



12th Science : Physics  
Electromagnetic induction,

DATE:

TIME: 1 hr

MARKS: 25

SEAT NO:

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**Note:-**

1. All Questions are compulsory.
2. Numbers on the right indicate full marks.

**Section A**

**Q.1 Select and Write the correct answer.**

**(4)**

1. A conductor rod of length ( $l$ ) is moving with velocity ( $v$ ) in a direction normal to a uniform magnetic field ( $B$ ). What will be the magnitude of induced emf produced between the ends of the moving conductor?  
A)  $BLv$                       B)  $BLv^2$   
C)  $\frac{1}{2} Blv$                     D)  $\frac{2Bl}{v}$
2. A current through a coil of self inductance 10 mH increases from 0 to 1 A in 0.1 s. What is the induced emf in the coil?  
A) 0.1 V                      B) 1 V  
C) 10 V                        D) 0.01 V
3. The power loss in a transformer working on 20 V ac supply is 30%. The ratio of primary to secondary current when output voltage is 110 V is  
A) 1 : 2                        B) 2 : 1  
C) 1 : 1                        D) 5 : 7
4. If the magnetic flux linked with the coil of unit area is doubled in 0.2S, the induced emf across the coil is  
A) zero                        B) 2 B  
C) 5 B                         D) 10 B

**Q.2 Answer the following.**

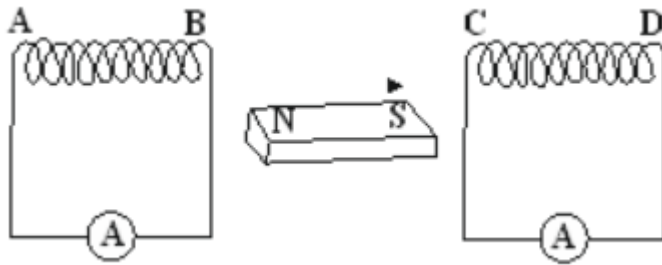
**(3)**

1. Define : Motional e.m.f.
2. What is the force experienced by a moving charge in a magnetic field?
3. Define : Mutual Inductance (M)

**Section B**  
**Attempt any Four**

- Q.3 Mention the factors which affects the mutual inductance between two coils. **(2)**
- Q.4 Mention the factors on which mutual inductances between two coils depends. **(2)**
- Q.5 How to obtain pulsating DC output by making variations in an AC generator? **(2)**

- Q.6 A magnet is moved in the direction indicated by an arrow between two coils AB and CD as shown in figure. Suggest the direction of current in each coil. (2)



- Q.7 A train is moving in the N-S direction with a speed of  $108 \text{ km h}^{-1}$ . Find the amount of emf generated between two wheels, if the length of the axle is 2m. Assume that the vertical component of earth's field is  $8 \times 10^{-5} \text{ Wbm}^{-2}$  (2)

- Q.8 We are rotating a 1 m long metallic rod with an angular frequency of  $400 \text{ rad/s}^{-1}$  with an axis normal to the rod passing through its one end. And on to the other end of the rod it is connected with a circular metallic ring. There exist a uniform magnetic field of 0.5 T which is parallel to the axis everywhere. Find out the emf induced between the centre and the ring. (2)

**Section C**  
**Attempt any Two**

- Q.9 State and explain Lenz's law in the light of principle of conservation of energy. (3)
- Q.10 What do you mean by electromagnetic induction? State the Faraday's laws of electromagnetic induction. (3)
- Q.11 A capacitor of capacitance 6 $\mu\text{f}$  is charged by a 6v battery. The charged capacitor is now connected to an inductor of inductance 2 mH. Find the current in the circuit, when one-third energy stored in the capacitor converts into the energy stored in the inductor. (3)

**Section D**  
**Attempt any One**

- Q.12 How can we overcome the limitation of life-time of a battery in case of electric and hybrid vehicles? (4)
- A pair of adjacent coils has a mutual inductance of 1.5 H. If the current in one coil changes from 0 to 10 A in 0.2 s, what is the change of flux linkage with the other coil?
- Q.13 Show that the self inductance of circuit is numerically equal to twice the work done in establishing the magnetic flux associated with unit current in the circuit. (4)