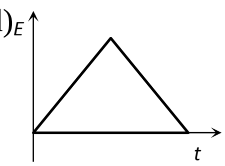
Q8. The variation of induced emf (E) with time (t) in a coil if a short bar magnet is moved along its axis with a constant velocity is best represented as



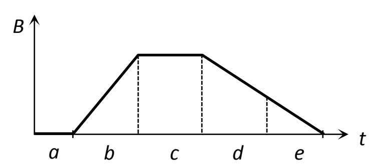
(a) 

(b) 

(c) 

(d) 

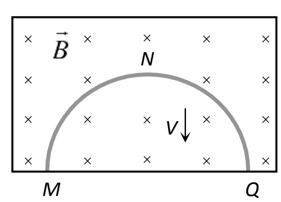
Q9. The graph gives the magnitude B(t) of a uniform magnetic field that exists throughout a conducting loop, perpendicular to the plane of the loop. Rank the five regions of the graph according to the magnitude of the emf induced in the loop, greatest first



(a) b > (d = e) < (a = c) (b) b > (d = e) > (a = c)

(c) b < d < e < c < a (d) b > (a = c) > (d = e)

Q10. A thin semicircular conducting ring of radius R is falling with its plane vertical in a horizontal magnetic induction B. At the position MNQ, the speed of the ring is V and the potential difference developed across the ring is



(a) Zero

(b) $Bv\pi R^2/2$ and M is at higher potential

(c) πRBV and Q is at higher potential

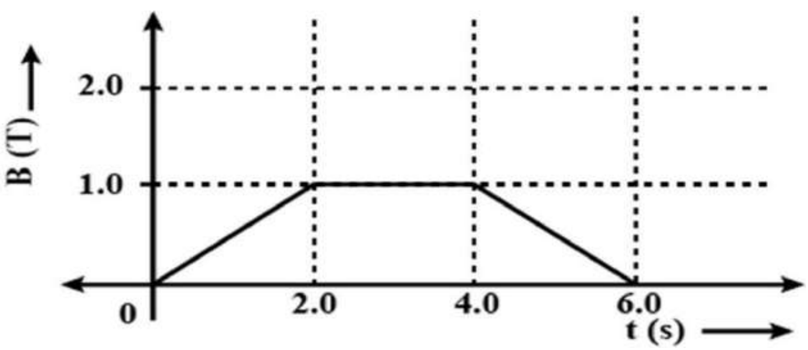
(d) 2RBV and Q is at higher potential

Q11. A conducting rod of length 2l is rotating with constant angular speed ω about its perpendicular bisector. A uniform magnetic field $\vec{B}$ exists parallel to the axis of rotation. The e.m.f. induced between two ends of the rod is

(a) $B\omega l^2$ (b) $\frac{1}{2}B\omega l^2$ (c) $\frac{1}{8}B\omega l^2$ (d) none of these

2-MARKS QUESTONS

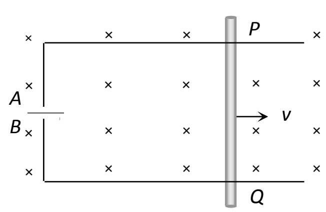
12. The magnetic field through a circular loop of wire, 12cm in radius and 8.5Ω resistance, changes with time as shown in the figure. The magnetic field is perpendicular to the plane of the loop. Calculate the current induced in the loop .



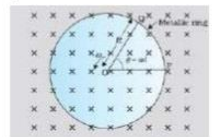
13. A short solenoid of radius a, number of turns per unit length n, and length L is kept coaxially inside a very long solenoid of radius b, number of turns per unit length n. What is the mutual inductance of the system?

3-Marks Questions

Q14. A conducting rod PQ of length L = 1.0 m is moving with a uniform speed v = 2 m/s in a uniform magnetic field $B = 4.0\,T$ directed into the paper. A capacitor of capacity C = 10 μF is connected as shown in figure. Find the charge store in capacitor.

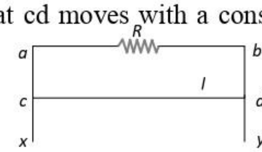


Q15. A conducting rod rotates with angular speed w with one end at the centre and other end at circumference of a circular metallic ring of radius R, about an axis passing through the centre of the coil perpendicular to the plane of the coil A constant magnetic field B parallel to the axis is present everywhere shown in fig. Show that the emf. between the centre and the metallic ring is $\frac{1}{2}$ BwR^2



Q16. What is mean by Self Induction. Derive an expression for self-inductance which shows that it is not depend upon emf and current induce in It.

Q17. A wire cd of length l and mass m is sliding without friction on conducting rails ax and by as shown. The vertical rails are connected to each other with a resistance R between a and b. A uniform magnetic field B is applied perpendicular to the plane abcd such that cd moves with a constant velocity v.Find the required velocity



Q18. The network shown in the figure is a part of a complete circuit. If at a certain instant the current i is 5 A and is decreasing at the rate of $10^3 A/s$ then find $V_A - V_B$ is