1.

A coil has 1,000 turns and 500 cm^2 as its area. The plane of the coil is placed at right angles to a magnetic induction field of $2 \times 10^{-5}\ Wb/m^2$. The coil is rotated through 180^o in 0.2 *seconds*. The average e.m.f. induced in the coil, in *milli-volts*, is

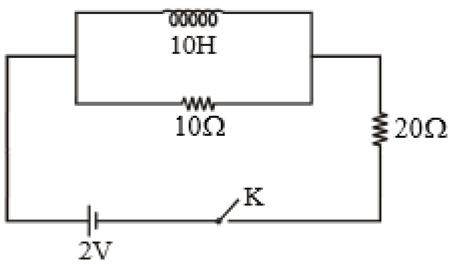
1. 5
2. 10
3. 15
4. 20

2.

A small square loop of wire of side l is placed inside a large square of wire of side L (L>>l). The loops are co-planar and their centres coincide. The mutual inductance of the system is proportional to:

1. l/L
2. l^2/L
3. L/l
4. L^2/l

3.



The key K is inserted at time $t = 0$. The initial ($t = 0$) and final ($t \to \infty$) currents through battery are :

1. $\frac{1}{15}$ Amp, $\frac{1}{10}$ Amp
2. $\frac{1}{10}$ Amp, $\frac{1}{15}$ Amp
3. $\frac{2}{15}$ Amp, $\frac{1}{10}$ Amp
4. $\frac{1}{15}$ Amp, $\frac{2}{25}$ Amp

4.

Lenz's law is consequence of the law of conservation of

(1) Charge

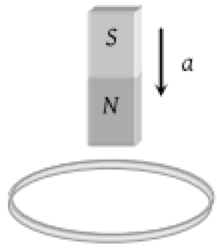
(2) Momentum

(3) Mass

(4) Energy

5.

A metallic ring is attached with the wall of a room. When the north pole of a magnet is brought near to it, the induced current in the ring will be



(1) First clockwise then anticlockwise

(2) In clockwise direction

(3) In anticlockwise direction

(4) First anticlockwise then clockwise

6.

A copper ring is held horizontally and a bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet while it is passing through the ring is

(1) Equal to that due to gravity

(2) Less than that due to gravity

(3) More than that due to gravity

(4) Depends on the diameter of the ring and the length of the magnet

7.

A coil having 500 square loops each of side 10 *cm* is placed normal to a magnetic flux which increases at the rate of 1.0 *tesla/second*. The induced e.m.f. in volts is

(1) 0.1

(2) 0.5

(3) 1

(4) 5

8.

The magnetic field in a coil of 100 turns and 40 *square cm* area is increased from 1 *Tesla* to 6 *Tesla* in 2 *second.* The magnetic field is perpendicular to the coil. The e.m.f. generated in it is

(1) $10^4\ V$

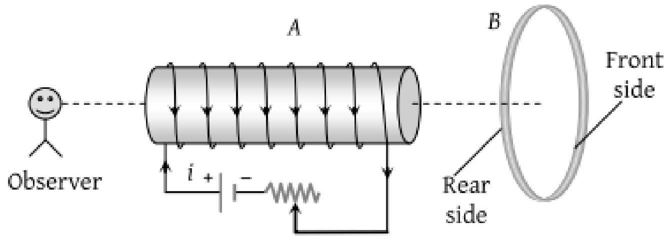
(2) $1.2\ V$

(3) $1.0\ V$

(4) $10^{-2}\ V$

9.

An aluminium ring B faces an electromagnet A. The current I through A can be altered



(1) Whether I increases or decreases, B will not experience any force

(2) If I decrease, A will repel B

(3) If I increases, A will attract B

(4) If I increases, A will repel B

10.

Two rails of a railway track insulated from each other and the ground are connected to a milli voltmeter. What is the reading of voltmeter, when a train travels with a speed of 180 *km/hr* along the track. Given that the vertical component of earth's magnetic field is 0.2×10^{-4} weber/m^2 and the rails are separated by 1 *metre*

(1) 10^{-2} volt

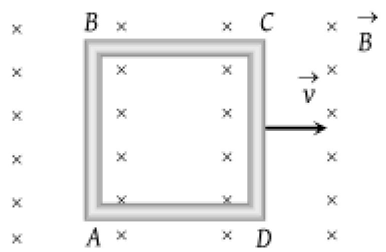
(2) 10^{-4} volt

(3) 10^{-3} volt

(4) 1 volt

11.

