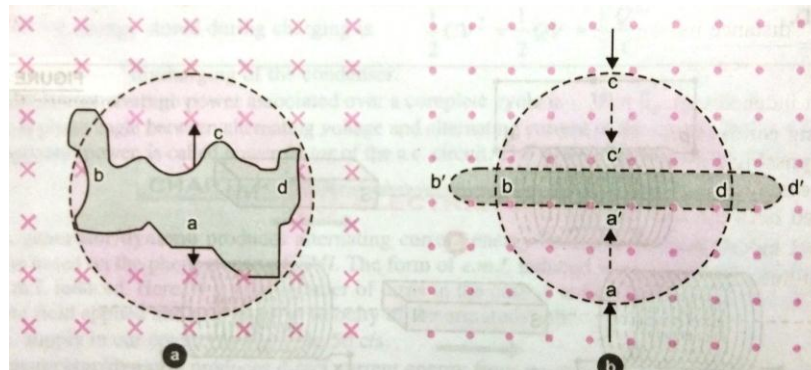


- Section A is of 1 mark questions.
- Section B consist of 5 questions of 2 marks each.
- Section C consists of 5 questions of 3 marks each

SECTION A

1. Lenz's law of electromagnetic induction is as per law of conservation of
 - (a) Energy
 - (b) Angular momentum
 - (c) Charge
 - (d) Electromotive force
2. A loop made of straight edges has six corners at $A(0,0,0)$, $B(L,0,0)$, $C(L,L,0)$, $D(0,L,0)$, $E(0,L,L)$ and $F(0,0,L)$. A magnetic field $B = B_0(\hat{i} + \hat{j})$ T is present in the region. The flux passing through the loop ABCDEFA is
 - (a) B_0L^2
 - (b) $2 B_0L^2$
 - (c) $B_0L^2/2$
 - (d) $4 B_0L^2$
3. A solenoid is connected to a battery so that a steady current flows through it. If an iron core is inserted into the solenoid, The current will
 - (a) Increase
 - (b) Decrease
 - (c) Remain same
 - (d) First increase then decrease
- 4.



In the figures shown,

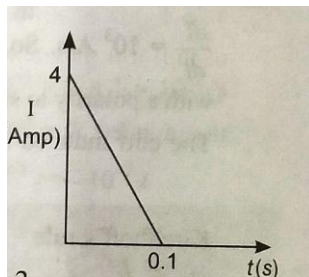
- (a) A wire of irregular shape turning into a circular shape
- (b) A circular loop being deformed into a narrow straight wire.

The direction of induced current in the coils a and b respectively are

- (a) Clockwise in both
- (b) Anticlockwise in both
- (c) Clockwise in a and anticlockwise in b
- (d) anticlockwise in a and clockwise in b

5. While keeping area of cross section of a solenoid same, the number of turns and length of solenoid are both doubled. The self inductance of the coil will be
- (a) halved
 - (b) doubled
 - (c) $\frac{1}{4}$ times the original value
 - (d) Unaffected

6. In a coil of resistance 31.4 ohms, the induced current developed by changing the magnetic flux is shown in graph. The magnitude of change in flux through the coil in weber is



- (a) 8
 - (b) 2
 - (c) 4
 - (d) 6
7. A wire and a rod AB are in the same plane. The rod moves parallel to the wire with a velocity v , then
- (a) End A will be at higher potential
 - (b) End B will be at higher potential
 - (c) No emf will be induced in the coil as rod is moving parallel to the wire
 - (d) No emf will be induced as magnetic field is not changing with time.
8. Which of the following is not an application of Eddy currents?
- (a) Electromagnetic damping
 - (b) AC generator
 - (c) Electric power meters
 - (d) Magnetic brakes in trains

- 9.** To reduce the resonant frequency in an LCR series circuit with a generator
- (a) The generator frequency should be reduced
 - (b) Another capacitor should be added in parallel to the first
 - (c) The iron core of the inductor should be removed
 - (d) Dielectric in the capacitor should be removed
- 10.** As the frequency of an ac circuit increases, the current first increases and then decreases. What combination of circuit elements is most likely to comprise the circuit?
- (a) Inductor and capacitor
 - (b) Resistor and inductor
 - (c) Resistor and capacitor
 - (d) Inductor only
- 11.** The phase difference between the alternating current and emf is $\pi/2$. Which of the following cannot be the constituent of the circuit?
- (a) C alone
 - (b) L alone
 - (c) L and C
 - (d) R and L
- 12.** An ac circuit has a resistance of 12 ohm and impedance of 15 ohm. The power factor of the circuit will be
- (a) 0.8
 - (b) 0.4
 - (c) 0.125
 - (d) 1.25
- 13.** In an LCR circuit, capacitance is changed from C to 2C. for resonant frequency to remain unchanged the inductance should be changed from L to
- (a) 4 L
 - (b) 2L
 - (c) L/2
 - (d) L/4
- 14.** Which quantity is increased in a step down transformer?
- (a) Current
 - (b) Voltage
 - (c) Power
 - (d) Frequency
- 15.** The reactance of a capacitor is X. if both the frequency of ac source and capacitance be doubled, then new reactance will be
- (a) X
 - (b) 4X

