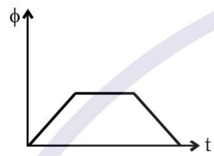
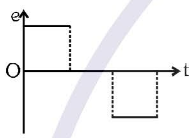
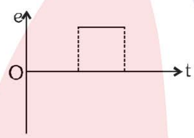
1. A circular disc of radius 0.2 meter is placed in a uniform magnetic field of $\frac{1}{\pi}$ wb/m^2 in such way that its axis makes an angle of 60° with $\vec{B}$. The magnetic flux linked with the disc is :-

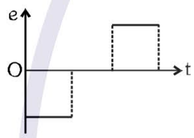
(1) 0.08 wb (2) 0.01 wb
(3) 0.02 wb (4) 0.06 wb

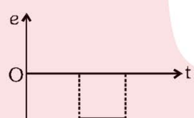
2. Magnetic flux linked through the coil changes with respect to time according to following graph, then induced emf v/s time graph for coil is :–



(1)


(2)


(3)


(4)


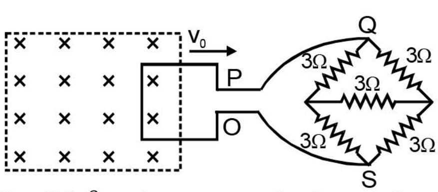
3. Magnetic field changes at the rate of 0.4 T/sec. in a square coil of side 4 cm. kept perpendicular to the field. If the resistance of the coil is $2 \times 10^{-3}\ \Omega$, then induced current in coil is :–

(1) 0.16 A (2) 0.32 A (3) 3.2 A (4) 1.6 A

4. In a circuit a coil of resistance 2Ω, then magnetic flux changes from 2.0Wb to 10.0Wb in 0.2 sec. The charge flow in the coil during this time is :–

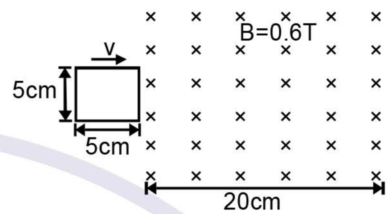
(1) 5.0 C (2) 4.0 C (3) 1.0 C (4) 0.8 C

5. A metallic square wire loop of side 10 cm and resistance 1 Ω is moved with a constant velocity v_0 in a uniform magnetic field of induction B = 2 T as shown in the figure. The magnetic field perpendicular to the plane of the loop. The loop is connected to a network of resistors each of value 3 ohm. The resistance of the lead wires OS and PQ are negligible. What should be the speed of the loop so as to have a steady current of 1 mA in it? Give the direction of current in the loop.



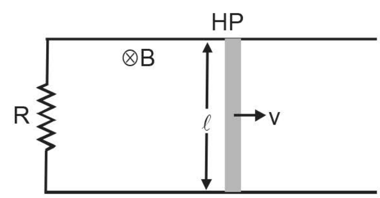
(1) 2×10^{-2} m/sec. , anticlockwise direction
(2) 4×10^{-2} m/sec. , anticlockwise direction
(3) 2×10^{-2} m/sec. , clockwise direction
(4) 4×10^{-2} m/sec. , clockwise direction

6. Figure shows a square loop of side 5 cm being moved towards right at a constant speed of 1cm/sec. The front edge just enters the 20 cm wide magnetic field at t = 0. Find the induced emf in the loop at t = 2s and t = 10s.



(1) 3×10^{-2}, zero
(2) 3×10^{-2}, 3×10^{-4}
(3) 3×10^{-4}, 3×10^{-4}
(4) 3×10^{-4}, zero

7. A conducting rod moves towards right with constant velocity v in unifrom transverse magnetic field. Graph between force applied by the external agent v/s velocity and power supplied by the external agent v/s velocity.



