

JEE MAIN MOVING CHARGES AND MAGNETISM — PYQs

Max. Marks: 336

Questions: 84

Section A (MCQ) — 54 questions

- Q.1** A current carrying circular loop of radius 2 cm with unit normal $\hat{n} = \frac{\hat{k} + \hat{i}}{\sqrt{2}}$ is placed in a magnetic field, $\vec{B} = B_0(3\hat{i} + 2\hat{k})$. If $B_0 = 4 \times 10^{-3}$ T and current $I = 100\sqrt{2}$ A, the torque experienced by the loop is _____ Wb.A. ($\pi = 3.14$)

[JEE Main 2026 (Online) 8th April Evening Shift]

- (1) $16 \times 10^{-5} \hat{k}$ (2) $5024 \times 10^{-7} \hat{k}$
(3) $5024 \times 10^{-7} \hat{i}$ (4) $5024 \times 10^{-7} \hat{j}$

Scan or tap for the
full solution



- Q.2** A small cube of side 1 mm is placed at the centre of a circular loop of radius 10 cm carrying a current of 2 A. The magnetic energy stored inside the cube is $\alpha \times 10^{-14}$ J. The value of α is _____.

($\mu_0 = 4\pi \times 10^{-7}$ Tm/A, $\pi = 3.14$)

[JEE Main 2026 (Online) 6th April Morning Shift]

- (1) 6.28 (2) 6.28×10^{-6}
(3) 628 (4) 6.28×10^{-4}

Scan or tap for the
full solution



- Q.3** A current of 30 A each flows in opposite directions in two conducting wires, placed parallel to each other at a distance of 8 cm. The magnetic field at the mid point between the two wires is _____ μ T.

($\frac{\mu_0}{4\pi} = 10^{-7}$ N/A²)

[JEE Main 2026 (Online) 6th April Evening Shift]

- (1) 30 (2) 300 (3) 150 (4) 0.0

Scan or tap for the
full solution



- Q.4** An insulated wire is wound so that it forms a flat coil with $N = 200$ turns. The radius of the innermost turn is $r_1 = 3$ cm, and of the outermost turn $r_2 = 6$ cm. If 20 mA current flows in it then the magnetic moment will be $\alpha \times 10^{-2}$ A m². The value of α is _____.

[JEE Main 2026 (Online) 4th April Morning Shift]

- (1) 4.4 (2) 2.64 (3) 3.25 (4) 1.2

Scan or tap for the
full solution



- Q.5** A particle of charge q and mass m is projected from origin with an initial velocity $\vec{v} = \left(\frac{v_0}{\sqrt{2}}\hat{x} + \frac{v_0}{\sqrt{2}}\hat{y} \right)$.

There exists a uniform magnetic field $\vec{B} = B_0\hat{z}$ and a space varying electric field $\vec{E} = E_0e^{-\lambda x}\hat{x}$ within the region $0 \leq x \leq L$. After travelling a distance such that x -coordinate has changed from $x = 0$ to $x = L$, the change in the kinetic energy is _____.

[JEE Main 2026 (Online) 5th April Evening Shift]

- (1) $\frac{qE_0}{\lambda}[1 - e^{-\lambda L}]$
(2) $\left(\frac{v_0 q B_0}{2\lambda} \right)[2 - e^{-2\lambda L}]$
(3) $\frac{qE_0}{\lambda}[1 + e^{-\lambda L}]$
(4) $q \left(\frac{E_0 + v_0 B_0}{\lambda} \right)[1 - e^{-\lambda L/2}]$

Scan or tap for the
full solution



- Q.6** A voltmeter with internal resistance of $x \Omega$ can be used to measure up to 20 V. In order to increase its measuring range to 30 V, the required modification is to _____.

[JEE Main 2026 (Online) 4th April Morning Shift]

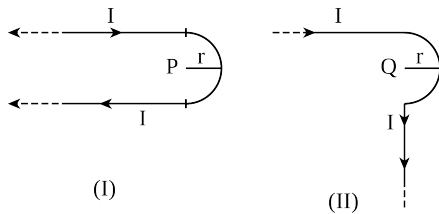
- (1) connect resistor of $\frac{x}{2} \Omega$, in series with voltmeter.
(2) connect resistor of $\frac{x}{2} \Omega$, in parallel to voltmeter.
(3) connect a resistor of $x \Omega$ in series with voltmeter.
(4) connect resistor of $2x \Omega$ in parallel to voltmeter.

Scan or tap for the
full solution



- Q.7** Two identical long current carrying wires are bent into the shapes shown in the following figures. If the magnitude of magnetic fields at the centres P and Q of a semicircular arc are B_1 and B_2 respectively, then the ratio $\frac{B_1}{B_2}$ is _____.

[JEE Main 2026 (Online) 2nd April Morning Shift]



- (1) $\frac{2+\pi}{1+\pi}$ (2) $\frac{1+\pi}{1-\pi}$ (3) $\frac{2+\pi}{1-\pi}$ (4) $\frac{1+\pi}{2-\pi}$

Scan or tap for the full solution



- Q.8** A particle having charge 10^{-9} C moving in x-y plane in fields of $0.4\hat{j}$ N/C and $4 \times 10^{-3}\hat{k}$ T experiences a force of $(4\hat{i} + 2\hat{j}) \times 10^{-10}$ N. The velocity of the particle at that instant is _____ m/s.

[JEE Main 2026 (Online) 2nd April Evening Shift]

- (1) $50\hat{i} + 100\hat{j}$ (2) $100\hat{i} + 50\hat{j}$
(3) $-50\hat{i} + 100\hat{j}$ (4) $50\hat{i} - 100\hat{j}$

Scan or tap for the full solution



- Q.9** The magnetic field at the centre of a current carrying circular loop of radius R is $16 \mu\text{T}$. The magnetic field at a distance $x = \sqrt{3}R$ on its axis from the centre is _____ μT .

[JEE Main 2026 (Online) 28th January Morning Shift]

- (1) 8 (2) 2 (3) 4 (4) $2\sqrt{2}$

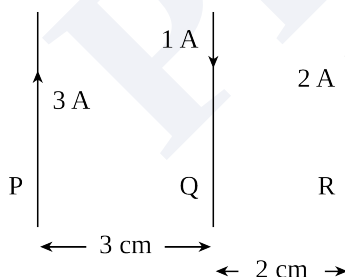
Scan or tap for the full solution



- Q.10** Three long straight wires carrying current are arranged mutually parallel as shown in the figure. The force experienced by 15 cm length of wire Q is _____.

