

LAXMI INTERNATIONAL SCHOOL -- SRI BHARADWAJ Edu Genea

Department of PHYSICS

UNIT IV (ELECTROMAGNETIC INDUCTION & ALTERNATING CURRENTS)

Electromagnetic Induction

1. What is electromagnetic induction? State and explain Faraday's laws of electromagnetic induction.
2. State and explain Lenz's law. Show that this law is in accordance with the law of conservation of energy.
3. Derive an expression for induced e.m.f. developed in a conductor of length l moving with velocity v normal to a uniform magnetic field of strength B
4. Explain the phenomenon of self induction. Derive an expression for self induction of a long solenoid.
5. Explain the phenomenon of mutual induction. Derive an expression for coefficient of mutual inductance between two long solenoids.
6. What are eddy currents? Give five useful applications of eddy currents.
7. What are eddy currents? Explain how these are minimised. Give three useful applications of eddy currents.
8. Give two alternate definitions of (i) self inductance of a coil (ii) mutual inductance of two coils.
9. Two coils of self inductances L_1 and L_2 are connected in series. If current in them flows in the same sense and they have a mutual inductance M , what is their equivalent inductance?

Alternating Currents

10. What is meant by average value of an alternating current? Derive an expression for average value of a.c. over the half cycle.
11. Define root mean square value of alternating current. Derive an expression for the root mean square value of alternating current.
12. An a.c. voltage $E=E_0 \sin \omega t$ is applied across an inductor L . Obtain the expression for current and power absorbed

(or)

Find the phase relation between current and e.m.f. if an a.c. circuit contains a pure inductor. Prove that a high frequency a.c. cannot pass through a pure inductor.

13. An a.c. voltage $E=E_0 \sin \omega t$ is applied across a pure capacitor. Obtain the expression for current and power absorbed

(or)

Find the phase relation between current and e.m.f. if an a.c. circuit contains a pure capacitor. Prove that a d.c. cannot pass through a capacitor.

14. Find the expression for (i) current (ii) power absorbed in an a.c. R - L series circuit.
15. Find the expression for (i) current (ii) power absorbed in an a.c. R - C series circuit.
16. What is impedance triangle? What is its importance? Draw impedance triangle for an a.c. R - L series circuit.
17. An a.c. voltage $E = E_0 \sin \omega t$ is applied to a series combination of R, L and C. Using phasor diagram, find expression for (i) impedance of the circuit (ii) phase angle between circuit current and applied alternating e.m.f.
18. What is electrical resonance? Derive an expression for the frequency of a series resonant circuit. What is Q factor of this circuit?
19. Derive expression for power absorbed in (i) a pure resistor (ii) pure inductance.
20. Derive an expression for power absorbed in LCR series circuit connected to a.c. supply.

Transformer and Generator

21. Derive an expression for the e.m.f. produced in a coil rotating with a constant angular velocity in a uniform magnetic field.
22. Explain the principle, construction and working of an a.c. generator.
23. Explain the principle, construction and working of a transformer.
24. Explain the uses of a transformer.

UNIT V (ELECTROMAGNETIC WAVES)

1. State and explain Maxwell's modification of Ampere's law. (or)

What is displacement current? Show that the conduction and displacement currents are individually discontinuous but their sum is continuous.

2. What is an electromagnetic wave? Show that electromagnetic waves are transverse in nature.
3. What do you understand by electromagnetic waves? Give their properties
4. Find the relation for the velocity of electromagnetic waves. (or)

Prove that for a electromagnetic wave (i) $E_0 = cB_0$ (ii) $c = 1/\mu_0 \epsilon_0$

5. Explain Hertz experiment for the generation of electromagnetic waves.
6. Name the parts of an electromagnetic spectrum giving their frequency range and source of production in each case.

7. Give three uses of (i) X - rays (ii) Microwaves (iii) Ultraviolet rays (iv) radio waves (v) infrared rays
8. State the uses of electromagnetic waves.