CHAPTER-7
Alternating Current
ASSIGNMENT-1

MULTIPLE CHOICE QUESTION

Q1.Power delivered by the source of the circuit becomes maximum, when

(a) $\omega L = \omega C$ (b) $\omega L = 1/\omega C$ (c) $\omega L = -(1/\omega C)^2$ (d) $\omega L = \sqrt{\omega C}$

Q2. The power factor of LCR circuit at resonance is

(a) 0.707 (b) 1 (c) Zero (d) 0.5

Q3. The phase difference between the current and voltage of LCR circuit in series combination at resonance is

(a) 0 (b) $\pi / 2$ (c) π (d) $-\pi$

Q4. What will be the phase difference between virtual voltage and virtual current, when the current in the circuit is wattless

(a) 90° (b) 45° (c) 180° (d) 60°

Assertion Reasoning Question:

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

(c) If assertion is true but reason is false.

(d) If the assertion and reason both are false

Q5. **Assertion** : A bulb connected in series with a solenoid is connected to ac source. If a soft iron core is introduced in the solenoid, the bulb will glow brighter.

Reason : On introducing soft iron core in the solenoid, the inductance decreases.

Q6. Which of the following is constructed on the principle of electromagnetic induction:

(a) Galvanometer (b) a.c. generator (c) Generator (d) Voltmeter

Q7. A transformer is based on the principle of

(a) Mutual inductance (b) Self-inductance (c) Ampere's law (d) Lenz's law

Q8. A transformer is employed to

(a) Obtain a suitable dc voltage (b) Convert dc into ac

(c) Obtain a suitable ac voltage (d) Convert ac into dc

Q9. Quantity that remains unchanged in a transformer is

(a) Voltage (b) Current (c) Frequency (d) None of above

Q10. **Assertion**: Soft iron is used as a core of transformer.

Reason: Area of hysteresis is loop for soft iron is small

SHORT ANSWER TYPE I (2MARKS EACH)

Q11.What is wattless current?

Q12.Mention the two characteristic properties of the material suitable for making core of a transformer.

Q13.A generator developed an emf of 120V and has terminal potential difference of 115V, when the armature current is 25A. What is the resistance of armature?

SHORT ANSWER TYPE II (3MARKS EACH)

Q14.A circuit is set up by connecting inductance L = 100 mH, resistor R = 100 Ω and a capacitor of reactance 200 Ω in series. An alternating emf of $150\sqrt{2}$ V, $500/\pi$ Hz is applied across this series combination. Calculate the power dissipated in the resistor.

LONG ANSWER TYPE (5MARKS EACH)

Q15. (a) What is impedance?

(b) A series LCR circuit is connected to an ac source having voltage $V = V_0 \sin \omega t$. Derive expression for the impedance, instantaneous current and its phase relationship to the applied voltage. Find the expression for resonant frequency.

Q16. Explain with the help of a labelled diagram, the principle and working of an ac generator. Write the expression for the emf generated in the coil in terms of speed of rotation. Can the current produced by an ac generator be measured with a moving coil galvanometer?

Q17. Describe briefly, with the help of a labelled diagram, the basic elements of an ac generator. State its underlying principle. Show diagrammatically how an alternating emf is generated by a loop of wire rotating in a magnetic field. Write the expression for the instantaneous value of the emf induced in the rotating loop.

Q18. State the working of ac generator with the help of a labelled diagram. The coil of an ac generator having N turns, each of area A, is rotated with a constant angular velocity ω. Deduce the expression for the alternating emf generated in the coil. What is the source of energy generation in this device?

Q19. (a) Describe briefly, with the help of a labelled diagram, the working of a step-up transformer.

(b) Write any two sources of energy loss in a transformer.

(c) A step-up transformer converts a low voltage into high voltage. Does it not violate the principle of conservation of energy? Explain.

CASE STUDY TYPE (4 MARKS EACH)

Q20. When electric power is transmitted over great distances, it is economical to use a high voltage and a low current to minimize the I^2R loss in the transmission lines. Consequently, 350-kV lines are common, and in many areas even higher-voltage (765-kV) lines are under construction. At the receiving end of such lines, the consumer requires power at a low voltage (for safety and for efficiency in design). Therefore, a device is required that can change the alternating voltage and current without causing appreciable changes in the power delivered. The ac transformer is that device. In its simplest form, the ac transformer consists of two coils of wire wound around a core of iron. The coil on the left, which is connected to the input alternating voltage source and has N1 turns, is called the primary winding (or the primary). The coil on the right, consisting of N 2 turns and connected to a load resistor R, is called the secondary winding (or the secondary). The purpose of the iron core is to increase the magnetic flux through the coil and to provide a medium in which nearly all the flux through one coil passes through the other coil. Eddy current losses are reduced by using a laminated core. Iron is used as the core material because it is a soft ferromagnetic substance and hence reduces hysteresis losses. Typical transformers have power efficiencies from 90% to 99%. In the discussion that follows, we assume an ideal transformer, one in which the energy losses in the windings and core are zero.

1. Name the different types of losses involve in transformer.
2. How to minimise eddy current losses in transformer?
3. What cause the Hysteresis loss?
4. Which type of transformer used at the receiving end?