($\mu_0 = 4\pi \times 10^{-7}$ T m/A)

[JEE Main 2026 (Online) 28th January Morning Shift]



- (1) 6×10^{-6} N towards P
(2) 6×10^{-6} N towards R
(3) 6×10^{-7} N towards P
(4) 6×10^{-7} N towards R



Solution

- Q.11** A long cylindrical conductor with large cross section carries an electric current distributed uniformly over its cross-section. Magnetic field due to this current is:

- A. maximum at either ends of the conductor and minimum at the midpoint
B. maximum at the axis of the conductor
C. minimum at the surface of the conductor
D. minimum at the axis of the conductor
E. same at all points in the cross-section of the conductor

Choose the **correct** answer from the options given below:

[JEE Main 2026 (Online) 28th January Evening Shift]

- (1) B, C Only (2) E Only
(3) A, D Only (4) D Only



Solution

- Q.12** A moving coil galvanometer of resistance 100Ω shows a full scale deflection for a current of 1 mA. The value of resistance required to convert this galvanometer into an ammeter, showing full scale deflection for a current of 5 mA, is _____ Ω

[JEE Main 2026 (Online) 24th January Evening Shift]

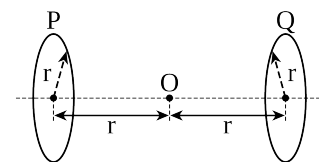
- (1) 25 (2) 2.5 (3) 0.5 (4) 10

Scan or tap for the full solution



- Q.13** Two identical circular loops P and Q each of radius r are lying in parallel planes such that they have common axis. The currents through P and Q are I and 4I respectively in clockwise direction as seen from O. The net magnetic field at O is :

[JEE Main 2026 (Online) 24th January Evening Shift]



- (1) $\frac{\mu_0 I}{4\sqrt{2}r}$ towards Q (2) $\frac{3\mu_0 I}{4\sqrt{2}r}$ towards Q
(3) $\frac{3\mu_0 I}{4\sqrt{2}r}$ towards P (4) $\frac{\mu_0 I}{4\sqrt{2}r}$ towards P

Scan or tap for the full solution



- Q.14** The current passing through a conducting loop in the form of equilateral triangle of side $4\sqrt{3}$ cm is 2 A. The magnetic field at its centroid is $\alpha \times 10^{-5}$ T. The value of α is _____.
(Given: $\mu_0 = 4\pi \times 10^{-7}$ SI units)

[JEE Main 2026 (Online) 23rd January Evening Shift]

- (1) $3\sqrt{3}$ (2) $2\sqrt{3}$ (3) $\sqrt{3}$ (4) $\frac{\sqrt{3}}{2}$

Scan or tap for the full solution



Q.15 A current carrying solenoid is placed vertically and a particle of mass m with charge Q is released from rest. The particle moves along the axis of solenoid. If g is acceleration due to gravity then the acceleration (a) of the charged particle will satisfy :

[JEE Main 2026 (Online) 21st January Morning Shift]

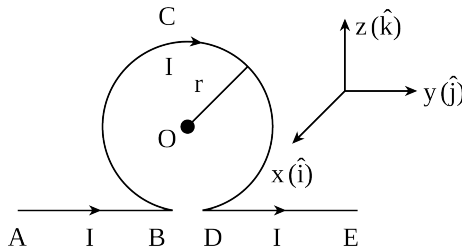
- (1) $a > g$ (2) $a = 0$
(3) $0 < a < g$ (4) $a = g$



Solution

Q.16 An infinitely long straight wire carrying current I is bent in a planar shape as shown in the diagram. The radius of the circular part is r . The magnetic field at the centre O of the circular loop is :

[JEE Main 2026 (Online) 21st January Evening Shift]

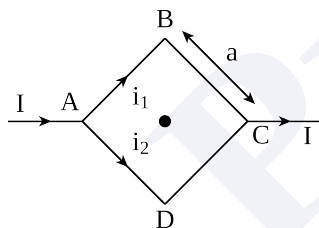
- 
- (1) $-\frac{\mu_0 I}{2\pi r}(\pi + 1)\hat{i}$ (2) $-\frac{\mu_0 I}{2\pi r}(\pi - 1)\hat{i}$
(3) $\frac{\mu_0 I}{2\pi r}(\pi + 1)\hat{i}$ (4) $\frac{\mu_0 I}{2\pi r}(\pi - 1)\hat{i}$

Scan or tap for the full solution



Q.17 Figure shows a current carrying square loop ABCD of edge length 'a' lying in a plane. If the resistance of the ABC part is r and that of ADC part is $2r$, then the magnitude of the resultant magnetic field at centre of the square loop is

[JEE Main 2025 (Online) 8th April Evening Shift]

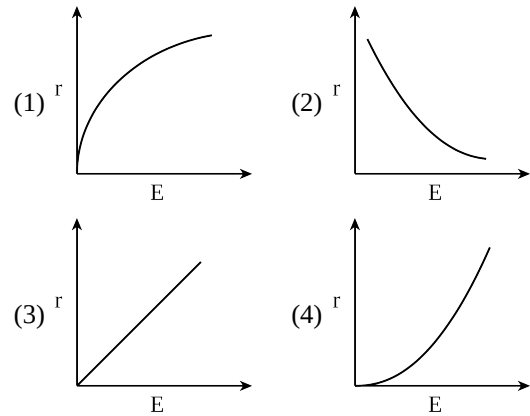


- (1) $\frac{2\mu_0 I}{3\pi a}$ (2) $\frac{\sqrt{2}\mu_0 I}{3\pi a}$
(3) $\frac{3\pi\mu_0 I}{\sqrt{2}a}$ (4) $\frac{\mu_0 I}{2\pi a}$

Scan or tap for the full solution



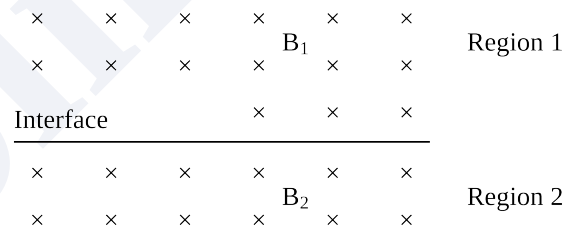
Q.18 A particle of charge q , mass m and kinetic energy E enters a magnetic field perpendicular to its velocity and undergoes a circular arc of radius (r). Which of the following curves represents the variation of r with E ? [JEE Main 2025 (Online) 7th April Morning Shift]



Scan or tap for the full solution



Q.19 Uniform magnetic fields of different strengths (B_1 and B_2), both normal to the plane of the paper exist as shown in the figure. A charged particle of mass m and charge q , at the interface at an instant, moves into the region 2 with velocity v and returns to the interface. It continues to move into region 1 and finally reaches the interface. What is the displacement of the particle during this movement along the interface?



