

JEE MAIN ELECTROMAGNETIC INDUCTION — PYQS

Max. Marks: 100
Questions: 25

Section A (MCQ) — 18 questions

- Q.1** A 30 cm long solenoid has 10 turns per cm and area of 5 cm². The current through the solenoid coil varies from 2 A to 4 A in 3.14 s. The e.m.f. induced in the coil is $\alpha \times 10^{-5}$ V. The value α is _____.

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

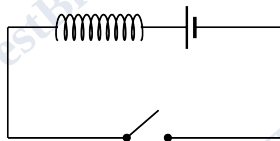
- (1) 60 (2) 12 (3) 120 (4) 34

Scan or tap for the full solution



- Q.2** An inductor of inductance 10 mH having resistance of 100 Ω is connected to battery of E.M.F. 1.0 V through a switch as shown in the figure below. After switch is closed, the ratio of instantaneous voltages across the inductor when the current passing through it is 2 mA and 4 mA is _____.

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



- (1) 4/3 (2) 3/4 (3) 5/3 (4) 3/5

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- Q.3** A square loop of side 2 cm is placed in a time varying magnetic field with magnitude as $B = 0.4\sin(300t)$ Tesla. The normal to the plane of loop makes an angle of 60° with the field. The maximum induced emf produced in the loop is _____ mV.

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

- (1) 12 (2) 18 (3) 21 (4) 24

Scan or tap for the full solution



- Q.4** A metal rod of length L rotates about one end at origin with a uniform angular velocity ω . The magnetic field radially falls off as $B(r) = B_0 e^{-\lambda r}$, λ being a positive constant. The emf induced (neglecting the centripetal force on electrons in the rod) is : [JEE Main 2026 (Online) 5th April Evening Shift]

- (1) $B_0 \omega \left[\frac{1}{\lambda^2} - e^{-\lambda L} \left(\frac{1}{\lambda^2} + \frac{L}{\lambda} \right) \right]$
 (2) $B_0 \omega \left[\frac{1}{\lambda^2} + e^{-\lambda L} \left(\frac{1}{\lambda^2} + \frac{L}{\lambda} \right) \right]$
 (3) $B_0 \omega \left[\frac{4}{\lambda^2} - e^{-2\lambda L} \left(\frac{1}{\lambda^2} + \frac{2L}{\lambda} \right) \right]$
 (4) $B_0 \omega \left[\frac{3}{\lambda^2} - e^{-3\lambda L} \left(\frac{3}{\lambda^2} + \frac{L}{\lambda} \right) \right]$

Scan or tap for the full solution



- Q.5** When a coil is placed in a time dependent magnetic field the power dissipated in it is P . The number of turns, area of the coil and radius of the coil wire are N , A and r respectively. For a second coil number of turns, area of the coil and radius of the coil wire are $2N$, $2A$ and $3r$ respectively. When the first coil is replaced with second coil the power dissipated in it is $\sqrt{2} \alpha P$. The value of α is _____.

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

- (1) 36 (2) $128\sqrt{2}$
 (3) 16 (4) 64

Scan or tap for the full solution



- Q.6** A circular current loop of radius R is placed inside square loop of side length L ($L \gg R$) such that they are co-planar and their centers coincide. The permeability of free space is μ_0 . The mutual inductance between circular loop and square loop is _____. [JEE Main 2026 (Online) 2nd April Evening Shift]

- (1) $2\sqrt{2} \frac{\mu_0 L^2}{R}$ (2) $\sqrt{2} \frac{\mu_0 L^2}{R}$
 (3) $\sqrt{2} \frac{\mu_0 R^2}{L}$ (4) $2\sqrt{2} \frac{\mu_0 R^2}{L}$

Scan or tap for the full solution



- Q.7** A 20 m long uniform copper wire held horizontally is allowed to fall under the gravity ($g = 10 \text{ m/s}^2$) through a uniform horizontal magnetic field of 0.5 Gauss perpendicular to the length of the wire. The induced EMF across the wire when it travels a vertical distance of 200 m is _____ mV.

