RM

Based on AIATS-06

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CONCEPT STRENGTHENING SHEET

CSS-06

PHYSICS

AIATS 06 – RM – Q.3

Topic: Induced EMF

A ring of radius *a* rotates with a constant angular velocity ω about its axis (passing through its centre and perpendicular to its plane). The ring is in *x*-*y* plane. The potential difference induced in the ring would be zero, if uniform magnetic field is along

(1) *x*-axis (2) *y*-axis

(3) *z*-axis (4) All of these

To access the video solution of the above question, Scan / Click the QR Code.

Practice Questions:

1. EMF can be induced in a circuit by
   (1) Introducing time varying magnetic field
   (2) Changing the orientation of area vector
   (3) Changing the area of circuit
   (4) All of these
2. A ring of radius *a* rotates with constant angular velocity ω about its axis (Passing through centre and perpendicular to plane.) The ring is in *x*-*y* plane. A time varying magnetic field is along *x*-axis. The flux of this field through the ring is
   (1) Increases with time (2) Decreases with time
   (3) Zero (4) Non-zero constant
3. A ring of radius *a* rotates with constant angular velocity ω about its axis [Passing through centre and perpendicular to plane.] The ring is *x*-*y* plane. A time varying magnetic field is along the line $y = 3x + 2$. The flux of this field through ring is
   (1) Increases with time (2) Decreases with time
   (3) Zero (4) Constant
4. A ring of radius *a* rotates with constant angular velocity ω about its axis. (Passing through centre and perpendicular to plane) The ring is in *x*-*y* plane. A uniform magnetic field B_0 exists along *z*-axis. The flux of this field and emf induced due to this is respectively
   (1) $B_0\pi a^2, \frac{B\omega a^2}{2}$
   (2) Zero, Zero
   (3) $B_0\pi a^2$, Zero
   (4) Zero, $\frac{B\omega a^2}{2}$

AIATS 06 – RM – Q.12

Topic: Motion of Charged Particle in Magnetic Field

A positively charged particle moves in a region having a uniform magnetic field and uniform electric field in same direction. At time $t = 0$, the velocity of the particle is perpendicular to the field direction. The subsequent path of the particle will be

(1) A straight line

(2) A circle

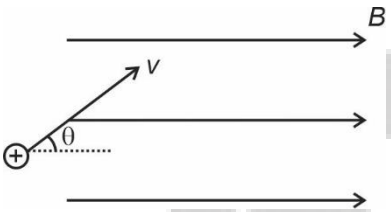
(3) A helix with uniform pitch

(4) A helix with increasing pitch

To access the video solution of the above question, Scan / Click the QR Code.

Practice Questions:

1. A uniform magnetic field, exists along the *x*-axis. A charged particle is projected with a certain velocity along the *x*-axis. The path of particle will be
   (1) Straight line
   (2) Helix with uniform pitch
   (3) Helix with non-uniform pitch
   (4) Parabola
2. A uniform electric field exists along the *z*-axis. A positive charged particle is projected along the *x*-axis. The path of particle will be
   (1) Straight line (2) Parabola
   (3) Circular (4) Helix
3. A positively charged particle moves in a region having uniform magnetic field and uniform electric field in same direction. At $t = 0$, the velocity of particle is parallel to field direction. The subsequent path of particle will be
   (1) Straight line
   (2) Circle
   (3) Helix with uniform pitch
   (4) Helix with non-uniform pitch
4. The subsequent path of a charged particle for the situation shown below is



   (1) Straight line
   (2) Circular
   (3) Helix with uniform pitch
   (4) Helix with non-uniform pitch

AIATS 06 – RM – Q.34

Topic: Properties of Magnetic Force on Charge

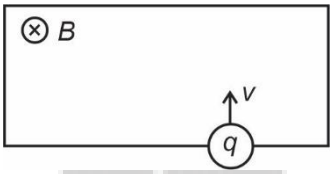
A proton beam moving from west to east enters a uniform magnetic field directed vertically upwards. Then the initial deflection of beam will be

(1) Towards east (2) Towards west
(3) Towards north (4) Towards south

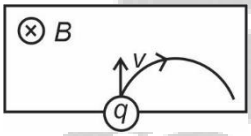
To access the video solution of the above question, Scan / Click the QR Code.