(Consider the velocity of the particle to be normal to the magnetic field and $B_2 > B_1$)

[JEE Main 2025 (Online) 7th April Morning Shift]

- (1) $\frac{mv}{qB_1} \left(1 - \frac{B_1}{B_2}\right) \times 2$ (2) $\frac{mv}{qB_1} \left(1 - \frac{B_2}{B_1}\right) \times 2$
(3) $\frac{mv}{qB_1} \left(1 - \frac{B_2}{B_1}\right)$ (4) $\frac{mv}{qB_1} \left(1 - \frac{B_1}{B_2}\right)$

Scan or tap for the full solution



Q.20 Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**. **Assertion (A):** If oxygen ion (O^{2-}) and hydrogen ion (H^+) enter normal to the magnetic field with equal momentum, then the path of O^{2-} ion has a smaller radius of curvature than that of H^+ . **Reason (R):** A proton with same linear momentum as an electron will form a path of smaller radius of curvature on entering a uniform magnetic field perpendicularly.

In the light of the above statements, choose the correct answer from the options given below

[JEE Main 2025 (Online) 3rd April Evening Shift]

- (1) Both A and R are true but R is NOT the correct explanation of A
(2) A is false but R is true

- (3) A is true but R is false
 (4) Both A and R are true and R is the correct explanation of A

Scan or tap for the full solution



Q.21 A monochromatic light of wavelength λ is incident on a metallic plate having work function ϕ . An electron, emitted normally to the plate from a point A with maximum kinetic energy, enters a constant magnetic field, perpendicular to the initial velocity of electron. The electron passes through a curve and hits back the plate at a point B. The distance between A and B is : (Given : The magnitude of charge of an electron is e and mass is m , h is Planck's constant and c is velocity of light. Take the magnetic field exists throughout the path of electron)

[JEE Main 2025 (Online) 2nd April Morning Shift]

- (1) $\sqrt{2m\left(\frac{hc}{\lambda} - \phi\right)}/eB$
 (2) $\sqrt{8m\left(\frac{hc}{\lambda} - \phi\right)}/eB$
 (3) $\sqrt{m(hc/\lambda - \phi)}/eB$
 (4) $2\sqrt{m(hc/\lambda - \phi)}/eB$

Scan or tap for the full solution



Q.22 Let B_1 be the magnitude of magnetic field at center of a circular coil of radius R carrying current I . Let B_2 be the magnitude of magnetic field at an axial distance ' x ' from the center. For $x:R = 3:4$, $\frac{B_2}{B_1}$ is :

[JEE Main 2025 (Online) 2nd April Morning Shift]

- (1) 64:125 (2) 25:16 (3) 4:5 (4) 16:25

Scan or tap for the full solution



Q.23 In a moving coil galvanometer, two moving coils M_1 and M_2 have the following particulars :
 $R_1 = 5 \Omega$, $N_1 = 15$, $A_1 = 3.6 \times 10^{-3} \text{ m}^2$, $B_1 = 0.25 \text{ T}$
 $R_2 = 7 \Omega$, $N_2 = 21$, $A_2 = 1.8 \times 10^{-3} \text{ m}^2$, $B_2 = 0.50 \text{ T}$
 Assuming that torsional constant of the springs are same for both coils, what will be the ratio of voltage sensitivity of M_1 and M_2 ?

[JEE Main 2025 (Online) 2nd April Evening Shift]

- (1) 1 : 1 (2) 1 : 3 (3) 1 : 2 (4) 1 : 4

Scan or tap for the full solution



Q.24 An electron with mass ' m ' with an initial velocity ($t=0$) $\vec{v} = v_0 \hat{i}$ ($v_0 > 0$) enters a magnetic field $\vec{B} = B_0 \hat{j}$. If the initial de Broglie wavelength at $t = 0$ is λ_0 then its value after time ' t ' would be :

[JEE Main 2025 (Online) 2nd April Evening Shift]

- (1) $\frac{\lambda_0}{\sqrt{1 - \frac{e^2 B_0^2 t^2}{m^2}}}$ (2) λ_0
 (3) $\lambda_0 \sqrt{1 + \frac{e^2 B_0^2 t^2}{m^2}}$ (4) $\frac{\lambda_0}{\sqrt{1 + \frac{e^2 B_0^2 t^2}{m^2}}}$

Scan or tap for the full solution



Q.25 Consider a long straight wire of a circular cross-section (radius a) carrying a steady current I . The current is uniformly distributed across this cross-section. The distances from the centre of the wire's cross-section at which the magnetic field [inside the wire, outside the wire] is half of the maximum possible magnetic field, any where due to the wire, will be :

[JEE Main 2025 (Online) 29th January Morning Shift]

- (1) $[a/2, 3a]$ (2) $[a/4, 3a/2]$
 (3) $[a/2, 2a]$ (4) $[a/4, 2a]$

Scan or tap for the full solution



Q.26 Consider a long thin conducting wire carrying a uniform current I . A particle having mass ' m ' and charge ' q ' is released at a distance ' a ' from the wire with a speed v_0 along the direction of current in the wire. The particle gets attracted to the wire due to magnetic force. The particle turns round when it is at distance x from the wire. The value of x is [μ_0 is vacuum permeability]

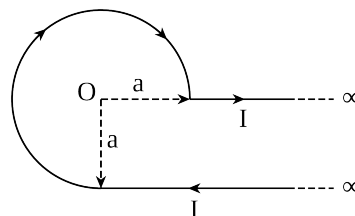
[JEE Main 2025 (Online) 28th January Morning Shift]

- (1) $a \left[1 - \frac{mv_0}{2q\mu_0 I} \right]$ (2) $a e^{-\frac{4\pi m v_0}{q\mu_0 I}}$
 (3) $a \left[1 - \frac{mv_0}{q} \mu_0 I \right]$ (4) $\frac{a}{2}$

Scan or tap for the full solution



Q.27



An infinite wire has a circular bend of radius a , and carrying a current I as shown in the figure. The magnitude of magnetic field at the origin O of the arc is given by:

[JEE Main 2025 (Online) 28th January Evening Shift]

