JEE MAIN : CHAPTER WISE TEST-5

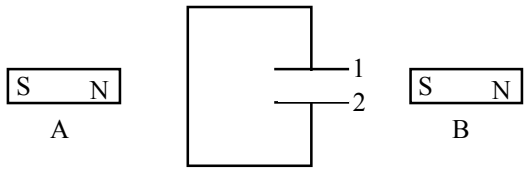
SUBJECT :- PHYSICS **DATE.....**

CLASS :- 12th **NAME.....**

CHAPTER :- ELECTROMAGNETIC INDUCTION **SECTION.....**

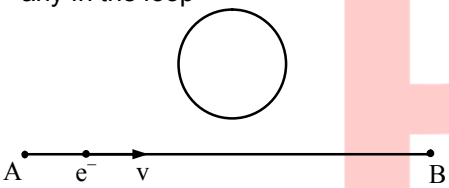
(SECTION A)

1. Two bar magnets A and B moving with same speed in the given figure. Choose correct statement -



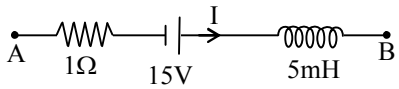
(A) Plate (1) will be positive relative to (2) if A is moving toward left also B is moving toward left
(B) Plate (1) will be positive relative to plate (2) if A is moving toward left and B is moving toward right
(C) Change on capacitor increase if A and B are at rest
(D) None of these

2. An electron moves along the line AB which lies in the same plane as a circular loop of conducting wire as shown in figure. What will be the direction of current induced if any in the loop -



(A) No current will be induced
(B) Induced current will be clockwise
(C) Induced current will be anti clockwise
(D) The current will change direction as the electron passes by

3. The network shown in figure is part of a complete circuit. If at a certain instant the current (I) is 5 A, and decreasing at a rate of 10^3 A/s, then $V_B - V_A$ =



(A) 15 V (B) 10 V
(C) 5 V (D) 20 V

4. An inductor of inductance L = 400 mH and resistors of resistances $R_1 = 2\Omega$ and $R_2 = 2\Omega$ are connected to a battery of emf 12V as shown in the figure. The internal resistance of the battery is negligible. The switch S is closed at t = 0. The potential drop across L as a function of time is –

(A) $6\ e^{-5t}V$ (B) $\frac{12}{t}\ e^{-3t}V$
(C) $6\ [1 - e^{-t/0.2})\ V$ (D) $12\ e^{-5t}V$

5. The flux linked with a coil at any instant 't' is given by $\phi = 10t^2 - 50t + 250$. The induced emf at t = 3 s is –

(A) 10 V (B) 190 V
(C) – 190 V (D) – 10 V

6. Two coaxial solenoids are made by winding thin insulated wire over a pipe of cross-sectional area A = 10 cm^2 and length *l* = 20 cm. If one of the solenoids has 300 turns and the other 400 turns, their mutual-inductance is ($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(A) $2.4\ \pi \times 10^{-5}$ H (B) $4.8\ \pi \times 10^{-4}$ H
(C) $4.8\ \pi \times 10^{-5}$ H (D) $2.4\ \pi \times 10^{-4}$ H

7. The self inductance of the motor of an electric fan is 10 H. In order to impart maximum power at 50 Hz, it should be connected to a capacitance of –

(A) 4μF (B) 8μF
(C) 1μF (D) 2μF

8. A metal conductor of length 1 m rotates vertically about one of its ends at angular velocity 5 radians per second. If the horizontal component of earth's magnetic field is 0.2×10^{-4}T, then the e.m.f. developed between the two ends of the conductor is –

(A) 5 μV (B) 50 μV
(C) 5 mV (D) 50 mV

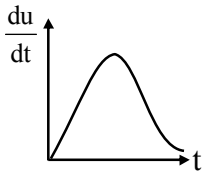
9. A coil of inductance 300 mH and resistance 2Ω is connected to a source of voltage 2 V. The current reaches half of its steady state value in-

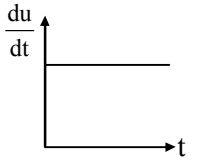
(A) 0.05 s (B) 0.1 s
(C) 0.15 s (D) 0.3 s

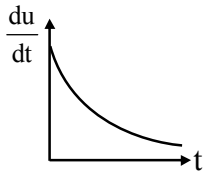
10. A coil of inductance 8.4 mH and resistance 6Ω is connected to a 12V battery. The current in the coil is 1.0 A at approximately the time –

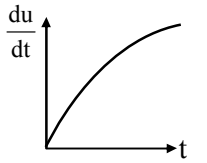
(A) 500s (B) 20s
(C) 35 ms (D) 1 ms

11. Rate of increment of energy in an inductor with time in series LR circuit getting charge with battery of e.m.f. E is best represented by :
[inductor has initially zero current]

(A) 

(B) 

(C) 

(D) 

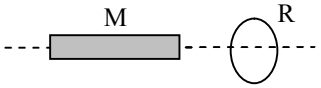
12. A current I = 10 sin(100π t) amp. is passed in first coil, which induces a maximum e.m.f of 5π volt in second coil. The mutual inductance between the coils is -
(A) 10 mH (B) 15 mH
(C) 25 mH (D) 5 mH

13. A superconducting loop of radius R has self inductance L. A uniform and constant magnetic field B is applied perpendicular to the plane of the loop. Initially current in this loop is zero. The loop is rotated by 180º. The current in the loop after rotation is equal to -

(A) zero (B) $\frac{B\pi R^2}{L}$

(C) $\frac{2B\pi R^2}{L}$ (D) $\frac{B\pi R^2}{2L}$

14. A conducting ring R is placed on the axis of a bar magnet M. The plane of R is perpendicular to this axis, M can move along this axis.