A conducting square loop of side L and resistance R moves in its plane with a uniform velocity v perpendicular to one of its sides. A magnetic induction B constant in time and space, pointing perpendicular and into the plane of the loop exists everywhere. The current induced in the loop is



(1) $\frac{Blv}{R}$ clockwise

(2) $\frac{Blv}{R}$ anticlockwise

(3) $\frac{2Blv}{R}$ anticlockwise

(4) Zero

12.

The magnitude of the earth's magnetic field at a place is B_0 and the angle of dip is δ. A horizontal conductor of length l lying along the magnetic north-south moves eastwards with a velocity v. The emf induced across the conductor is

(1) Zero

(2) $B_0 lv \sin \delta$

(3) $B_0 lv$

(4) $B_0 lv \cos \delta$

13.

A coil and a bulb are connected in series with a dc source, a soft iron core is then inserted in the coil. Then

(1) Intensity of the bulb remains the same

(2) Intensity of the bulb decreases

(3) Intensity of the bulb increases

(4) The bulb ceases to glow

14.

In an LR-circuit, time constant is that time in which current grows from zero to the value (where I_0 is the steady state current)

(1) $0.63\ I_0$

(2) $0.50\ I_0$

(3) $0.37\ I_0$

(4) I_0

15.

A copper rod of length l is rotated about one end perpendicular to the magnetic field B with constant angular velocity ω. The induced e.m.f. between the two ends is

(1) $\frac{1}{2}B\omega l^2$

(2) $\frac{3}{4}B\omega l^2$

(3) $B\omega l^2$

(4) $2B\omega l^2$

16.

A circular loop of radius R carrying current I lies in x-y plane with its centre at origin. The total magnetic flux through x-y plane is

(1) Directly proportional to I

(2) Directly proportional to R

(3) Directly proportional to R^2

(4) Zero

17.

A coil of wire having finite inductance and resistance has a conducting ring placed coaxially within it. The coil is connected to a battery at time t = 0, so that a time-dependent current $I_1(t)$ starts flowing through the coil. If $I_2(t)$ is the current induced in the ring. and $B(t)$ is the magnetic field at the axis of the coil due to $I_1(t)$, then as a function of time ($t > 0$), the product $I_2(t)\,B(t)$

(1) Increases with time

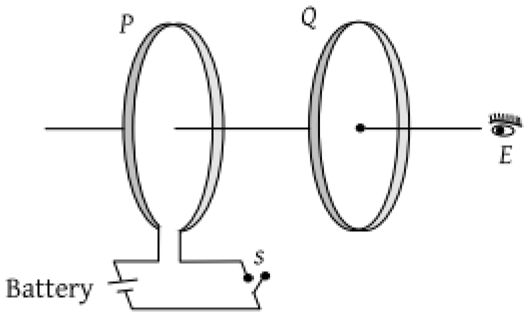
(2) Decreases with time

(3) Does not vary with time

(4) Passes through a maximum

18.

As shown in the figure, P and Q are two coaxial conducting loops separated by some distance. When the switch S is closed, a clockwise current I_P flows in P (as seen by E) and an induced current I_{Q_1} flows in Q. The switch remains closed for a long time. When S is opened, a current I_{Q_2} flows in Q. Then the directions of I_{Q_1} and I_{Q_2} (as seen by E) are



(1) Respectively clockwise and anticlockwise

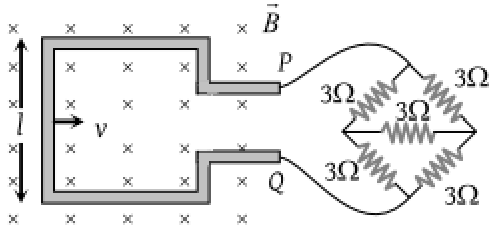
(2) Both clockwise

(3) Both anticlockwise

(4) Respectively anticlockwise and clockwise

19.