- (1) $\frac{\mu_0 I}{2\pi a} \left[\frac{\pi}{2} + 2 \right]$ (2) $\frac{\mu_0 I}{4\pi a} \left[\frac{3\pi}{2} + 1 \right]$

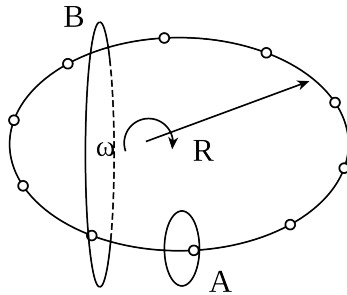
$$(3) \frac{\mu_0 I}{4\pi a} \left[\frac{\pi}{2} + 1 \right]$$

$$(4) \frac{\mu_0 I}{4\pi a} \left[\frac{3\pi}{2} + 2 \right]$$

Scan or tap for the full solution



Q.28



N equally spaced charges each of value q , are placed on a circle of radius R . The circle rotates about its axis with an angular velocity ω as shown in the figure. A bigger Amperian loop B encloses the whole circle whereas a smaller Amperian loop A encloses a small segment. The difference between enclosed currents, $I_A - I_B$, for the given Amperian loops is

[JEE Main 2025 (Online) 24th January Evening Shift]

- (1) $\frac{N^2}{2\pi}q\omega$ (2) $\frac{N}{2\pi}q\omega$ (3) $\frac{2\pi}{N}q\omega$ (4) $\frac{N}{\pi}q\omega$

Scan or tap for the full solution



Q.29 Given below are two statements. One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): An electron in a certain region of uniform magnetic field is moving with constant velocity in a straight line path.

Reason (R): The magnetic field in that region is along the direction of velocity of the electron.

In the light of the above statements, choose the correct answer from the options given below :

[JEE Main 2025 (Online) 24th January Evening Shift]

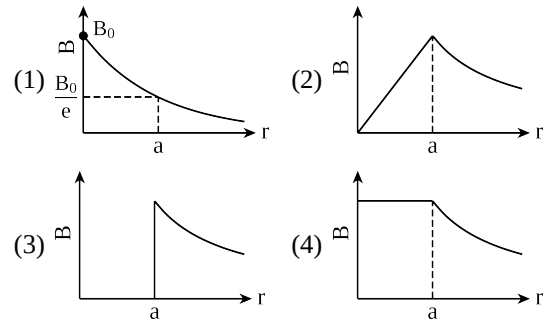
- (1) (A) is true but (R) is false
 (2) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (3) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)
 (4) (A) is false but (R) is true

Scan or tap for the full solution



Q.30 A long straight wire of a circular cross-section with radius ' a ' carries a steady current I . The current I is uniformly distributed across this cross-section. The plot of magnitude of magnetic field B with distance r from the centre of the wire is given by

[JEE Main 2025 (Online) 24th January Evening Shift]



Scan or tap for the full solution



Q.31 Consider a moving coil galvanometer (MCG):

- A. The torsional constant in moving coil galvanometer has dimensions $[ML^2T^{-2}]$
 B. Increasing the current sensitivity may not necessarily increase the voltage sensitivity.
 C. If we increase number of turns (N) to its double ($2N$), then the voltage sensitivity doubles.
 D. MCG can be converted into an ammeter by introducing a shunt resistance of large value in parallel with galvanometer.
 E. Current sensitivity of MCG depends inversely on number of turns of coil.

Choose the correct answer from the options given below:

[JEE Main 2025 (Online) 23rd January Morning Shift]

- (1) A, D Only (2) A, B Only
 (3) A, B, E Only (4) B, D, E Only

Scan or tap for the full solution



Q.32 A galvanometer having a coil of resistance $30\ \Omega$ need 20 mA of current for full-scale deflection. If a maximum current of 3 A is to be measured using this galvanometer, the resistance of the shunt to be added to the galvanometer should be $\frac{30}{X}\ \Omega$, where X

is [JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 447 (2) 298 (3) 149 (4) 596

Scan or tap for the full solution



Q.33 An electron projected perpendicular to a uniform magnetic field B moves in a circle. If Bohr's quantization is applicable, then the radius of the electronic orbit in the first excited state is :

[JEE Main 2025 (Online) 22nd January Evening Shift]

- (1) $\sqrt{\frac{h}{\pi e B}}$ (2) $\sqrt{\frac{4h}{\pi e B}}$
 (3) $\sqrt{\frac{h}{2\pi e B}}$ (4) $\sqrt{\frac{2h}{\pi e B}}$

Scan or tap for the full solution



- Q.34** A galvanometer has a coil of resistance $200\ \Omega$ with a full scale deflection at $20\ \mu\text{A}$. The value of resistance to be added to use it as an ammeter of range $(0 - 20)\ \text{mA}$ is :

[JEE Main 2024 (Online) 9th April Morning Shift]

- (1) $0.40\ \Omega$ (2) $0.10\ \Omega$ (3) $0.20\ \Omega$ (4) $0.50\ \Omega$

Scan or tap for the full solution



- Q.35** Given below are two statements :

Statement-I: When currents vary with time, Newton's third law is valid only if momentum carried by the electromagnetic field is taken into account

Statement-II: Ampere's circuital law does not depend on Biot-Savart's law.

In the light of the above statements, choose the correct answer from the options given below :

[JEE Main 2024 (Online) 9th April Morning Shift]

- (1) Both Statement-I and Statement-II are false
 (2) Statement-I is false but Statement-II is true
 (3) Both Statement-I and Statement-II are true
 (4) Statement-I is true but Statement-II is false

Scan or tap for the full solution



- Q.36** A proton and a deuteron ($q = +e$, $m = 2.0\ \text{u}$) having same kinetic energies enter a region of uniform magnetic field $\vec{B}$, moving perpendicular to $\vec{B}$. The ratio of the radius r_d of deuteron path to the radius r_p of the proton path is:

[JEE Main 2024 (Online) 9th April Evening Shift]

- (1) 1:2 (2) 1:1
 (3) $\sqrt{2} : 1$ (4) $1 : \sqrt{2}$

Scan or tap for the full solution



- Q.37** A long straight wire of radius a carries a steady current I . The current is uniformly distributed across its cross section. The ratio of the magnetic field at $\frac{a}{2}$ and $2a$ from axis of the wire is :

[JEE Main 2024 (Online) 8th April Evening Shift]