Practice Questions:

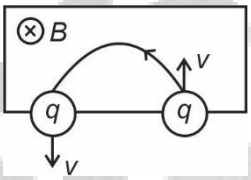
1. A electron beam moving from east to west enters a uniform magnetic field directed vertically down wards. Then initial deflection of beam will be
   (1) Towards east (2) Towards west
   (3) Towards north (4) Towards south
2. Positive charge entering uniform magnetic field region shown in figure. Trajectory of charge is



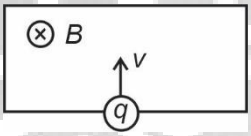
(1)



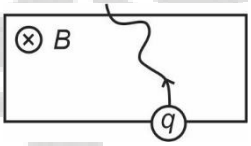
(2)



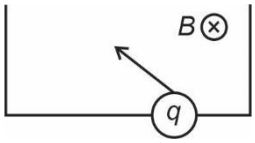
(3)



(4)



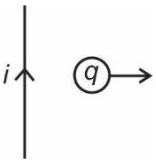
3. Negative charge *q* entering uniform magnetic field as shown in figure. Direction of force acting on it at the moment, it enters in the region is



(1) (2)

(3) (4)

4. Positive point charge is moving with speed *v* (away from current carrying wire) as shown in figure. Direction of force acting on it at that moment is



(1) ↓ (2) ↑

(3) No Force (4) ↘

AIATS 06 – RM – Q.27

Topic: Motion of Charge Particle in Magnetic Field

If a charged particle which is projected in an electromagnetic field, experiences no electromagnetic force, then

(1) The electric field must be zero

(2) The magnetic field must be zero

(3) The electric field may or may not be zero

(4) Both (1) and (2)

To access the video solution of the above question, Scan / Click the QR Code.

Practice Questions:

1. Positive charge when projected in a electro-magnetic field follows straight line path (along +ve *y*-direction). Magnetic field is along negative *z*-axis. Direction of electric field is

(1) +ve *x*-axis (2) +ve *y*-axis

(3) –ve *x*-axis (4) –ve *z*-axis

2. Positive charge *q* is projected in electromagnetic field where electric field is $(\hat{k}-\hat{j}+\hat{i})$ N/C and magnetic field is $-(\hat{j}+\hat{k})T$. Trajectory of charge particle will be straight line if velocity of projection is

(1) $(\hat{j}+\hat{k})$ m/s

(2) $(\hat{i}-\hat{j})$ m/s

(3) $(\hat{i}+\hat{j})$ m/s

(4) $(\hat{i}+\hat{k})$ m/s

3. A charge *q* of mass *m*, moving with velocity $v_0\hat{i}+v_0\hat{j}$ enters a region of magnetic field $B_0\hat{j}$ and electric field $E_0\hat{j}$. Which of following is the correct expression for pitch during first revolution?

(1) $\frac{\pi m}{qB}\left(v_0+\frac{E_0}{B_0}\right)$

(2) $\frac{\pi m}{qB}\left(v_0+\frac{\pi E_0}{B_0}\right)$

(3) $\frac{2\pi m}{qB}\left(v_0+\frac{E_0}{B_0}\right)$

(4) $\frac{2\pi m}{qB}\left(v_0+\frac{\pi E_0}{B_0}\right)$

4. A charged particle is at rest in the region where magnetic field and electric field are parallel. The particle will move in a

(1) Straight line (2) Circle

(3) Ellipse (4) Parabola

AIATS 06 – RM – Q.25

Topic: Lenz's Law

Two identical coaxial circular loops carry a current *i* each circulating in the same direction. As the loops are moved away from each other

(1) The current in each will decrease

(2) The current in each will increase

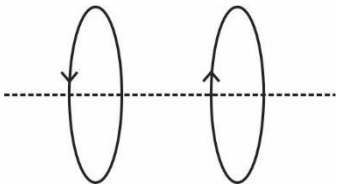
(3) The current in each will remain the same

(4) The current in one will increase and in other will decrease

To access the video solution of the above question, Scan / Click the QR Code.