A square metallic wire loop of side 0.1 m and resistance of 1Ω is moved with a constant velocity in a magnetic field of 2 wb/m^2 as shown in figure. The magnetic field is perpendicular to the plane of the loop, loop is connected to a network of resistances. What should be the velocity of loop so as to have a steady current of 1mA in loop



(1) 1 cm/sec

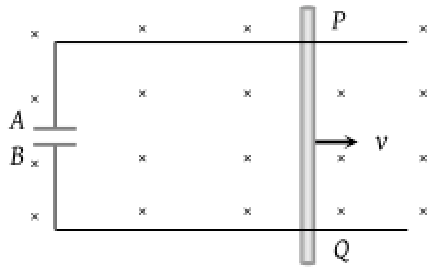
(2) 2 cm/sec

(3) 3 cm/sec

(4) 4 cm/sec

20.

A conducting rod PQ of length L = 1.0 m is moving with a uniform speed v = 2 m/s in a uniform magnetic field B = 4.0 T directed into the paper. A capacitor of capacity C = 10 μF is connected as shown in figure. Then



(1) $q_A = +80\ \mu C$ and $q_B = -80\ \mu C$

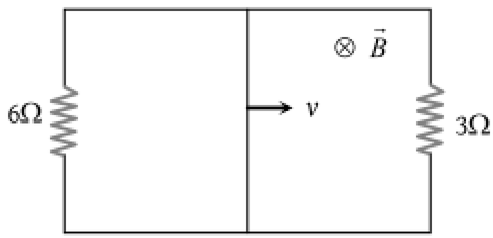
(2) $q_A = -80\ \mu C$ and $q_B = +80\ \mu C$

(3) $q_A = 0 = q_B$

(4) Charge stored in the capacitor increases exponentially with time

21.

A rectangular loop with a sliding connector of length l = 1.0 m is situated in a uniform magnetic field B = 2T perpendicular to the plane of loop. Resistance of connector is r = 2Ω. Two resistance of 6Ω and 3Ω are connected as shown in figure. The external force required to keep the connector moving with a constant velocity v = 2m/s is



(1) 6 N

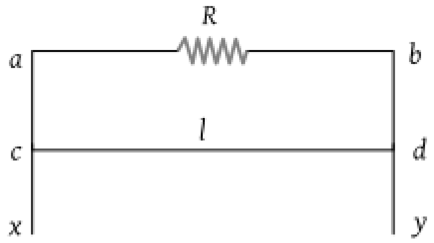
(2) 4 N

(3) 2 N

(4) 1 N

22.

A wire cd of length l and mass m is sliding without friction on conducting rails ax and by as shown. The vertical rails are connected to each other with a resistance R between a and b. A uniform magnetic field B is applied perpendicular to the plane $abcd$ such that cd moves with a constant velocity of



(1) $\frac{mgR}{Bl}$

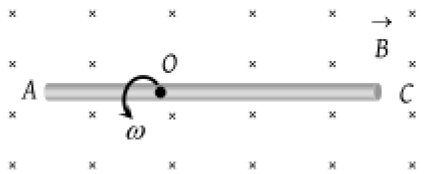
(2) $\frac{mgR}{B^2l^2}$

(3) $\frac{mgR}{B^3l^3}$

(4) $\frac{mgR}{B^2l}$

23.

A conducting rod AC of length $4l$ is rotated about a point O in a uniform magnetic field $\vec{B}$ directed into the paper. $AO = l$ and $OC = 3l$. Then



(1) $V_A - V_O = \frac{B\omega l^2}{2}$

(2) $V_O - V_C = \frac{7}{2}B\omega l^2$

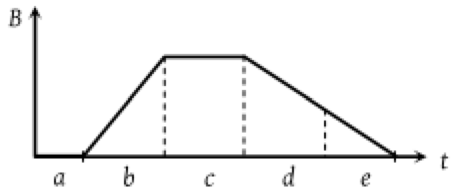
(3) $V_A - V_C = 4B\omega l^2$

(4) $V_C - V_O = \frac{9}{2}B\omega l^2$

24.

The graph gives the magnitude $B(t)$ of a uniform magnetic field that exists throughout a conducting loop, perpendicular to the plane of the loop.