- (1) 4:1 (2) 3:4 (3) 1:1 (4) 1:4

Scan or tap for the full solution



- Q.38** Match List I with List II

LIST I		LIST II	
A.	Torque	I.	$[M^1L^1T^{-2}A^{-2}]$
B.	Magnetic field	II.	$[L^2A^1]$
C.	Magnetic moment	III.	$[M^1T^{-2}A^{-1}]$
D.	Permeability of free space	IV.	$[M^1L^2T^{-2}]$

Choose the correct answer from the options given below: [JEE Main 2024 (Online) 6th April Morning Shift]

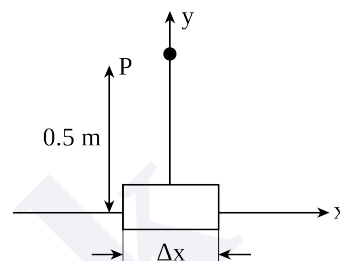
- (1) A-I, B-III, C-II, D-IV
 (2) A-IV, B-II, C-III, D-I
 (3) A-III, B-I, C-II, D-IV
 (4) A-IV, B-III, C-II, D-I



Solution

- Q.39** An element $\Delta l = \Delta x \hat{i}$ is placed at the origin and carries a large current $I = 10\ \text{A}$. The magnetic field on the y-axis at a distance of $0.5\ \text{m}$ from the element Δx of $1\ \text{cm}$ length is:

[JEE Main 2024 (Online) 6th April Morning Shift]



- (1) $10 \times 10^{-8}\ \text{T}$ (2) $8 \times 10^{-8}\ \text{T}$
 (3) $4 \times 10^{-8}\ \text{T}$ (4) $12 \times 10^{-8}\ \text{T}$

Scan or tap for the full solution



- Q.40** Match List I with List II:

LIST I (Y vs X)	
A.	Y = magnetic susceptibility X = magnetising field
B.	Y = magnetic field X = distance from centre of a current carrying wire for $x < a$ (where a = radius of wire)
C.	Y = magnetic field X = distance from centre of a current carrying wire for $x > a$ (where a = radius of wire)
D.	Y = magnetic field inside solenoid X = distance from centre

LIST II (Shape of Graph)	
I.	
II.	

LIST II (Shape of Graph)	
III.	
IV.	

Choose the correct answer from the options given below : [JEE Main 2024 (Online) 6th April Evening Shift]

- (1) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)
 (2) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
 (3) (A)-(IV), (B)-(I), (C)-(III), (D)-(II)
 (4) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)

Scan or tap for the full solution



Q.41 In a co-axial straight cable, the central conductor and the outer conductor carry equal currents in opposite directions. The magnetic field is zero :

[JEE Main 2024 (Online) 5th April Morning Shift]

- (1) inside the outer conductor
 (2) outside the cable
 (3) in between the two conductors
 (4) inside the inner conductor



Solution

Q.42 A galvanometer of resistance $100\ \Omega$ when connected in series with $400\ \Omega$ measures a voltage of upto 10 V . The value of resistance required to convert the galvanometer into ammeter to read upto 10 A is $x \times 10^{-2}\ \Omega$. The value of x is :

[JEE Main 2024 (Online) 5th April Evening Shift]

- (1) 2 (2) 20 (3) 800 (4) 200

Scan or tap for the full solution



Q.43 The electrostatic force ($\vec{F}_1$) and magnetic force ($\vec{F}_2$) acting on a charge q moving with velocity $\vec{v}$ can be written :

[JEE Main 2024 (Online) 5th April Evening Shift]

- (1) $\vec{F}_1 = q\vec{E}$, $\vec{F}_2 = q(\vec{B} \times \vec{v})$
 (2) $\vec{F}_1 = q\vec{V} \cdot \vec{E}$, $\vec{F}_2 = q(\vec{B} \cdot \vec{V})$
 (3) $\vec{F}_1 = q\vec{E}$, $\vec{F}_2 = q(\vec{V} \times \vec{B})$
 (4) $\vec{F}_1 = q\vec{E}$, $\vec{F}_2 = q(\vec{B} \times \vec{V})$

Scan or tap for the full solution



Q.44 An electron is projected with uniform velocity along the axis inside a current carrying long solenoid. Then :

[JEE Main 2024 (Online) 4th April Morning Shift]

- (1) the electron will experience a force at 45° to the axis and execute a helical path.
 (2) the electron will be accelerated along the axis.
 (3) the electron path will be circular about the axis.
 (4) the electron will continue to move with uniform velocity along the axis of the solenoid.

Scan or tap for the full solution



Q.45 A galvanometer has a resistance of $50\ \Omega$ and it allows maximum current of 5 mA . It can be converted into voltmeter to measure up to 100 V by connecting in series a resistor of resistance :

[JEE Main 2024 (Online) 1st February Morning Shift]

- (1) $19500\ \Omega$ (2) $5975\ \Omega$
 (3) $20050\ \Omega$ (4) $19950\ \Omega$

Scan or tap for the full solution



Q.46 In an ammeter, 5% of the main current passes through the galvanometer. If resistance of the galvanometer is G , the resistance of ammeter will be :

[JEE Main 2024 (Online) 1st February Evening Shift]

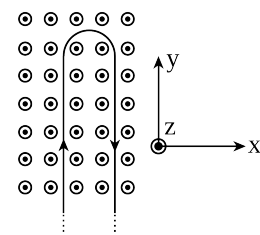
- (1) $\frac{G}{200}$ (2) $\frac{G}{199}$ (3) $199\ G$ (4) $200\ G$

Scan or tap for the full solution



Q.47 A rigid wire consists of a semicircular portion of radius R and two straight sections. The wire is partially immersed in a perpendicular magnetic field $\vec{B} = B_0\hat{k}$ as shown in figure. The magnetic force on the wire if it has a current i is:

[JEE Main 2024 (Online) 31st January Morning Shift]



- (1) $iBR\hat{j}$ (2) $-2iBR\hat{j}$
 (3) $2iBR\hat{j}$ (4) $-iBR\hat{j}$

Scan or tap for the full solution



Q.48 A uniform magnetic field of 2×10^{-3} T acts along positive Y-direction. A rectangular loop of sides 20 cm and 10 cm with current of 5 A is in Y – Z plane. The current is in anticlockwise sense with reference to negative X axis. Magnitude and direction of the torque is:

[JEE Main 2024 (Online) 31st January Evening Shift]

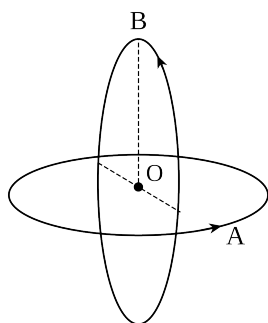
- (1) 2×10^{-4} N – m along negative Z-direction
- (2) 2×10^{-4} N – m along positive X-direction
- (3) 2×10^{-4} N – m along positive Y-direction
- (4) 2×10^{-4} N – m along positive Z-direction