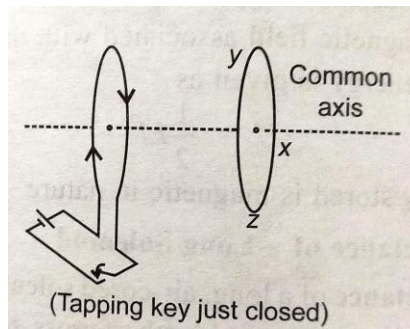
- (c) $2X$
- (d) $X/4$

16. Why is the use of ac voltage preferred over dc voltage?(write 2 points)

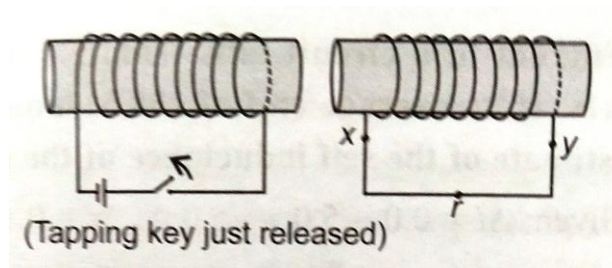
17. The core of any transformer is laminated to.....

18. 1 weber = 10^8 Maxwell. True /false?

19. What is the direction of induced current in the coil?

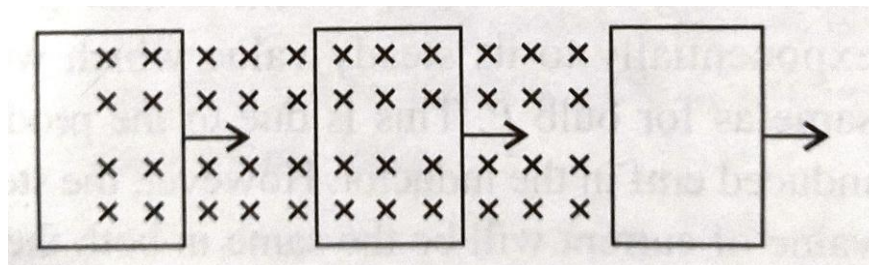


20. What is the direction of induced current in the coil?



SECTION B

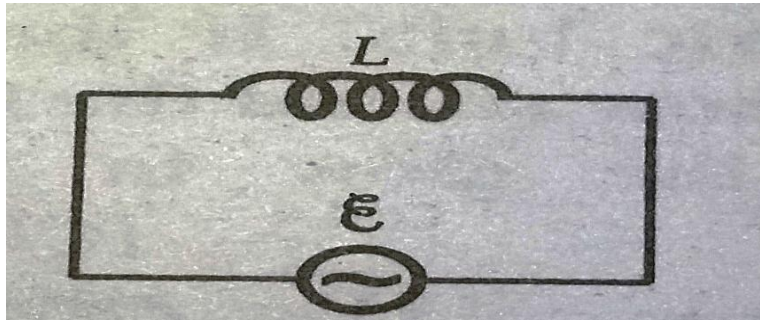
21. A uniform magnetic field exists normal to the plane of the paper over a small region of space.



A rectangular loop of wire is slowly moved with a uniform velocity across the field as shown in figure. Draw the graph showing the variation of

- (a) Magnetic flux linked with the loop and
(b) The induced emf in the loop with time

- 22.** A square loop of side 10 cm and resistance 0.5Ω is placed vertically in the east-west plane. A uniform magnetic field of 0.10 T is set up across the plane in the north-east direction. The magnetic field is decreased to zero in 0.70 s at a steady rate. Determine the magnitudes of induced emf and current during this time-interval.
- 23.** A 1.0 m long metallic rod is rotated with an angular frequency of 400 rad s^{-1} about an axis normal to the rod passing through its one end. The other end of the rod is in contact with a circular metallic ring. A constant and uniform magnetic field of 0.5 T parallel to the axis exists everywhere. Calculate the emf developed between the centre and the ring.
- 24.** A lamp is connected in series with a capacitor. Predict your observations for dc and ac connections. What happens in each case if the capacitance of the capacitor is reduced?
- 25.** In the circuit shown below, what will be the effect on current in the circuit, if:
- Frequency of ac source is increased
 - Frequency of ac source is reduced
 - Number of turns of inductor is increased
 - A soft iron core is introduced



SECTION C

- 26.** Derive an expression for the emf induced in a conductor of length l when it moves at v m/s perpendicular to a uniform magnetic field B .
- A jet plane is travelling towards west at a speed of 1800 km/h. What is the voltage difference developed between the ends of the wing having a span of 25 m, if the Earth's magnetic field at the location has a magnitude of $5 \times 10^{-4} \text{ T}$ and the dip angle is 30° .
- 27.** Define the term 'eddy currents'. State the main undesirable effect of these currents and give the method used to minimize this undesirable effect.
- 28.** Draw a labelled diagram of AC generator. Derive the expression for the instantaneous value of the emf induced in the coil.
- 29.** With the help of a labelled diagram, explain the principle and working of a transformer.

30. A small town with a demand of 800kW of electric power at 220V is situated 15km away from an electric plant generating power at 440V. The resistance of the two wire line carrying power is 0.5Ω per km. The town gets power from the line through a 4000 – 220V step down transformer at a substation in the town.

- (1) Estimate the line power loss,
- (2) How much power must the plant supply,
- (3) Characterize the step up transformer at the plant.



PREPARED BY Er. JITIN K MITTAL ☺ 9818446461, 9213601234

ACADEMICS DIRECTOR, MASTERMIND TUTORIALS