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

- (1) $200\sqrt{10}$ (2) $0.2\sqrt{10}$
 (3) $20\sqrt{10}$ (4) $2\sqrt{10}$

Scan or tap for the full solution



Q.8 A circular loop of radius 7 cm is placed in uniform magnetic field of 0.2 T directed perpendicular to plane of loop. The loop is converted into a square loop in 0.5 s. The EMF induced in the loop is _____ mV.

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

- (1) 13.2 (2) 6.6 (3) 1.32 (4) 8.25

Scan or tap for the full solution



Q.9 Suppose a long solenoid of 100 cm length, radius 2 cm having 500 turns per unit length, carries a current $I = 10\sin(\omega t)$ A, where $\omega = 1000$ rad/s. A circular conducting loop (B) of radius 1 cm coaxially slid through the solenoid at a speed $v = 1$ cm/s. The r.m.s. current through the loop when the coil B is inserted 10 cm inside the solenoid is $\frac{\alpha}{\sqrt{2}}$ μ A. The value of α is _____.

[Resistance of the loop = 10 Ω]

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

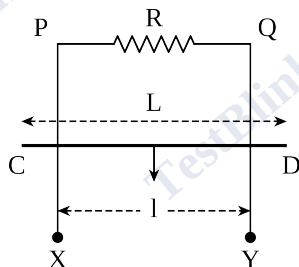
- (1) 80 (2) 280 (3) 100 (4) 197

Scan or tap for the full solution



Q.10 XPQY is a vertical smooth long loop having a total resistance R where PX is parallel to QY and separation between them is l. A constant magnetic field B perpendicular to the plane of the loop exists in the entire space. A rod CD of length L ($L > l$) and mass m is made to slide down from rest under the gravity as shown in figure. The terminal speed acquired by the rod is _____ m/s. (g = acceleration due to gravity)

[JEE Main 2026 (Online) 22nd January Morning Shift]



- (1) $\frac{mgR}{B^2 l^2}$ (2) $\frac{2mgR}{B^2 L^2}$ (3) $\frac{2mgR}{B^2 l^2}$ (4) $\frac{8mgR}{B^2 l^2}$

Scan or tap for the full solution



Q.11 Three identical coils C_1 , C_2 and C_3 are closely placed such that they share a common axis. C_2 is exactly midway. C_1 carries current I in anti-clockwise direction while C_3 carries current I in clockwise direction. An induced current flows through C_2 will be in clockwise direction when

[JEE Main 2026 (Online) 22nd January Morning Shift]

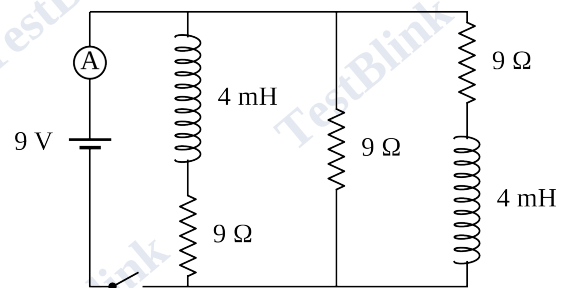
- (1) C_1 and C_3 move with equal speeds away from C_2
 (2) C_1 moves towards C_2 and C_3 moves away from C_2
 (3) C_1 and C_3 move with equal speeds towards C_2
 (4) C_1 moves away from C_2 and C_3 moves towards C_2

Scan or tap for the full solution



Q.12 Figure shows the circuit that contains three resistances ($9\ \Omega$ each) and two inductors (4 mH each). The reading of ammeter at the moment switch K is turned ON, is _____ A.

