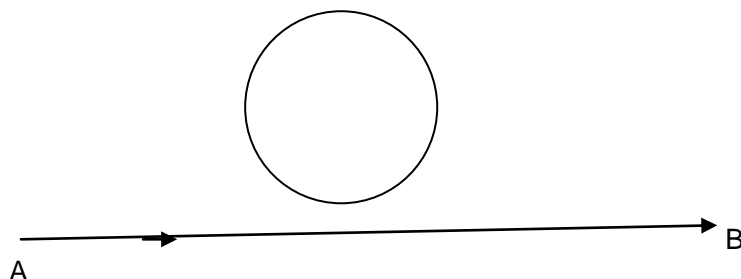
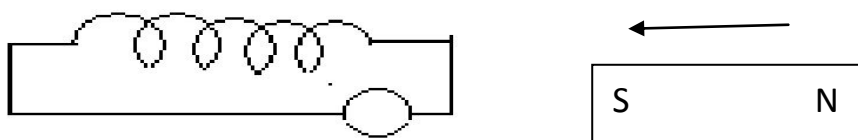


Electromagnetic induction

1. The electromagnetic induction was first discovered by Faraday.
 - (a) . State the laws of electromagnetic induction . 2scores
 - (b) The magnetic flux through a coil perpendicular to its plane is varying according to the relation $= (4 t^3 + 5 t^2 + 8t + 5)$ wb . Calculate the induced current through the coil at time $t = 2s$, if the resistance of the coil is 8.1 ohms. 2scores
2. A current from A to B is increasing in magnitude. What is the direction of induced current, if any in the loop shown in figure. Justify the answer.(2 marks)



3.



- (a). Predict the direction of induced current in the above situation. Score:1
 - (b). Which law is used for this. State the law. Score:1
 - (c). Is the law violates the law of conservation of energy. Explain. Score:1
 - (d). The magnetic flux linked with the coil is given by $\Phi = 4t^2 + 2t + 1$ Weber. What is the magnitude of induced emf when $t=3$ sec. Score:2
4. (a)Derive a relation for energy stored in an inductor carrying current. 2scores
 5. Give the structural differences between a step up and step down transformer. 2
- 6 Select the working principle of the following device from bracket
 a) Choke b) Cyclotron c) speedometer d) Transformer (Eddy current, Gauss theorem, Self induction, mutual induction, Lorentz force)
- (4 × ½ = 2)
7. When a metal sheet moves in a magnetic field the magnetic flux associated with it changes, and a current is induced inside the metal.
 - a) Name the current. (1)
 - b) Why transformer cores are laminated? (1½)
 - c) Flux ϕ in a closed circuit of resistance 12Ω varies with time t as $\phi = 9t^2 + 6t + 3$ milliweber where t is in seconds. Find the emf and current induced in the coil at $t=3s$. (2½)
 8. A boy uses a coil of wire (90m long) without taking it out from the cover (only the ends are taken) to light a bulb from 230V AC mains. Then he took it out, unwound it and again lighted the bulb.
 - (a) What difference does he observe?

- (b) Name the phenomenon in the first case.
- (c) Obtain the expression for its coefficient. (3)

7.

Transformer helps to step up or step down ac voltage.

- a. Draw a diagram of a step down transformer showing primary and secondary coils. (1½)

ഒരു step down ട്രാൻസ്ഫോർമറിന്റെ ചിത്രം വരയ്ക്കുക.

- b. Name the common energy losses in a transformer. (1½)

ഒരു ട്രാൻസ്ഫോർമറിൽ സാധാരണ സംഭവിക്കുന്ന ഊർജ്ജനഷ്ടങ്ങൾ ഏവ?

10. Whenever the magnetic flux linked with a closed circuit changes an emf is induced in the circuit.

Ac is passed through a capacitor and bulb connected in series.

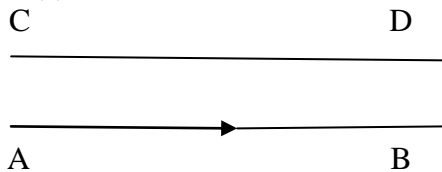
- (a) What happens to the brightness of the bulb when frequency of ac is increased?
- (b) What happens to the brightness of the bulb when an iron core is introduced into the coil?
- (c) Obtain an expression for current through a series L C R circuit analytically. Also find the values of impedance and phase angle? (2+1+3=6scores)

11. The working principle of a transformer is mutual induction

- a. Write any two energy losses in transformer. 1
- b. Write the expression for efficiency of a transformer.
- c. Write the relation between voltage and number of turns in a transformer. 1

12. What is the direction of induced current in a conductor CD if current from A to B

- (a) increases (b) decreases (c) remains constant



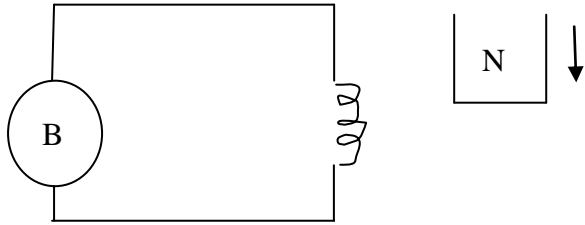
13. The teacher gave a coil of 30 turns to Seema and another coil of 15 turns to Nila and asked them to introduce a magnet in to the quickly and observe the effect.

