Chapter 7

Alternating Current

(Assertion and Reason Questions)

Directions: Each of these questions contain two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.

(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion

(c) Assertion is correct, reason is incorrect

(d) Assertion is incorrect, reason is correct.

Q.1. Assertion: In series LCR resonance circuit, the impedance is equal to the ohmic resistance.
Reason: At resonance, the inductive reactance exceeds the capacitive reactance.

Q.2. Assertion: A capacitor is connected to a direct current source. Its reactance is infinite.
Reason: Reactance of a capacitor is given by $\chi_c = 1/\omega C$.

Q.3. Assertion: Average value of ac over a complete cycle is always zero.
Reason: Average value of ac is always defined over half cycle.

Q.4. Assertion: The alternating current lags behind the emf by a phase angle of, $\pi/2$ when AC flows through an inductor.
Reason: The inductive reactance increases as the frequency of AC source increases.

Q.5. Assertion: The inductive reactance limits amplitude of the current in a purely inductive circuit.
Reason: The inductive reactance is independent of the frequency of the current.

Q.6. Assertion: The power is produced when a transformer steps up the voltage.
Reason: In an ideal transformer VI = constant.

Q.7. Assertion: A capacitor blocks direct current in the steady state.
Reason: The capacitive reactance of the capacitor is inversely proportional to frequency f of the source of emf.

Q.8. Assertion: The voltage and current in a series AC circuit are given by $V = V_0 \sin\omega t$ and $i = i_0 \cos\omega t$. The power dissipated in the circuit is zero.
Reason: Power in AC circuit is given by $P = V_0 I_0 \cos\Phi / 2$

Q.9. Assertion: In a purely inductive or capacitive circuit, the current is referred to as wattless current.
Reason: No power is dissipated in a purely inductive or capacitive circuit even though a current is flowing in the circuit.

Q.10. Assertion: The power in an ac circuit is minimum if the circuit has only a resistor.
Reason: Power of a circuit is independent of the phase angle.

Q.11. Assertion: When the frequency of the AC source in an LCR circuit equals the resonant frequency, the reactance of the circuit is zero, and so there is no current through the inductor or the capacitor.
Reason: The net current in the inductor and capacitor is zero.

Q.12. Assertion: A laminated core is used in transformers to increase eddy currents.
Reason: The efficiency of a transformer increases with increase in eddy currents.

Q.13. Assertion: Choke coil is preferred over a resistor to control the current in an

AC circuit.
Reason: Power factor of an ideal inductor is zero.

-x-x-x-

ANSWER KEY

Q.1 : (c) **Q.2 :** (a) **Q.3 :** (b) **Q.4 :** (b)

Q.5 : (c)

Q.6 : (a) Transformer cannot produce power, but it transfer from primary to secondary.

Q.7 : (b) **Q.8 :** (a) **Q.9 :** (a) **Q.10 :** (d)

Q.11 : (d) he currents in capacitor and in inductor are opposite and so net current is zero.

Q.12 : (d) Large eddy currents are produced in non-laminated iron core of the transformer by the induced emf, as the resistance of bulk iron core is very small. By using thin iron sheets as core the resistance is increased. Laminating the core substantially reduces the eddy currents. Eddy current heats up the core of the transformer. More the eddy currents greater is the loss of energy and the efficiency goes down.

Q.13 : (a)