Rank the five regions of the graph according to the magnitude of the emf induced in the loop, greatest first



(1) $b > (d = e) < (a = c)$

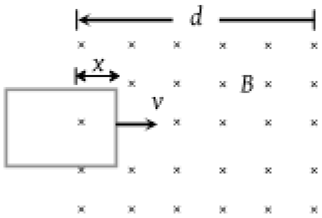
(2) $b > (d = e) > (a = c)$

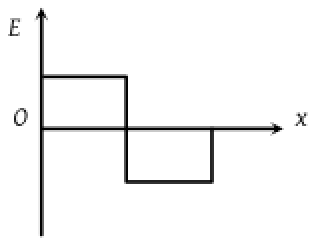
(3) $b < d < e < c < a$

(4) $b > (a = c) > (d = e)$

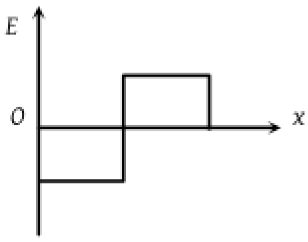
25.

A rectangular loop is being pulled at a constant speed v, through a region of certain thickness d, in which a uniform magnetic field B is set up. The graph between position x of the right-hand edge of the loop and the induced emf E will be-

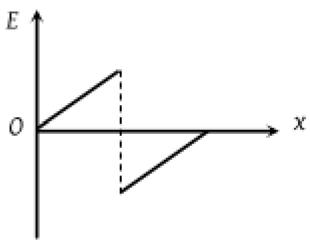




(1)

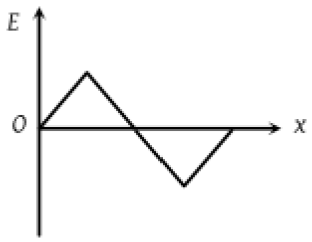


(2)



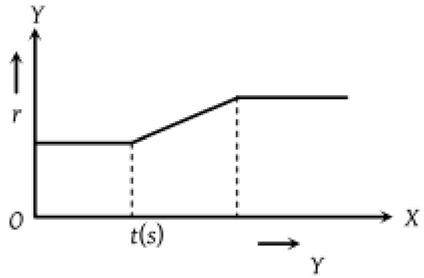
(3)

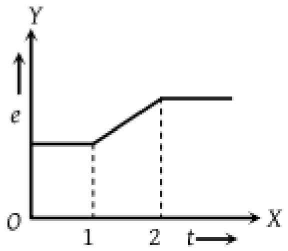
(4)

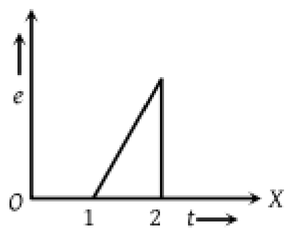


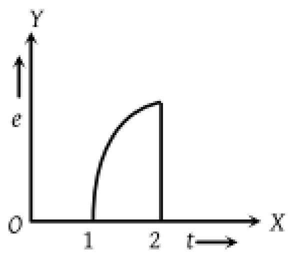
26.

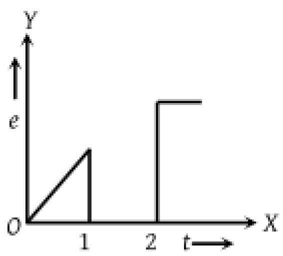
A flexible wire bent in the form of a circle is placed in a uniform magnetic field perpendicular to the plane of the coil. The radius of the coil changes as shown in figure. The graph of induced emf in the coil is represented by



(1) 

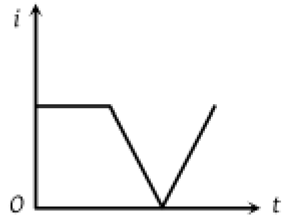
(2) 

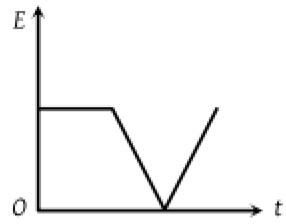
(3) 

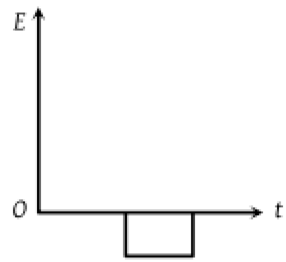
(4) 

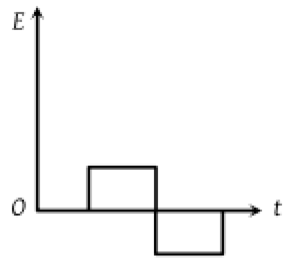
27.