[JEE Main 2026 (Online) 22nd January Evening Shift]



- (1) 2 (2) 3 (3) 1 (4) zero

Scan or tap for the full solution



Q.13 A conducting circular loop of area 1.0 m^2 is placed perpendicular to a magnetic field which varies as $B = \sin(100t)$ Tesla. If the resistance of the loop is $100\ \Omega$, then the average thermal energy dissipated in the loop in one period is _____ J.

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

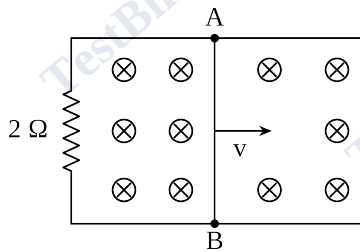
- (1) π^2 (2) $\frac{\pi}{2}$ (3) π (4) 2π

Scan or tap for the full solution



Q.14 A 1 m long metal rod AB completes the circuit as shown in figure. The area of circuit is perpendicular to the magnetic field of 0.10 T. If the resistance of the total circuit is $2\ \Omega$ then the force needed to move the rod towards right with constant speed (v) of 1.5 m/s is _____ N.

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



- (1) 5.7×10^{-2} (2) 7.5×10^{-3}
 (3) 5.7×10^{-3} (4) 7.5×10^{-2}

Scan or tap for the full solution



- Q.15** A solenoid having area A and length ' l ' is filled with a material having relative permeability 2. The magnetic energy stored in the solenoid is :

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

- (1) $\frac{B^2 Al}{4\mu_0}$ (2) $\frac{B^2 Al}{2\mu_0}$ (3) $\frac{B^2 Al}{\mu_0}$ (4) $B^2 Al$

Scan or tap for the full solution



- Q.16** A coil of area A and N turns is rotating with angular velocity ω in a uniform magnetic field $\vec{B}$ about an axis perpendicular to $\vec{B}$. Magnetic flux ϕ and induced emf ε across it, at an instant when $\vec{B}$ is parallel to the plane of coil, are :

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

- (1) $\phi = AB$, $\varepsilon = NAB\omega$ (2) $\phi = AB$, $\varepsilon = 0$
 (3) $\phi = 0$, $\varepsilon = 0$ (4) $\phi = 0$, $\varepsilon = NAB\omega$

Scan or tap for the full solution



- Q.17** Consider I_1 and I_2 are the currents flowing simultaneously in two nearby coils 1 & 2, respectively. If L_1 = self inductance of coil 1, M_{12} = mutual inductance of coil 1 with respect to coil 2, then the value of induced emf in coil 1 will be :

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

- (1) $e_1 = -L_1 \frac{dI_2}{dt} - M_{12} \frac{dI_1}{dt}$
 (2) $e_1 = -L_1 \frac{dI_1}{dt} + M_{12} \frac{dI_2}{dt}$
 (3) $e_1 = -L_1 \frac{dI_1}{dt} - M_{12} \frac{dI_1}{dt}$
 (4) $e_1 = -L_1 \frac{dI_1}{dt} - M_{12} \frac{dI_2}{dt}$

Scan or tap for the full solution



- Q.18** A uniform magnetic field of 0.4 T acts perpendicular to a circular copper disc 20 cm in radius. The disc is having a uniform angular velocity of $10\pi \text{ rad s}^{-1}$ about an axis through its centre and perpendicular to the disc. What is the potential difference developed between the axis of the disc and the rim? ($\pi = 3.14$)

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

- (1) 0.5024 V (2) 0.0628 V
 (3) 0.2512 V (4) 0.1256 V

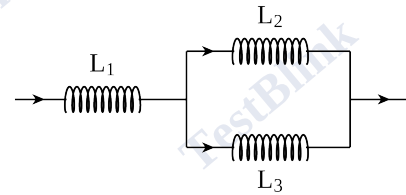
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Section B (Numerical) — 7 questions

- Q.19** In the given circuit below inductance values of L_1 , L_2 and L_3 are same. The magnetic energy stored in the entire circuit is (U_i) and that stored in the L_2 inductor is (U_i). U_i/U_1 is _____. (Ignore the mutual inductance if any)