(1) St. line, parabola (2) Parabola, st. line
(3) St. line, St. line (4) Parabola, Parabola

8. 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. The induced emf in the loop when the radius is 2 cm is :-

(1) 1.6 π μV (2) 3.2 π μV
(3) 4.8 π μV (4) 0.8 π μV

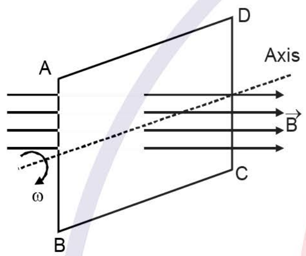
9. A rectangular, a square, a circular and an elliptical loop, all in the (x – y) plane, are moving out of a uniform magnetic field with a constant velocity, $\vec{V} = v\hat{i}$. The magnetic field is directed along the negative z axis direction. The induced emf, during the passage of these loops, out of the field region, will not remain constant for :-

(1) any of the four loops
(2) the rectangular, circular and elliptical loops
(3) the circular and the elliptical loops
(4) only the elliptical loop

10. A long solenoid of diameter 0.1 m has 2×10^4 turns per meter. At the centre of the solenoid, a coil of 100 turns and 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 0A 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 π μC (4) 32 π μC

11. A rectangular coil ABCD is rotated in uniform magnetic field with constant angular velocity about its one of the diameter as shown in figure.The induced emf will be maximum, when the plane of the coil is :-



(1) Perpendicular to the magnetic field
(2) Making an angle of 30° with the magnetic field.
(3) making an angle of 45° with the magnetic field.
(4) Parallel to the magnetic field.

12. A rectangular coil has 60 turns and its length and width is 20 cm and 10 cm recpectively. The coil rotates at a speed of 1800 rotation per minute in a uniform magnetic field of 0.5 T about its one of the diameter. The maximum induced emf will be :-

(1) 98 V (2) 110 V
(3) 113 V (4) 118 V

13. A circular loop of radius r is placed in a region where magnetic field increases with respect to time as B(t) = at then induced emf in coil :-

(1) $\pi r^2 a$ (2) $3\pi r^2 a$
(3) $2\pi r^2 a$ (4) $4\pi r^2 a$

14 For a coil having L = 2mH, current flow through it is $I = t^2e^{-t}$ then the time at which emf becomes zero:–

(1) 2 sec. (2) 1 sec.
(3) 4 sec. (4) 3 sec.

15. A solenoid wound over a rectangular frame. If all the linear dimensions of the frame are increased by a factor 3 and the number of turns per unit length remains the same, the self inductance increased by a factor of :–

(1) 3 (2) 9 (3) 27 (4) 63

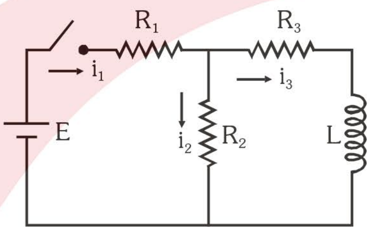
16. Two coils A and B having turns 300 and 600 respectively are placed near each other, on passing a current of 3.0 ampere in A, the flux linked with A is 1.2×10^{-4} weber and with B it is 9.0×10^{-5} weber. The mutual inductance of the system is :-

(1) 2×10^{-5} H (2) 3×10^{-5} H
(3) 4×10^{-5} H (4) 6×10^{-5} H

17. The length of a solenoid is 0.3 m and the number of turns is 2000. The area of cross-section of the solenoid is $1.2\text{x}10^{-3}\text{m}^2$. Another coil of 300 turns is wrapped over the solonoid. A current of 2A is passed through the solenoid and its direction is changed in 0.25 sec. then the induced emf in coil:-

(1) 4.8×10^{-2} V (2) 4.8×10^{-3} V
(3) 3.2×10^{-4} V (4) 3.2×10^{-2} V

18. In the circuit shown in adjoining fig E = 10V, $R_1 = 1\Omega$ $R_2 = 2\Omega$, $R_3 = 3\Omega$ and L = 2H. Calculate the value of current i_1, i_2 and i_3 immidiately after key S is closed:-



(1) 3.3 amp, 3.3 amp, 3.3 amp
(2) 3.3 amp, 3.3 amp , 0 amp
(3) 3.3 amp, 0 amp, 0 amp
(4) 3.3 amp, 3.3 amp 1.1 amp

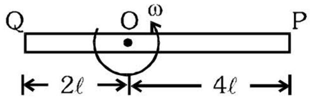
19. An inductor of 20 H and a resistance of 10 Ω, are connected to a battery of 5 volt in series, then initial rate of change of current is :-

(1) 0.5 amp/s (2) 2.0 amp/s
(3) 2.5 amp/s (4) 0.25 amp/s

20. A toroidal solenoid with an air core has an average radius of 15 cm, area of cross-section 12 cm² and 1200 turns. Ignoring the field variation across the cross-section of the toroid, the self-inductance of the toroid is :-