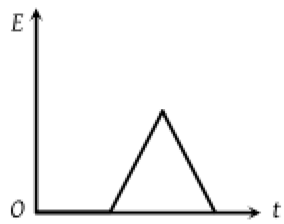
The current i in an induction coil varies with time t according to the graph shown in figure. Which of the following graphs shows the induced emf *(e)* in the coil with time



(1) 

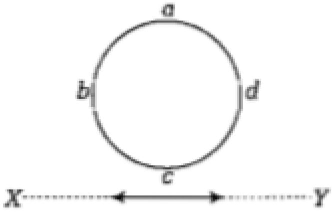
(2) 

(3) 

(4) 

28.

An electron moves on a straight line path XY as shown. The abcd is a coil adjacent in the path of electron. What will be the direction of current, if any induced in the coil?



(a)abcd

(b)adcb

(c)The current will reverse its direction as the electron goes past the coil

(d)No current induced

29.

A wire loop is rotated in a magnetic field. The frequency of change of direction of the induced emf is

(a) once per revolution

(b) twice per revolution

(c) four times per revolution

(d) six times per revolution

30.

A coil of resistance 400Ω is placed in a magnetic field. If the magnetic flux $\phi\ (Wb)$ linked with the coil varies with time t (sec) as $\phi = 50t^2 + 4$.

The current in the coil at t=2s is

(a) 0.5A (b) 0.1A

(c) 2A (d) 1A

31.

Two coils have a mutual inductance of 0.005 H. The current changes in the first coil according to the equation $\mathrm{I} = \mathrm{I}_0 \sin \omega t$, where $\mathrm{I}_0 = 10$ A and $\omega = 100\pi$ rad/s. The maximum value of emf in the second coil is

1. 2π
2. 5π
3. π
4. 4π

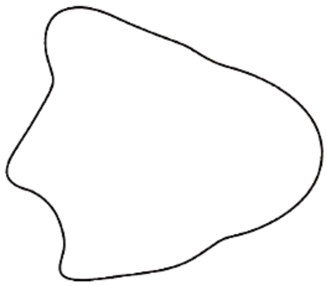
32.

The magnetic flux through a circuit of resistance R changes by an amount $\Delta\phi$ in a time Δt. Then the total quantity of electric charge Q that passes any point in the circuit during the time Δt is represented by

1. $\mathrm{Q} = \frac{\Delta\phi}{\mathrm{R}}$
2. $\mathrm{Q} = \frac{\Delta\phi}{\Delta\mathrm{t}}$
3. $\mathrm{Q} = \mathrm{R} \cdot \frac{\Delta\phi}{\Delta\mathrm{t}}$
4. $Q = \frac{1}{R} \cdot \frac{\Delta\phi}{\Delta t}$

33.

As a result of the change in the magnetic flux linked to the closed-loop shown in the figure, an emf, V volt is induced in the loop. The work is done (joules) in taking a charge Q coulomb once along the loop is



1. QV
2. QV/2
3. 2QV
4. zero

34.

A circular disc of radius 0.2 m is placed in a uniform magnetic field of induction $\frac{1}{\pi}\left(\frac{\mathrm{Wb}}{\mathrm{m}^2}\right)$ in such a way that its axis makes an angle of 60° with $\vec{\mathrm{B}}$. The magnetic flux linked with the disc is

1. 0.01 Wb
2. 0.02 Wb
3. 2.0 Wb
4. 1.0 Wb

35.

A long solenoid has 500 turns. When a current of 2 A is passed through it, the resulting magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb. The self-inductance of the solenoid is

1. 4.0 H
2. 2.5 H

3. 2.0 H

4. 1.0 H

36.

A conducting circular loop is placed in a uniform magnetic field, B = 0.025 T with its plane perpendicular to the loop. the radius of the loop is made to shrink at a constant rate of 1 mm s^{-1}. The induced emf when the radius is 2 cm is

1. $2\mu V$

2. $2\pi\mu V$

3. $\pi\mu V$

4. $\frac{\pi}{2}\mu V$

37.

A conducting circular loop is placed in a uniform magnetic field 0.04 T with its plane perpendicular to the magnetic field. The radius of the loop starts shrinking at 2 mm s^{-1}. The induced emf in the loop when the radius is 2 cm is

1. $4.8\pi\mu V$

2. $0.8\pi\mu V$

3. $1.6\pi\mu V$

4. $3.2\pi\mu V$

38.