(A) M will repel R when it is moving towards R
(B) M will attract R when it is moving towards R
(C) M will repel R when moving towards as well as away from R
(D) M will attract R when moving towards as well as away from R

15. A coil has 200 turns and area of 70 cm^2. The magnetic field perpendicular to the plane of the coil is 0.3 Wb/m^2 and take 0.1 sec to rotate through 180°. The value of the induced e.m.f. will be -
(A) 8.4 V (B) 84 V
(C) 42 V (D) 4.2 V

16. As a result of change in magnetic flux linked to the closed loop shown in Fig., an emf V volt is induced in the loop. The work done in taking a charge Q coulomb once along the loop is –

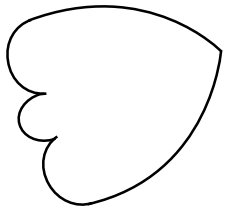
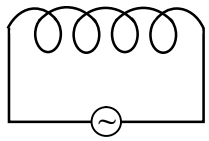


Fig.

(A) QV (B) 2QV
(C) QV/2 (D) Zero

17. If a Bismuth rod is introduced in the air coil as shown then current in the coil –



V = 10 sin ωt
Fig.

(A) increases
(B) remains unchanged
(C) decreases
(D) None of these

18. Find the steady state current through L_1 in the Fig. –

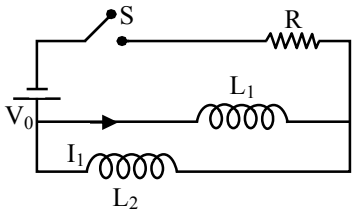


Fig.

(A) $\frac{V_0}{R}$ (B) $\frac{V_0L_1}{R(L_1+L_2)}$

(C) $\frac{V_0L_2}{R(L_1+L_2)}$ (D) None of these

19. A square wire frame of side a is placed a distance b away from a long straight conductor carrying current I. The frame has resistance R and self inductance L. The frame is rotated by 180º about OO′ as shown in Fig. Find the electric charge flown through the frame –

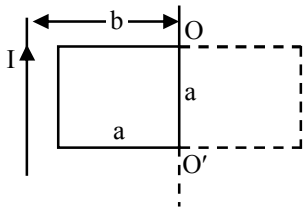


Fig.

(A) $\frac{2\mu_0 ia^2}{2\pi Rb}$

(B) $\frac{\mu_0 i}{2\pi R}\log_e\frac{b+a}{b-a}$

(C) $\frac{\mu_0 ia}{2\pi R}\log_e\frac{b+a}{b-a}$

(D) None of these

20. A short circuited coil is placed in a time varying magnetic field. Electrical power is dissipated due to the current induced in the coil. If the number of turns were to be quadrupled and the wire radius halved, the electrical power dissipated would be –

(A) halved (B) the same

(C) doubled (D) quadrupled

(SECTION B)

21. A long solenoid of radius 2 cm has 100 turns/cm and is surrounded by a 100 turn coil of radius 4 cm having a total resistance 20Ω. If current changes from 5 A to – 5A, the charge through galvanometer is $n \times 10^2$ μC. find the value of n.

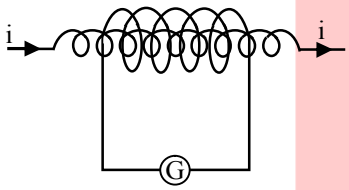
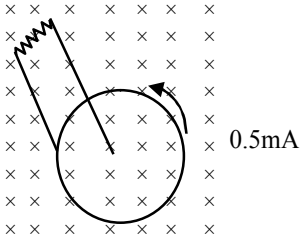


Fig.

22. A flux of 1m Wb passes through a strip having an area A = 0.02 m^2. The plane of the strip is at an angle of 60º to the direction of a uniform field B. The value of B is :.....T. (Multiplying your answer with 1000)

23. The following figure shows a conducting disc rotating about its axis in a perpendicular magnetic field B. The resistor of resistance R is connected between the centre and the rim. The current (amp) in the resistor is (The radius of the disc is 5.0 cm, angular speed ω = 10 radian/sec., B = 0.40 T and R = 10Ω.) (multiplying your answer by 10)



24. A solenoid has 2000 turns wound over a length of 0.30 m. Its area of cross-section is 1.2×10^{-3} m^2. Around its central section a coil of 300 turns is wound. If an initial current of 2A in the solenoid is reversed in 0.25 sec, the emf induced in the coil $x \times 10^{-2}$ volt. Find the value of x

25. In an inductor of self-inductance L=2 mH, current changes with time according to relation- $I = t^2e^{-1}$
At what time (second) e.m.f. is zero ?

26. A step-down transformer transforms a supply line voltage of 2200 volt into 220 volt. The primary coil has 5000 turns. The efficiency and power transmitted by the transformer are 90% and 8 kilowatt respectively. Then the number of turns in the secondary is -

27. A transformer is used to light 140 watt 24 volt lamp from 240 volt AC mains, the current in the main cable is 0.7 amp. The efficiency (in%) of the transformer is-

28. A step up transformer operates on a 230 volt line and supplies a load of 2 amp. The ratio of primary and secondary windings is 1 : 25. Determine the primary current (amp).

29. The number of turns in a long solenoid is 500. The area of cross-section of solenoid is 2×10^{-3} m^2. If the value of magnetic induction, on passing a current of 2 amp, through it is 5×10^{-3} Tesla, the magnitude of magnetic flux connected with it in Weber will be $n \times 10^{-3}$. Find the value of n.

30. Flux ϕ (in webers) in a closed circuit of resistance 10 ohm varies with time t (in seconds) according to the equation $\phi = 6t^2 - 5t + 1$. What is the magnitude of the induced current in 0.25 second :