Practice Questions:

1. Two loops carrying current in opposite sense placed parallel to each other are moved closer to each other. Then the current



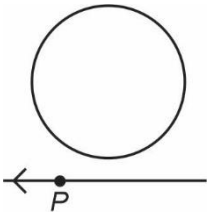
(1) In both of them increases

(2) In both of them decreases

(3) Increases in one and decreases in other

(4) In both of them remains same

2. Near a circular conducting loop as shown, a proton moves along a straight line. The direction of induced current, if any, in the loop at the given instant is



(1) Variable (2) Clockwise

(3) Anticlockwise (4) Zero

3. Two identical circular loops of wire are placed on smooth horizontal surface. If loop *A* carries a current which increases with time, then loop *B*

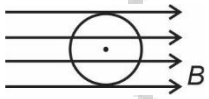
(1) Is attracted by loop *A*

(2) Is repelled by loop *A*

(3) Remains stationary

(4) None of these

4. Circular copper wire placed in uniform magnetic field as shown in figure. Magnetic field is increasing linearly with time as shown in figure. Direction of induced current in the wire is



(1) Clockwise

(2) Anticlockwise

(3) Alternating

(4) No current is induced

AIATS 06 – RM – Q.17

Topic: Displacement Current

A parallel plate capacitor with plate area 2*A* and separation between the plates *d*, is charged by a constant current *i*. Consider a plane surface of area *A*/4 parallel to the plates and drawn symmetrically between the plates, what is the displacement current through this area?

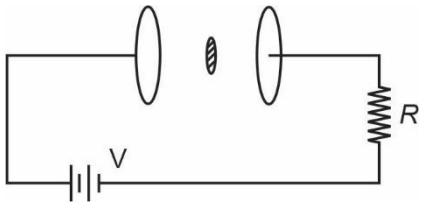
(1) *i* (2) 2*i*

(3) *i*/4 (4) *i*/8

To access the video solution of the above question, Scan / Click the QR Code.

Practice Questions:

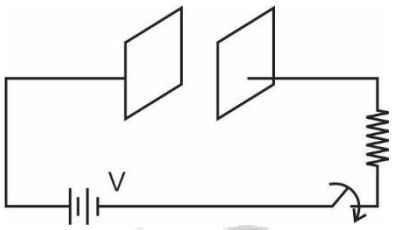
1. A parallel plate capacitor of circular plates (Area, A = 20 cm^2) is charged by a battery. If displacement current across it is 4 A, then the displacement current through an area, 5 cm^2 between plates is



(1) 4 A (2) Zero

(3) 1 A (4) 2 A

2. In the given arrangement of capacitor, if *I* is conduction current during charging and I_d is displacement current, then



(1) $I_d > I$

(2) $I_d < I$

(3) $I_d = I$

(4) There is no relation between I_d and *I*

3. For a displacement current flowing across the circular plates of a capacitor

(I) Magnetic field at all points is same

(II) Current density across any cross section is same

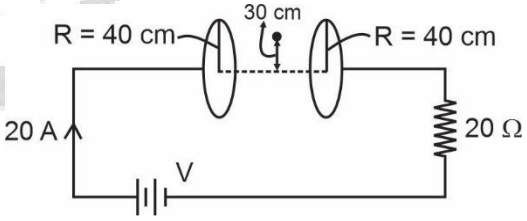
(1) Only (I) is correct

(2) Only (II) is correct

(3) Both (I) and (II) are correct

(4) Both (I) and (II) are incorrect

4. Find magnetic field at point P in the arrangement of capacitor shown below



(1) 7.5 μT (2) 15 μT

(3) 40 μT (4) 5 μT

AIATS 06 – RM – Q.21

Topic: Magnetic Field Due to Revolving Charge

An electron is revolving in a circular path of radius 4×10^{-10} m with a speed of 9×10^6 m/s. The magnetic field at the centre of circular path will be

(1) 1.2 T (2) 2.4 T

(3) 0.9 T (4) 3.6 T

To access the video solution of the above question, Scan / Click the QR Code.