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



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- Q.20** A circular loop of radius 20 cm and resistance 2Ω is placed in a time varying magnetic field $\vec{B} = (2t^2 + 2t + 3) \text{ T}$. At $t = 0$, for the plane of the loop being perpendicular to the magnetic field and, the induced current in the loop at $t = 3 \text{ s}$ is $\frac{\alpha}{50} \text{ A}$. The value of α is _____. (Take $\pi = 22/7$)

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

Scan or tap for the full solution



- Q.21** A simple pendulum made of mass 10 g and a metallic wire of length 10 cm is suspended vertically in a uniform magnetic field of 2 T. The magnetic field direction is perpendicular to the plane of oscillations of the pendulum. If the pendulum is released from an angle of 60° with vertical, then maximum induced EMF between the point of suspension and point of oscillation is _____ mV. (Take $g = 10 \text{ m/s}^2$)

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

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- Q.22** Inductance of a coil with 10^4 turns per metre is 10 mH and it is connected to a dc source of 10 V with internal resistance of 10Ω . The energy density in the inductor when the current reaches $\left(\frac{1}{e}\right)$ of its maximum value is $\alpha\pi \times \frac{1}{e^2} \text{ J/m}^3$. The value of α is _____. ($\mu_0 = 4\pi \times 10^{-7} \text{ T m/A}$).

[JEE Main 2026 (Online) 22nd January Morning Shift]

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full solution

- Q.23** A conducting circular loop is rotated about its diameter at a constant angular speed of 100 rad/s in a magnetic field of 0.5 T perpendicular to the axis of rotation. When the loop is rotated by 30° from the horizontal position, the induced EMF is 15.4 mV. The radius of the loop is _____ mm.

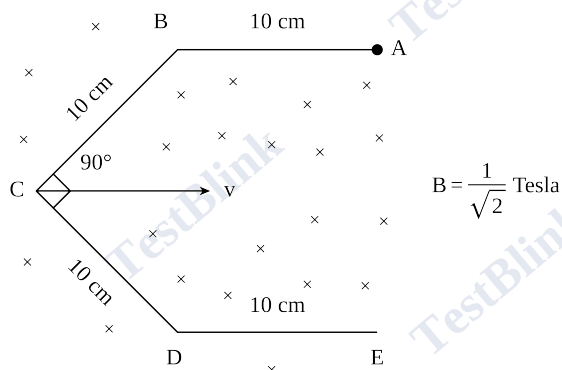
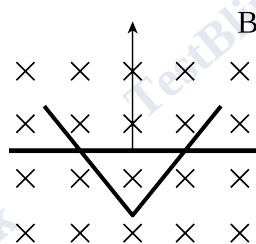
(Take $\pi = \frac{22}{7}$)

[JEE Main 2026 (Online) 22nd January Evening Shift]

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full solution

- Q.24** Conductor wire ABCDE with each arm 10 cm in length is placed in magnetic field of $\frac{1}{\sqrt{2}}$ Tesla, perpendicular to its plane. When conductor is pulled towards right with constant velocity of 10 cm/s, induced emf between points A and E is _____ mV.

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

Scan or tap for the
full solution**Q.25**

A conducting bar moves on two conducting rails as shown in the figure. A constant magnetic field B exists into the page. The bar starts to move from the vertex at time $t = 0$ with a constant velocity. If the induced EMF is $E = t^n$, then value of n is _____.

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

Scan or tap for the
full solution**ANSWER KEY****Section A (MCQ) — 18 questions**

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	2	1	4	1	1	4	3	3	4	1	2
Ques.	12	13	14	15	16	17	18				
Ans.	3	3	2	1	4	4	3				

Section B (Numerical) — 7 questions

Ques.	19	20	21	22	23	24	25
Ans.	6	44	100	20	14	10	1