PYQSide PYQSide.com — free PYQs with solutions Powered by PrepBlink

JEE MAIN ELECTROMAGNETIC INDUCTION — MOTIONAL EMF — PYQS

Max. Marks: 36 **Questions:** 9

Section A (MCQ) — 6 questions

Q.1 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 $B(r) = B_0e^{-\lambda r}$; 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.2 A 20 m long uniform copper wire held horizontally is allowed to fall under the gravity ($g = 10\ m/s^2$) 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]

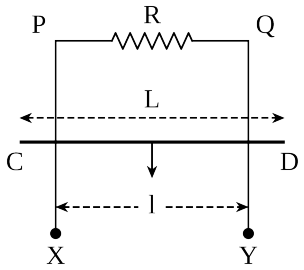
(1) $200\sqrt{10}$ (2) $0.2\sqrt{10}$

(3) $20\sqrt{10}$ (4) $2\sqrt{10}$

Scan or tap for the full solution

Q.3 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]

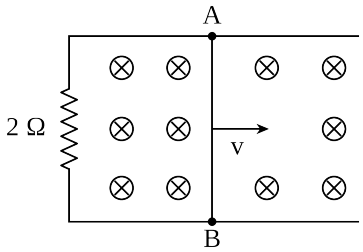


(1) $\frac{mgR}{B^2l^2}$ (2) $\frac{2mgR}{B^2L^2}$ (3) $\frac{2mgR}{B^2l^2}$ (4) $\frac{8mgR}{B^2l^2}$

Scan or tap for the full solution

Q.4 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 Ω 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.5 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 10π 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]

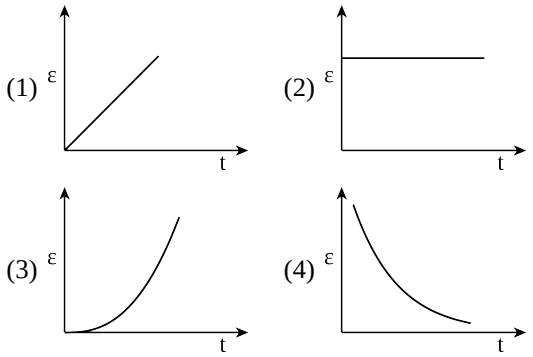
(1) 0.5024 V (2) 0.0628 V

(3) 0.2512 V (4) 0.1256 V

Scan or tap for the full solution

Q.6 A rectangular metallic loop is moving out of a uniform magnetic field region to a field free region with a constant speed. When the loop is partially inside the magnetic field, the plot of magnitude of induced emf (ε) with time (t) is given by

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



Scan or tap for the full solution

Section B (Numerical) — 3 questions

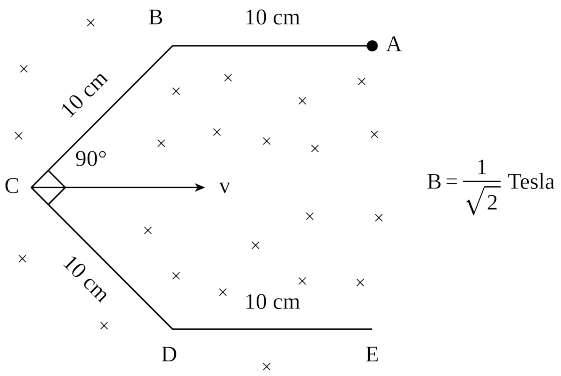
Q.7 A simple pendulum made of mass 10 g and a metallic wire of length 10 cm is suspended vertically in a uniform magnetic field of 2 T. The magnetic field direction is perpendicular to the plane of oscillations of the pendulum. If the pendulum is released from an angle of 60° with vertical, then maximum induced EMF between the point of suspension and point of oscillation is _____ mV. (Take g = 10 m/s^2)

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

Scan or tap for the full solution

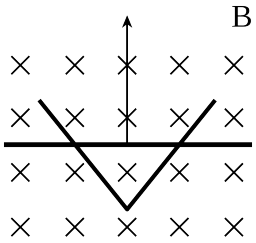
Q.8 Conductor wire ABCDE with each arm 10 cm in length is placed in magnetic field of $\frac{1}{\sqrt{2}}$ Tesla, perpendicular to its plane. When conductor is pulled towards right with constant velocity of 10 cm/s, induced emf between points A and E is _____ mV.

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



Scan or tap for the full solution

Q.9



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 $E \propto t^n$, 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) — 6 questions

Ques.	1	2	3	4	5	6					
Ans.	**1**	**3**	**1**	**2**	**3**	**2**					

Section B (Numerical) — 3 questions

Ques.	7	8	9				
Ans.	**100**	**10**	**1**				