Scan or tap for the full solution



Q.49 Two insulated circular loops A and B of radius 'a' carrying a current of 'I' in the anti clockwise direction as shown in the figure. The magnitude of the magnetic induction at the centre will be :

[JEE Main 2024 (Online) 30th January Morning Shift]



- (1) $\frac{\sqrt{2}\mu_0 I}{a}$
- (2) $\frac{\mu_0 I}{\sqrt{2}a}$
- (3) $\frac{\mu_0 I}{2a}$
- (4) $\frac{2\mu_0 I}{a}$

Scan or tap for the full solution



Q.50 The deflection in moving coil galvanometer falls from 25 divisions to 5 divisions when a shunt of 24Ω is applied. The resistance of galvanometer coil will be :

[JEE Main 2024 (Online) 29th January Morning Shift]

- (1) 48Ω
- (2) 100Ω
- (3) 96Ω
- (4) 12Ω

Scan or tap for the full solution



Q.51 A galvanometer having coil resistance 10Ω shows a full scale deflection for a current of 3 mA. For it to measure a current of 8 A, the value of the shunt should be:

[JEE Main 2024 (Online) 29th January Morning Shift]

- (1) $3.75 \times 10^{-3} \Omega$
- (2) $3 \times 10^{-3} \Omega$
- (3) $4.85 \times 10^{-3} \Omega$
- (4) $2.75 \times 10^{-3} \Omega$

Scan or tap for the full solution



Q.52 Two particles X and Y having equal charges are being accelerated through the same potential difference. Thereafter they enter normally in a region of uniform magnetic field and describe circular paths of radii R_1 and R_2 respectively. The mass ratio of X and Y is :

[JEE Main 2024 (Online) 29th January Evening Shift]

- (1) $\left(\frac{R_1}{R_2}\right)$
- (2) $\left(\frac{R_2}{R_1}\right)$
- (3) $\left(\frac{R_2}{R_1}\right)^2$
- (4) $\left(\frac{R_1}{R_2}\right)^2$

Scan or tap for the full solution



Q.53 A proton moving with a constant velocity passes through a region of space without any change in its velocity. If $\vec{E}$ and $\vec{B}$ represent the electric and magnetic fields respectively, then the region of space may have :

- A. $E = 0, B = 0$
- B. $E = 0, B \neq 0$
- C. $E \neq 0, B = 0$
- D. $E \neq 0, B \neq 0$

Choose the most appropriate answer from the options given below :

[JEE Main 2024 (Online) 27th January Morning Shift]

- (1) (A), (B) and (C) only
- (2) (A), (C) and (D) only
- (3) (A), (B) and (D) only
- (4) (B), (C) and (D) only



Solution

Q.54 A current of $200 \mu\text{A}$ deflects the coil of a moving coil galvanometer through 60° . The current to cause deflection through $\frac{\pi}{10}$ radian is :

[JEE Main 2024 (Online) 27th January Evening Shift]

- (1) $120 \mu\text{A}$
- (2) $180 \mu\text{A}$
- (3) $30 \mu\text{A}$
- (4) $60 \mu\text{A}$

Scan or tap for the full solution



Section B (Numerical) — 30 questions

Q.55 A 5 mg particle carrying a charge of $5\pi \times 10^{-6}$ C is moving with velocity of $(3\hat{i} + 2\hat{k}) \times 10^{-2}$ m/s in a region having magnetic field $\vec{B} = 0.1\hat{k}$ Wb/m². It moves a distance of α meter along $\hat{k}$ when it completes 5 revolutions. The value of α is _____.

[JEE Main 2026 (Online) 8th April Evening Shift]

Scan or tap for the full solution



- Q.56** A moving coil of galvanometer when shunted with $2\ \Omega$ resistance gives a full scale deflection for a current of 500 mA . When a resistance of $470\ \Omega$ is connected in series it gives a full scale deflection for 10 V potential applied on it. The value of resistance of galvanometer coil is _____ Ω .

[JEE Main 2026 (Online) 6th April Evening Shift]

Scan or tap for the full solution



- Q.57** The charged particle moving in a uniform magnetic field of $(3\hat{i} + 2\hat{j})\text{ T}$ has an acceleration $(4\hat{i} - \frac{x}{2}\hat{j})\text{ m/s}^2$. The value of x is _____.

[JEE Main 2026 (Online) 5th April Morning Shift]

Scan or tap for the full solution



- Q.58** A circular coil of radius 2 cm and 125 turns carries a current of 1 A . The coil is placed in a uniform magnetic field of magnitude 0.4 T . The axis of the coil makes an angle of 30° with the direction of the magnetic field. The torque acting on the coil is $\alpha \times 10^{-4}\text{ N m}$. The value of α is _____.
($\pi = 3.14$)

[JEE Main 2026 (Online) 4th April Evening Shift]

Scan or tap for the full solution



- Q.59** $1\ \mu\text{C}$ charge moving with velocity $\vec{v} = (\hat{i} - 2\hat{j} + 3\hat{k})\text{ m/s}$ in the region of magnetic field $\vec{B} = (2\hat{i} + 3\hat{j} - 5\hat{k})\text{ T}$. The magnitude of force acting on it is $\sqrt{\alpha} \times 10^{-6}\text{ N}$. The value of α is _____.

[JEE Main 2026 (Online) 2nd April Morning Shift]

Scan or tap for the full solution



- Q.60** A particle of charge $1.6\ \mu\text{C}$ and mass $16\ \mu\text{g}$ is present in a strong magnetic field of 6.28 T . The particle is then fired perpendicular to magnetic field. The time required for the particle to return to original location for the first time is _____ s (rounded off to the nearest integer). ($\pi = 3.14$)

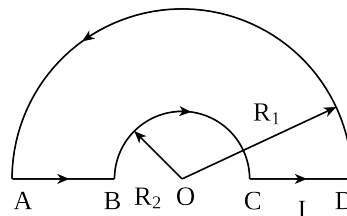
[JEE Main 2025 (Online) 4th April Evening Shift]

Scan or tap for the full solution



- Q.61** A loop ABCDA, carrying current $I = 12\text{ A}$, is placed in a plane, consists of two semi-circular segments of radius $R_1 = 6\pi\text{ m}$ and $R_2 = 4\pi\text{ m}$. The magnitude of the resultant magnetic field at center O is $k \times 10^{-7}\text{ T}$. The value of k is _____.
(Given $\mu_0 = 4\pi \times 10^{-7}\text{ T m A}^{-1}$)

[JEE Main 2025 (Online) 3rd April Morning Shift]



Scan or tap for the full solution



- Q.62** A 4.0 cm long straight wire carrying a current of 8 A is placed perpendicular to a uniform magnetic field of strength 0.15 T . The magnetic force on the wire is _____ mN .

