# Additional Conceptual Short Questions with Answers

1. A light metallic ring is released from above into a vertical bar magnet (Fig. Q.15.3). Viewed from above, does current flow clockwise or anticlockwise in the ring?

Ans. The induced current flows clockwise in the ring. (as viewed from above)
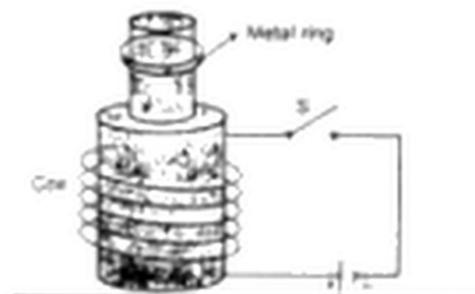
Reason:

When the metallic ring the released, the magnetic flux passing through ring changes and an emf is induced in the ring.

According to Lenz' law, the direction of induced current is such that is opposes the downward motion of ring. It is possible only when the face of ring towards magnet act as north pole. Thus, according to right hand rule, the induced current must be clockwise as seen from above.
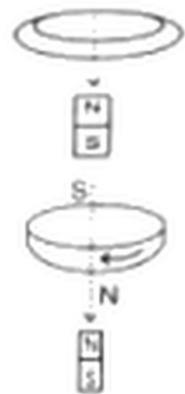
2. When the switch in the circuit is closed a current is established in the coil and the metal ring jumps upward. Why?

Ans. Reason:

When the switch is closed, the current through coil increases from zero to a maximum steady value. So, the magnetic flux through ring is increased which

According the Lenz's law, this induced emf acts to decrease the magnetic flux through ring. That is why ring jumps upward.

3. When the primary of a transformer is connected to a.c mains the current in it.

(a) is very small if the secondary circuit is open, but

(b) increase when the secondary circuit closed. Explain these facts.

Ans. Reason

(a) In a transformer,

power input = power output

OR $V_P I_P = V_S I_S$

If secondary circuit is open then $I_s = 0$

$\Rightarrow$ $V_p I_p \approx 0$

$V_P \neq 0$ therefore $I_p \approx 0$

Reason:

(b) When the secondary circuit is closed, the output power is increased. Since, in a transformer input power is nearly equal to output power. Therefore, input power is also increased.

Now, Power input = $V_p I_p$

V_p = constant, so to increase the input power I_p should be increased.

4. Wearing a metal bracelet in a region of strong magnetic field can be hazardous. Discuss

Ans. If for any reason magnetic field change rapidly, a large emf produce in it. If bracelet is a continuous band, the induced emf would produce induce

5. The inductance coils are made of thick copper wire. Why?

Ans. The thick copper wire has small resistance and hence induced current will be large.

6. Two identical loops, one of copper and another of nichrome are rotated with same speed in a magnetic field. In which case will the induced (a) emf (b) current greater?

Ans. The emf in both the loops will be same but current is different. The current in the loop having small resistance is greater i.e. copper loop.

7. What is physical significance of self-inductance?

Ans. The self-inductance is called the electrical inertia of the coil or circuit just as mass is a measure of inertia in mechanical motion. If inductance is large, the induced emf is high and greater is the opposition to the change in current. To overcome this inertia the coil should be connected to an external voltage source.

8. What happen to the self-inductance of a coil if the number of turns per metre length in it is doubled?

Ans.

$$L = \frac{\mu_0 N^2 A}{l} \quad L = \left(\mu_0 \left(\frac{N}{l} \right)^2 A \right) l$$

$$L = \mu_0 n^2 A l \qquad\qquad (1)$$

When number of turns per metre length is doubled

$$n' = 2n$$

$$L' = \mu_0 n'^2 A l 1$$

$$L' = \mu_0 (2n)^2 A l 1$$

Putting value from eq (1)

L'= 4L

When number of turns per metre length is doubled then self-inductance increases four times.

Self-Assessment Paper 1

Q.No.2 Write Short Answers any SIX of the following questions.

1. Show that $\frac{\Delta\varphi}{\Delta t}$ have the same units as ε

2. Analyze information to explain how inductions used in cook tops in electrical rings

3. Does the induced emf in a circuit depend on the resistance of the circuit? Does the induced current depend on the resistance of the circuit?

4. How electromagnetic brakes works?

5. When an electric motor such as an electric drill, is being used, does it also act as a generator? If so, what is the consequence of this?

6. What are hysteresis and eddy current losses of a transformer?

7. Can an electric motor be used to drive an electric generator with the output from the generator being used to operate the motor?

Q.No.3 Extensive Question.

Q. (a) What is motional emf? Derive its expression, how would the steady current is attained by induced emf?

(b) The current in a coil of 1000 turns placed in the magnetic field of 1 mWb. The coil has 100 turns and galvanometer of 400 ohms is connected in series.

with it. Find the average emf and the current if the coil is removed in 1/10th from the given field of z that?

Self-Assessment Paper 2

Q.No.2 Write Short Answers any SIX of the following questions.

1. In a certain region the earth's magnetic field point vertically down. When plane flies due north, which wingtip is positively charged?

2. How can we reduce the power loses of a transformer?

3. Is it possible to change both the area of the loop and the magnetic field passing through the loop and still not have an induced emf in the loop?

4. State Faraday's law and Lenz's law.

5. Can a step-up transformer increases the power level?

6. What are the different methods for production of induced emf?

7. A suspended magnet is oscillating freely in a horizontal plane. The oscillations are quickly damped out when a metal plate is placed under the magnet. Explain why this occurs?

Q.No.3 Extensive Questions.

Q. (a) Determine the energy stored in an inductor.

(b) When current through a coil changes from 100mA to 200mA in 0.005 s, an induced emf of 40mV is produced in the coil. Find the increase in energy in the stor