A coil of resistance of 400Ω is placed in a magnetic field. If the magnetic flux $\phi(Wb)$ linked with the coil varies with time t(s) as $\phi = 50t^2 + 4$, the current in the coil at t = 2 s is -

1. 2A

2. 1A

3. 0.5A

4. 0.1A

39.

Alternating electric field of frequency v, is applied across the dees (radius = R) of a cyclotron that is being used to accelerate protons (mass = m). The operating magnetic field (B) used in the cyclotron and the kinetic energy (K) of the proton beam, produced by it, are given by

1. $B = \frac{2\pi mv}{e}$ and $K = 2m\pi^2v^2R^2$

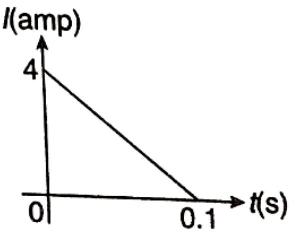
2. $B = \frac{mv}{e}$ and $k = m^2\pi vR^2$

3. $B = \frac{mv}{e}$ and $K = 2m\pi^2v^2R$

4. $B = \frac{2\pi mv}{e}$ and $K = m^2\pi vR^2$

40.

In a coil of resistance 10 Ω, the induced current developed by changing magnetic flux through it is shown in the figure as a function of time. The magnitude of change in flux through the coil in Weber is



1. 6

2. 4

3. 8

4. 2

41.

A wire loop is rotated in a magnetic field. The frequency of change of direction of the induced emf is

1. Once per revolution

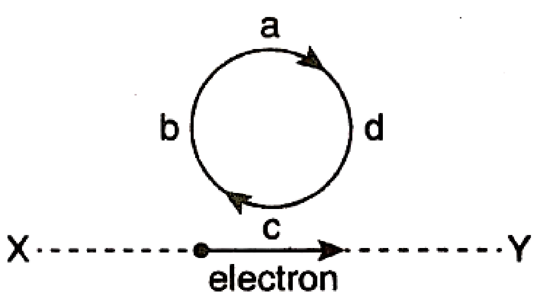
2. Twice per revolution

3. Four times per revolution

4. Six-time per revolution

42.

An electron moves on a straight-line path XY as shown below,abcd is a coil adjacent to the path of the electron. What will be the direction of the current, if any induced in the coil?



1. No current-induced

2. abcd

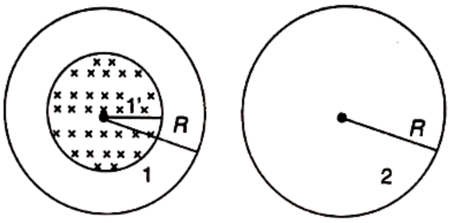
3. adcd

4. The current will reverse its direction as the electron goes past the coil.

43.

A uniform magnetic field is restricted within a region of radius r.

The magnetic field changes with time at a rate $\frac{d\vec{B}}{dt}$. Loop 1 of radius R > r encloses the region r and loop 2 of radius R is outside the region of the magnetic field as shown in the figure below. Then the emf generated is



1. $-\frac{d\vec{B}}{dt}\ \pi r^2$ in loop 1 and $-\frac{d\vec{B}}{dt}\ \pi r^2$ in loop 2
2. $-\frac{d\vec{B}}{dt}\ \pi R^2$ in loop 1 and zero in loop 2
3. $-\frac{d\vec{B}}{dt}\ \pi r^2$ in loop 1 and zero in loop 2
4. zero in loop 1 and zero in loop 2

44.

A long solenoid of diameter 0.1 m has 2×10^4 turns per meter. At the center of the solenoid, a coil of 100 turns and a radius 0.01 m is placed with its axis coinciding with the solenoid axis. The current in the solenoid reduces at a constant rate to 0 A from 4 A in 0.05 s. If the resistance of the coil is $10\ \pi^2 \Omega$, the total charge flowing through the coil during this time is

1. 16 μC
2. 32 μC
3. 16 $\pi\mu$C
4. 32 $\pi\mu$C

45.

The magnetic potential energy stored in a certain inductor is 25 mJ when the current in the inductor is 60 mA. This inductor is of inductance

1. 1.389 H
2. 138.88 h
3. 0.138 H
4. 13.89 H

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