[JEE Main 2025 (Online) 3rd April Morning Shift]

Scan or tap for the full solution



- Q.63** The magnetic field inside a 200 turns solenoid of radius 10 cm is $2.9 \times 10^{-4}\text{ Tesla}$. If the solenoid carries a current of 0.29 A , then the length of the solenoid is _____ $\pi\text{ cm}$.

[JEE Main 2025 (Online) 29th January Evening Shift]

Scan or tap for the full solution



- Q.64** A current of 5 A exists in a square loop of side $\frac{1}{\sqrt{2}}\text{ m}$. Then the magnitude of the magnetic field B at the centre of the square loop will be $p \times 10^{-6}\text{ T}$, where, value of p is _____. [Take $\mu_0 = 4\pi \times 10^{-7}\text{ T m A}^{-1}$].

[JEE Main 2025 (Online) 24th January Morning Shift]

Scan or tap for the full solution



- Q.65** A tightly wound long solenoid carries a current of 1.5 A . An electron is executing uniform circular motion inside the solenoid with a time period of 75 ns . The number of turns per metre in the solenoid is _____.

[Take mass of electron $m_e = 9 \times 10^{-31}\text{ kg}$, charge of electron $|q_e| = 1.6 \times 10^{-19}\text{ C}$, $\mu_0 = 4\pi \times 10^{-7}\frac{\text{N}}{\text{A}^2}$, $1\text{ ns} = 10^{-9}\text{ s}$]

[JEE Main 2025 (Online) 24th January Evening Shift]

Scan or tap for the full solution



- Q.66** A proton is moving undeflected in a region of crossed electric and magnetic fields at a constant speed of $2 \times 10^5\text{ m s}^{-1}$. When the electric field is switched off, the proton moves along a circular path of radius 2 cm . The magnitude of electric field is $x \times 10^4\text{ N/C}$. The value of x is _____. Take the mass of the proton $= 1.6 \times 10^{-27}\text{ kg}$.

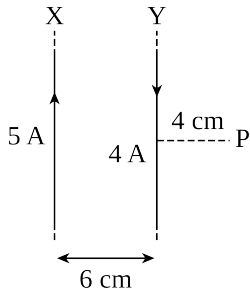
[JEE Main 2025 (Online) 22nd January Evening Shift]

Scan or tap for the full solution



- Q.67** Two long parallel wires X and Y, separated by a distance of 6 cm, carry currents of 5 A and 4 A, respectively, in opposite directions as shown in the figure. Magnitude of the resultant magnetic field at point P at a distance of 4 cm from wire Y is $x \times 10^{-5}$ T. The value of x is _____. Take permeability of free space as $\mu_0 = 4\pi \times 10^{-7}$ SI units.

[JEE Main 2025 (Online) 22nd January Evening Shift]



Scan or tap for the full solution



- Q.68** A square loop of edge length 2 m carrying current of 2 A is placed with its edges parallel to the x-y axis. A magnetic field is passing through the x-y plane and expressed as $\vec{B} = B_0(1 + 4x)\hat{k}$, where $B_0 = 5$ T. The net magnetic force experienced by the loop is _____ N.

[JEE Main 2024 (Online) 9th April Morning Shift]

Scan or tap for the full solution



- Q.69** An electron with kinetic energy 5 eV enters a region of uniform magnetic field of $3 \mu\text{T}$ perpendicular to its direction. An electric field E is applied perpendicular to the direction of velocity and magnetic field. The value of E , so that electron moves along the same path, is _____ N C^{-1} . (Given, mass of electron = 9×10^{-31} kg, electric charge = 1.6×10^{-19} C)

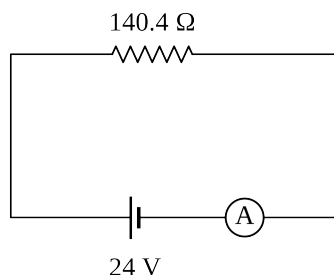
[JEE Main 2024 (Online) 8th April Morning Shift]

Scan or tap for the full solution



- Q.70** In the given figure an ammeter A consists of a 240Ω coil connected in parallel to a 10Ω shunt. The reading of the ammeter is _____ mA.

[JEE Main 2024 (Online) 6th April Evening Shift]



Scan or tap for the full solution



- Q.71** A coil having 100 turns, area of $5 \times 10^{-3} \text{ m}^2$, carrying current of 1 mA is placed in uniform magnetic field of 0.20 T such a way that plane of coil is perpendicular to the magnetic field. The work done in turning the coil through 90° is _____ μJ .

[JEE Main 2024 (Online) 6th April Evening Shift]

Scan or tap for the full solution



- Q.72** A 2 A current carrying straight metal wire of resistance 1Ω , resistivity $2 \times 10^{-6} \Omega\text{m}$, area of cross-section 10 mm^2 and mass 500 g is suspended horizontally in mid air by applying a uniform magnetic field $\vec{B}$. The magnitude of B is _____ $\times 10^{-1}$ T (given, $g = 10 \text{ m/s}^2$).

[JEE Main 2024 (Online) 5th April Morning Shift]

Scan or tap for the full solution



- Q.73** A solenoid of length 0.5 m has a radius of 1 cm and is made up of 'm' number of turns. It carries a current of 5 A. If the magnitude of the magnetic field inside the solenoid is 6.28×10^{-3} T then the value of m is _____.

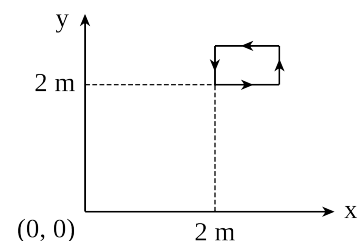
[JEE Main 2024 (Online) 5th April Evening Shift]

Scan or tap for the full solution



- Q.74** The magnetic field existing in a region is given by $\vec{B} = 0.2(1 + 2x)\hat{k}$. A square loop of edge 50 cm carrying 0.5 A current is placed in x-y plane with its edges parallel to the x-y axes, as shown in figure. The magnitude of the net magnetic force experienced by the loop is _____ mN.

