PART 1 - PHYSICS

Topic : Electromagnetic induction

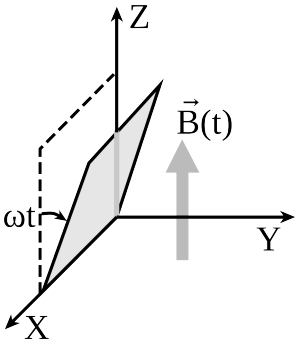
SECTION–1 : (Maximum Marks : 6)

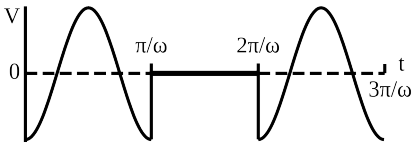
- This section contains **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme :

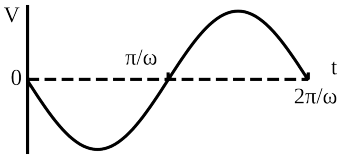
Full Marks	: +3	If ONLY the correct option is chosen;
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	: −1	In all other cases.

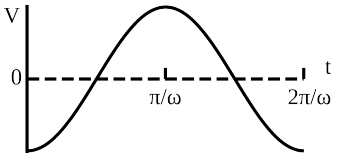
1. A conducting square loop initially lies in the XZ plane with its lower edge hinged along the X-axis. Only in the region $y \geq 0$, there is a time dependent magnetic field pointing along the Z-direction, $\vec{B}(t) = B_0(\cos\omega t)\hat{k}$, where B_0 is a constant. The magnetic field is zero everywhere else. At time t = 0, the loop starts rotating with constant angular speed ω about the X axis in the clockwise direction as viewed from the +X axis (as shown in the figure). Ignoring self-inductance of the loop and gravity, which of the following plots correctly represents the induced e.m.f. (V) in the loop as a function of time:

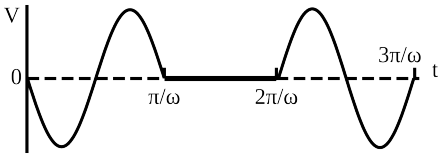
[JEE Advanced 2025 Paper 1]



(A)


(B)


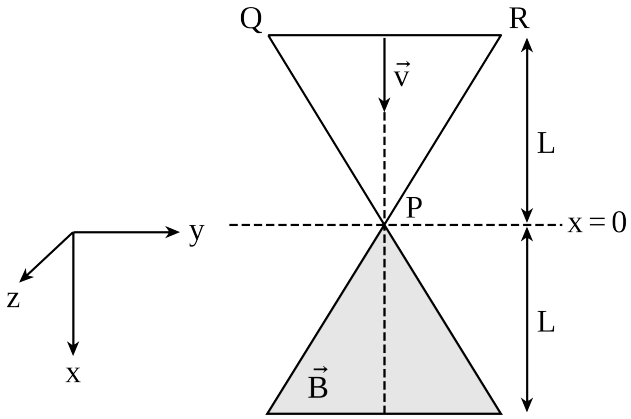
(C)


(D)


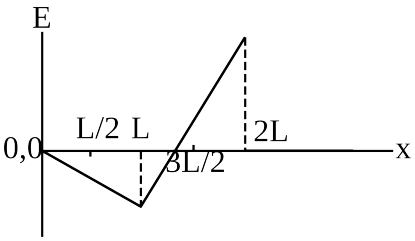
Scan or tap for the full solution

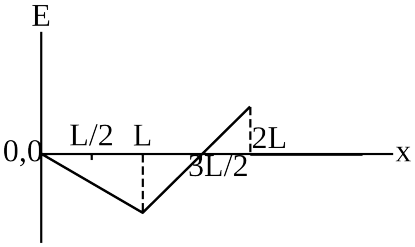
Space for Rough Work

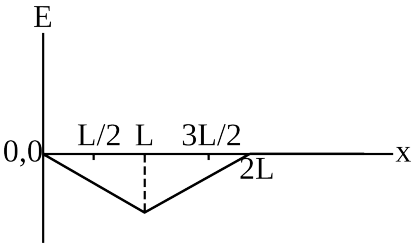
2. A region in the form of an equilateral triangle (in x-y plane) of height L has a uniform magnetic field $\vec{B}$ pointing in the +z-direction. A conducting loop PQR, in the form of an equilateral triangle of the same height L, is placed in the x-y plane with its vertex P at x = 0 in the orientation shown in the figure. At t = 0, the loop starts entering the region of the magnetic field with a uniform velocity $\vec{v}$ along the +x-direction. The plane of the loop and its orientation remain unchanged throughout its motion.

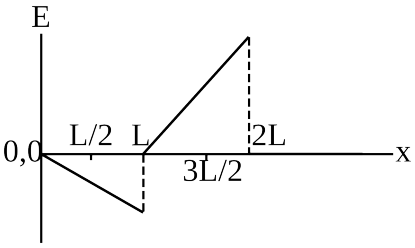


Which of the following graph best depicts the variation of the induced emf (E) in the loop as a function of the distance (x) starting from x = 0? [JEE Advanced 2024 Paper 2]

(A)


(B)


(C)


(D)


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SECTION–2 : (Maximum Marks : 4)

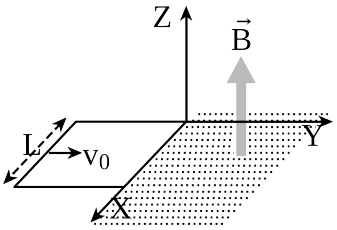
- This section contains **ONE** question.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks	: +4	ONLY if (all) the correct option(s) is(are) chosen;
Partial Marks	: +3	If all the four options are correct but ONLY three options are chosen;
Partial Marks	: +2	If three or more options are correct but ONLY two options are chosen, both of which are correct;
Partial Marks	: +1	If two or more options are correct but ONLY one option is chosen and it is a correct option;
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	: −2	In all other cases.

- For example, in a question, if **(A), (B) and (D)** are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get −2 marks.

3. A conducting square loop of side L, mass M and resistance R is moving in the XY plane with its edges parallel to the X and Y axes. The region $y \geq 0$ has a uniform magnetic field, $\vec{B} = B_0\hat{k}$. The magnetic field is zero everywhere else. At time t = 0, the loop starts to enter the magnetic field with an initial velocity $v_0\hat{j}$ m/s, as shown in the figure. Considering the quantity $K = \frac{B_0^2L^2}{RM}$ in appropriate units, ignoring self-inductance of the loop and gravity, which of the following statements is/are correct:

[JEE Advanced 2025 Paper 1]



(A) If v_0 = 1.5KL, the loop will stop before it enters completely inside the region of magnetic field.

(B) When the complete loop is inside the region of magnetic field, the net force acting on the loop is zero.

(C) If $v_0 = \frac{KL}{10}$, the loop comes to rest at $t = \left(\frac{1}{K}\right)\ln\left(\frac{5}{2}\right)$.

(D) If v_0 = 3KL, the complete loop enters inside the region of magnetic field at time $t = \left(\frac{1}{K}\right)\ln\left(\frac{3}{2}\right)$.

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PYQSide

TEST SERIES
(Academic Session : 2026-2027)

JEE ADVANCED ELECTROMAGNETIC INDUCTION — MOTIONAL EMF — PYQS

Test Pattern : **JEE (Advanced)**

ANSWER KEY

SECTION–1

Ques.	1	2
Ans.	A	A

SECTION–2

Ques.	3
Ans.	B, D