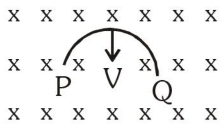
(1) 4.6 mH (2) 6.9 mH
(3) 2.3 mH (4) 9.2 mH

21. A conducting rod rotates with a constant angular velocity 'ω' about the axis which passes through point 'O' and perpendicular to its length. A uniform magnetic field 'B' exists parallel to the axis of the rotation. Then potential difference between the two ends of the rod is :



(1) $6B\omega\ell^2$ (2) $B\omega\ell^2$ (3) $10B\omega\ell^2$ (4) Zero

22. A semicircle loop PQ of radius 'R' is moved with velocity 'v' in transverse magnetic field as shown in figure. The value of induced emf. between the ends of loop is :-



(1) Bv (πr), end 'P' at high potential
(2) 2 BRv, end P at high potential
(3) 2 BRv, end Q at high potential
(4) $B\frac{\pi R^2}{2}v$, end P at high potential

23. In a L–R decay circuit, the initial current at t = 0 is I. The total charge that has flown through the resistor till the energy in the inductor has reduced to one–fourth its initial value, is

(1) LI/R (2) $LI/2R$
(3) $LI\sqrt{2}/R$ (4) None

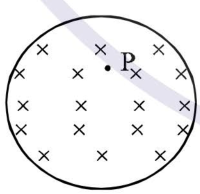
24. A coil of inductance 5H is joined to a cell of emf 6V through a resistance 10Ω at time t = 0. The emf across the coil at time $t = \ln\sqrt{2}$ s is:

(1) 3V (2) 1.5 V (3) 0.75 V (4) 4.5 V

25. A long straight wire is placed along the axis of a circular ring of radius R. The mutual inductance of this system is :-

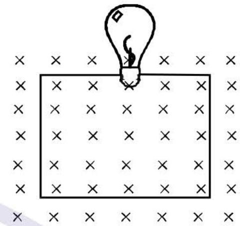
(1) $\frac{\mu_0 R}{2}$ (2) $\frac{\mu_0 \pi R}{2}$ (3) $\frac{\mu_0}{2}$ (4) 0

26. Figure shows a uniform magnetic field B confined to a cylindrical volume and is increasing at a constant rate. The instantaneous acceleration experienced by an electron placed at P is



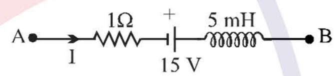
(1) zero (2) towards right
(3) towards left (4) upwards

27. A square wire loop of 10.0 cm side lies at right angles to a uniform magnetic field of 20T. A 10 V light bulb is in a series with the loop as shown in the fig. The magnetic field is decreasing steadily to zero over a time interval Δt. The bulb will shine with full brightness if Δt is equal to :-



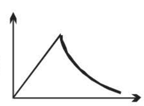
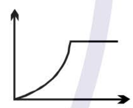
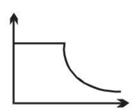
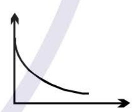
(1) 20 ms (2) 0.02 ms
(3) 2 ms (4) 0.2 ms

28. The network shown in the figure is part of a complete circuit. If at a certain instant, the current I is 5A and it is decreasing at a rate of 10^3 As^{-1} then $V_B - V_A$ equals



(1) 20 V (2) 15 V (3) 10 V (4) 5 V

29. A uniform but time variant magnetic field exists in a cylindrical region directed along the axis of cylinder of radius R. The graph of induced electric field at a given time v/s. r is (r = distance from axis)

(1) 
(2) 
(3) 
(4) 

30. L, C and R represent physical quantities inductance, capacitance and resistance. The combination which has the dimensions of frequency is

(1) $\frac{1}{RC}$ and $\frac{R}{L}$ (2) $\frac{1}{\sqrt{RC}}$ and $\sqrt{\frac{R}{L}}$
(3) $\sqrt{LC}$ (4) $\frac{C}{L}$

				ANSWER KEY						Exercise-I
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**3**	**3**	**2**	**2**	**3**	**4**	**1**	**2**	**3**	**2**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**4**	**3**	**1**	**1**	**3**	**2**	**1**	**2**	**4**	**3**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**1**	**3**	**2**	**1**	**4**	**2**	**1**	**2**	**1**	**1**