- a) What is the effect ? (1)
- b) What is the advantage of having more turns to the coil ? (1)
- c) Why is the magnet moved quickly ? (1)

14.. When a metallic block moves in a magnetic field, induced currents are developed in the body of the block.

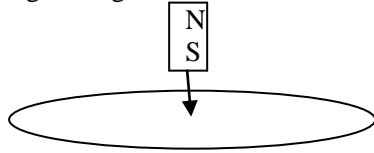
- a) Name the current induced. (½)
- b) This current finds its advantage in certain instruments. Name any 2 such instruments (1)
- c) Which law gives the direction of such currents? State the law. (1)
- d) Is the strength of such an induced current large or small? Justify your answer. (1)

15.



- (a) How the brightness of the bulb can be increased?
(b) State the laws associated with the above phenomenon. (1+2=3)

16. A bar magnet is falling through a ring. Write the direction of current in the ring when the magnet is



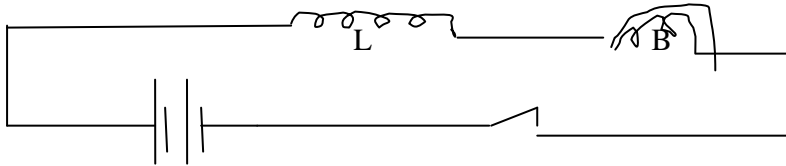
- (a) above the ring [½]
(b) below the ring [½]

17. (a) Define Faraday's laws of electromagnetic induction. [1]

- (b) Explain the working of an AC generator arrive at an expression for the maximum voltage generated. [2]

18. Why Eddy current is undesirable in the core of the transformer (1)

19. Figure shows a light bulb (B) and inductor (L) connected to a battery through a switch.



- a) The bulb will glow only after a short delay when switch is closed. Explain why?
b) How will glow change when battery is replaced by an ac source of rms voltage equal to voltage of dc battery?
c) Insert a soft iron core into the inductor when it is connected to ac. Comment about the change in glow.
d) How voltage and current through inductor related when ac flows through it? (1+2+1+1=5)

OR

20. p) A lamp is connected in series with a capacitor to a source. Predict your observations for dc and ac source?
q) Show that the current passing through capacitor leads voltage by $\pi/2$ when it is connected to ac?
r) Explain how eddy current can be minimized? (2+2+1=5)

21. The primary and secondary coils of transformer are not connected together.

- a).How is electrical energy transferred from primary to secondary?
b) Can we transform DC voltage using transformers? (1+1=2)

22. (a) What are eddy currents?

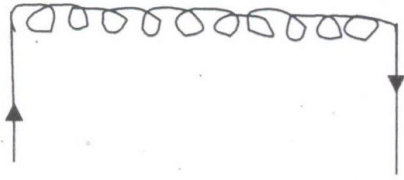
- (b) Explain the purpose of lamination in transformers
(c) Comment on the major energy losses in transformers. (1+1+1)

23. Transformers use laminations of metal as their cores. Why?

24. a)Obtain the expression for magnetic energy stored in a solenoid in terms of magnetic field.(2)

- b) Compare this magnetic energy with that of electrostatic energy stored in a capacitor. (2)

25.



- (a) Identify the name of the above device (Score: 1)
(b) If the current through the device is increased as well as decreased, what happens? (Score: 1)
(c) State and explain the laws relating to it. (Score: 2)

OR

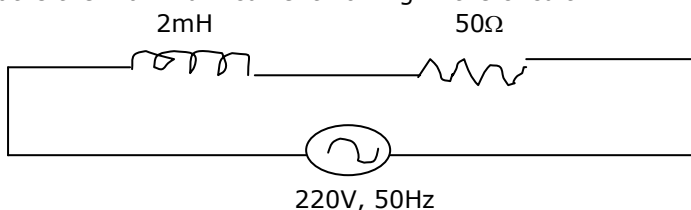
Transformer is an electrical device used for changing the voltage of AC.

- (a) Name the various losses in a transformer. (Score: 1)
(b) What do you mean by watt less (Score: 1 ½)
(c) Why choke coil is preferred in fluorescent lamps than a rheostat (Score: 1½)

(Total Score: 4)

26. (a) In which case an emf is induced across the ends of an axle of a train if it moves along
1) N → S ; 2) E → W ? [2]
(b) How eddy currents are produced? Mention some of its applications? [2]
(c) When a current flows in the coil of a transformer, then why does its core becomes hot? [1]
27. The energy stored in an inductance is 1 J when a current of 1 A is established in it. The self inductance of the coil is (a) 200 H (b) 20 H (c) 25 H (d) 2.59 H (1/2 score)
29. a) Each one of the following changes will increase the emf in a simple generator **except**
A] Increasing the number of turns
B] Winding of the coil on a soft iron armature
C] Increasing the size of the gap in which the armature turns
D] Increasing the speed of rotation
E] Using a stronger field magnet
b) A metallic loop is placed in a non uniform magnetic field. Will an emf be induced in the loop? Why?
c) The flux of magnetic field through a closed conducting loop changes with time according to the relation $\phi = at^2 + bt + c$.
i) Write SI units of a, b and c
ii) If magnitudes of a, b and c are 0.20, 0.40 and 0.60 respectively, find the induced emf at $t=2s$ [1+ 1 + 2]

30. a) What is the maximum current flowing in the circuit?



- b) A transformer has 50 turns in the primary and 100 in the secondary. If the primary is connected to a 220 V DC supply, what will be the voltage across the secondary? [2 + 1]