[JEE Main 2024 (Online) 4th April Morning Shift]

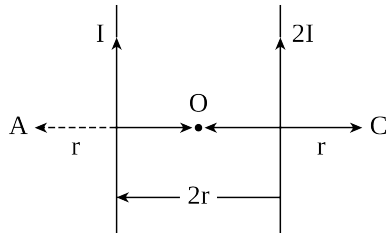


Scan or tap for the full solution



- Q.75** Two parallel long current carrying wires separated by a distance $2r$ are shown in the figure. The ratio of magnetic field at A to the magnetic field produced at C is $\frac{x}{7}$. The value of x is _____.

[JEE Main 2024 (Online) 4th April Evening Shift]



Scan or tap for the full solution



- Q.76** A regular polygon of 6 sides is formed by bending a wire of length 4π meter.

If an electric current of $4\pi\sqrt{3}$ A is flowing through the sides of the polygon, the magnetic field at the centre of the polygon would be $x \times 10^{-7}$ T.

The value of x is _____.

[JEE Main 2024 (Online) 1st February Morning Shift]

Scan or tap for the full solution



- Q.77** A moving coil galvanometer has 100 turns and each turn has an area of 2.0 cm^2 . The magnetic field produced by the magnet is 0.01 T and the deflection in the coil is 0.05 radian when a current of 10 mA is passed through it. The torsional constant of the suspension wire is $x \times 10^{-5} \text{ N-m/rad}$.

The value of x is _____.

[JEE Main 2024 (Online) 1st February Evening Shift]

Scan or tap for the full solution



- Q.78** An electron moves through a uniform magnetic field $\vec{B} = B_0\hat{i} + 2B_0\hat{j} \text{ T}$. At a particular instant of time, the velocity of electron is $\vec{u} = 3\hat{i} + 5\hat{j} \text{ m/s}$. If the magnetic force acting on electron is $\vec{F} = 5e\hat{k} \text{ N}$, where e is the charge of electron, then the value of B_0 is _____ T.

[JEE Main 2024 (Online) 31st January Morning Shift]

Scan or tap for the full solution



- Q.79** Two circular coils P and Q of 100 turns each have same radius of $\pi \text{ cm}$. The currents in P and Q are 1 A and 2 A respectively. P and Q are placed with their planes mutually perpendicular with their centers coincide. The resultant magnetic field induction at the center of the coils is $\sqrt{x} \text{ mT}$, where $x =$ _____.

[Use $\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1}$]

[JEE Main 2024 (Online) 31st January Evening Shift]

Scan or tap for the full solution



- Q.80** The horizontal component of earth's magnetic field at a place is $3.5 \times 10^{-5} \text{ T}$. A very long straight conductor carrying current of $\sqrt{2} \text{ A}$ in the direction from South east to North West is placed. The force per unit length experienced by the conductor is _____ $\times 10^{-6} \text{ N/m}$.

[JEE Main 2024 (Online) 30th January Morning Shift]

Scan or tap for the full solution



- Q.81** A current of 5 A flows in a square loop of side 1 m placed in air. The magnetic field at the centre of the loop is $X\sqrt{2} \times 10^{-7} \text{ T}$. The value of X is _____.

[JEE Main 2024 (Online) 30th January Evening Shift]

Scan or tap for the full solution



- Q.82** A charge of $4.0 \mu\text{C}$ is moving with a velocity of $4.0 \times 10^6 \text{ ms}^{-1}$ along the positive y axis under a magnetic field $\vec{B}$ of strength $(2\hat{k}) \text{ T}$. The force acting on the charge is $x\hat{i} \text{ N}$. The value of x is _____.

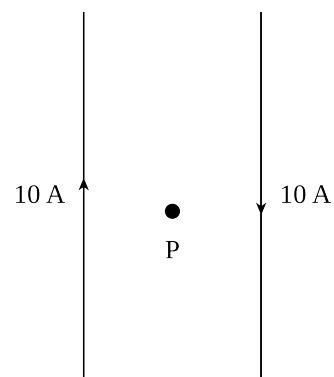
[JEE Main 2024 (Online) 29th January Evening Shift]

Scan or tap for the full solution



- Q.83** Two long, straight wires carry equal currents in opposite directions as shown in figure. The separation between the wires is 5.0 cm . The magnitude of the magnetic field at a point P midway between the wires is _____ μT (Given : $\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1}$)

[JEE Main 2024 (Online) 27th January Morning Shift]



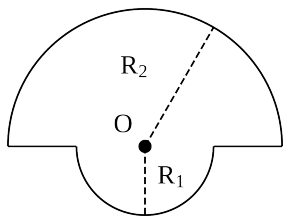
Scan or tap for the full solution



- Q.84** The magnetic field at the centre of a wire loop formed by two semicircular wires of radii $R_1 = 2\pi \text{ m}$ and $R_2 = 4\pi \text{ m}$, carrying current $I = 4 \text{ A}$ as per figure given below is $\alpha \times 10^{-7} \text{ T}$. The value of α is _____.

(Centre O is common for all segments)

[JEE Main 2024 (Online) 27th January Evening Shift]



Scan or tap for the
full solution



ANSWER KEY

Section A (MCQ) — 54 questions

Ques.	1	2	3	4	5
Ans.	4	1	2	2	1
Ques.	6	7	8	9	10
Ans.	1	1	1	2	2
Ques.	11	12	13	14	15
Ans.	4	1	2	1	4
Ques.	16	17	18	19	20
Ans.	2	2	1	1	3
Ques.	21	22	23	24	25
Ans.	2	1	1	2	3
Ques.	26	27	28	29	30
Ans.	2	2	2	2	2
Ques.	31	32	33	34	35
Ans.	2	3	1	3	4
Ques.	36	37	38	39	40
Ans.	3	3	4	3	2
Ques.	41	42	43	44	45
Ans.	2	2	3	4	4
Ques.	46	47	48	49	50
Ans.	BONUS	2	1	2	3
Ques.	51	52	53	54	
Ans.	1	4	3	4	

Section B (Numerical) — 30 questions

Ques.	55	56	57	58	59	60	61
Ans.	2	50	12	314	171	0	1
Ques.	62	63	64	65	66	67	68
Ans.	48	8	8	250	2	1	160
Ques.	69	70	71	72	73	74	75
Ans.	4	160	100	5	500	50	5
Ques.	76	77	78	79	80	81	82
Ans.	72	4	5	20	35	40	32
Ques.	83	84					
Ans.	160	3					