Practice Questions:

1. An electron revolving in a circular path of radius r, with uniform speed (v) produces magnetic field at centre equals to

   (1) $\frac{\mu_0 ev}{2\pi r}$

   (2) $\frac{\mu_0 ev^2}{2\pi r^2}$

   (3) $\frac{\mu_0 e}{2\pi rv}$

   (4) $\frac{\mu_0 ev}{4\pi r^2}$

2. Magnetic moment associated with a charge q and mass m, revolving in a circular path of radius r with uniform speed v is

   (1) $\frac{1}{2}(qvr)$ (2) $\frac{1}{2}\frac{qvr}{m}$

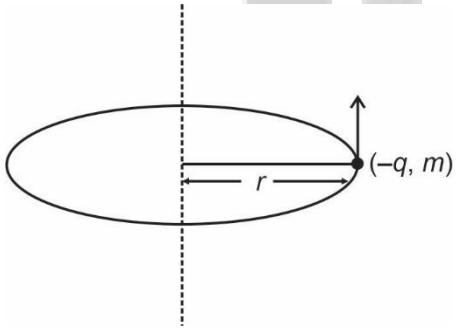
   (3) $\frac{1}{2}\frac{qm}{r}$ (4) $\frac{1}{2}\frac{q^2v^2}{mr}$

3. Ratio of magnetic moment and angular momentum of a revolving charge (q, m) is

   (1) $\frac{q}{m}$ (2) $\frac{q}{2m}$

   (3) $\frac{m}{q}$ (4) $\frac{m}{2q}$

4. Consider the following situation of a charge rotating in a horizontal plane anticlockwise (when seen from top)



   (1) The direction of magnetic field is upward while the magnetic moment is downward

   (2) The direction of magnetic field is downward while magnetic moment is upward

   (3) Both magnetic field and magnetic moment are in downward direction

   (4) Both magnetic field and magnetic moment are in upward direction

AIATS 06 – RM – Q.22

Topic: Induced Electric Field

Which of the following is true for induced electric field due to time varying magnetic field?

(1) They are conservative

(2) Their field lines form closed loops

(3) Both (1) and (2)

(4) Neither (1) nor (2)

To access the video solution of the above question, Scan / Click the QR Code.

Practice Questions:

1. A time varying magnetic field gives rise to

   (1) A magnetic field

   (2) Gravitational field

   (3) An induced electric field

   (4) It does not give rise to any field

2. If work done by an induced electric field in moving a charge of 10 C from point A to B is 10 J, then work done to move it back to point A will be

   (1) Must be 10 J (2) Must be –10 J

   (3) May be 10 J (4) Must be greater

3. Magnetic field in a region varies as $B = B_0 x^2 \hat{i}$ (Where x is in meters). The induced electric field has magnitude _____ at $x = 4$

   (1) 8 B_0 (2) 4 B_0

   (3) 16 B_0 (4) Zero

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CONCEPT STRENGTHENING SHEET

CSS-06

PHYSICS

Answer key

AIATS 06 – RM – Q.3

Topic: Induced EMF

1. (4)
2. (3)
3. (3)
4. (3)

AIATS 06 – RM – Q.12

Topic: Motion of Charged Particle in Magnetic Field

1. (1)
2. (2)
3. (1)
4. (3)

AIATS 06 – RM – Q.34

Topic: Properties of Magnetic Force on Charge

1. (3)
2. (2)
3. (1)
4. (2)

AIATS 06 – RM – Q.27

Topic: Motion of Charges Particle in Magnetic Field

1. (1)
2. (3)
3. (4)
4. (1)

AIATS 06 – RM – Q.25

Topic: Lenz's Law

1. (1)
2. (2)
3. (2)
4. (4)

AIATS 06 – RM – Q.17

Topic: Displacement Current

1. (3)
2. (3)
3. (2)
4. (1)

AIATS 06 – RM – Q.21

Topic: Magnetic Field Due to Revolving Charge

1. (4)
2. (1)
3. (2)
4. (3)

AIATS 06 – RM – Q.22

Topic: Induced Electric Field

1. (3)
2. (3)
3. (4)

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