

Objective Questions

(For Complete Chapter)

Multiple Choice Questions (MCQs)

1. The rms current in a circuit connected to a 50 Hz AC source is 15 A. The value of the current $\left(\frac{1}{600}\right)$ s after its value becomes

zero is **CBSE 2021 (Term-I)**

- (a) $\frac{15}{\sqrt{2}}$ A (b) $15\sqrt{2}$ A
(c) $\frac{\sqrt{2}}{15}$ A (d) 8 A

2. In a circuit, the phase difference between the alternating current and the source voltage is $\frac{\pi}{2}$. Which of the following cannot be the element(s) of the circuit?

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- (a) Only C (b) Only L
(c) L and R (d) L or C

3. The impedance of a series L - C - R circuit is

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- (a) $R + X_L + X_C$ (b) $\sqrt{\frac{1}{X_C^2} + \frac{1}{X_L^2} + R^2}$
(c) $\sqrt{X_L^2 - X_C^2 + R^2}$ (d) $\sqrt{R^2 + (X_L - X_C)^2}$

4. When an alternating voltage $E = E_0 \sin \omega t$ is applied to a circuit, a current $I = I_0 \sin\left(\omega t + \frac{\pi}{2}\right)$ flows through it. The average power dissipated in the circuit is

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- (a) $E_{\text{rms}} \cdot I_{\text{rms}}$ (b) $E_0 I_0$
(c) $\frac{E_0 I_0}{\sqrt{2}}$ (d) zero

5. The voltage across a resistor, an inductor and a capacitor connected in series to an AC source are 20 V, 15 V and 30 V, respectively. The resultant voltage in the circuit is **CBSE 2021 (Term-I)**
 (a) 5 V (b) 20 V (c) 25 V (d) 65 V
6. A circuit is connected to an AC source of variable frequency. As, the frequency of the source is increased, the current first increases and then decreases. Which of the following combinations of elements is likely to comprise the circuit?
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 (a) L , C and R (b) L and C
 (c) L and R (d) R and C
7. A $15\ \Omega$ resistor, an 80 mH inductor and a capacitor of capacitance C are connected in series with a 50 Hz AC source. If the source voltage and current in the circuit are in phase, then the value of capacitance is
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 (a) $100\ \mu\text{F}$ (b) $127\ \mu\text{F}$
 (c) $142\ \mu\text{F}$ (d) $160\ \mu\text{F}$
8. A $300\ \Omega$ resistor and a capacitor of $\left(\frac{25}{\pi}\right)\ \mu\text{F}$ are connected in series to a 200 V-50 Hz AC source. The current in the circuit is
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 (a) 0.1 A (b) 0.4 A
 (c) 0.6 A (d) 0.8 A
9. The power factor of a series L - C - R circuit at resonance will be **Delhi 2020**
 (a) 1 (b) zero
 (c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}$
10. The selectivity of a series L - C - R AC circuit is large, when **Delhi 2020**
 (a) L is large and R is large
 (b) L is small and R is small
 (c) L is large and R is small
 (d) $L = R$
11. The core of a transformer is laminated to reduce the effect of **CBSE 2022 (Term-II)**
 (a) flux leakage
 (b) copper loss
 (c) hysteresis loss
 (d) eddy current
12. When power is drawn from the secondary coil of the transformer, the dynamic resistance
 (a) increases
 (b) decreases
 (c) remains unchanged
 (d) changes erratically
13. Transformer is based upon the principle of
 (a) self-induction
 (b) mutual induction
 (c) eddy current
 (d) None of the above
14. The turns ratio of a transformer is given as 2 : 3. If the current through the primary coil is 3 A, thus calculate the current through load resistance.
 (a) 1 A (b) 4.5 A (c) 2 A (d) 1.5 A

Assertion-Reason Questions

Directions (Q. Nos. 15-21) *In the following questions, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below*

- (a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
 (b) If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
 (c) If Assertion is correct but Reason is incorrect.
 (d) If both Assertion and Reason are incorrect.
15. **Assertion** A step-up transformer cannot be used as a step-down transformer.
Reason A transformer works only in one direction. **CBSE 2021 (Term-I)**
16. **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 decreases.
17. **Assertion** When the capacitor is connected to an AC source, it limits or regulates the current, but does not completely prevent the flow of charge.

Reason The capacitor is alternately charged and discharged as the current reverses each half-cycle.

- 18. Assertion** Capacitor serves as a barrier for DC and offers an easy path to AC.

Reason Capacitive reactance is inversely proportional to frequency.

- 19. Assertion** At resonance, power factor of $L-C-R$ series circuit is 1.

Reason At resonance, $X_C = X_L$.

- 20. Assertion** In $L-C-R$ series AC circuit, $X_L = X_C = R$ at a given frequency. When frequency is doubled, the impedance of the circuit is $\frac{\sqrt{13}}{2} R$.

Reason The given frequency is resonance frequency.

- 21. Assertion** Choke coil controls AC as well as DC.

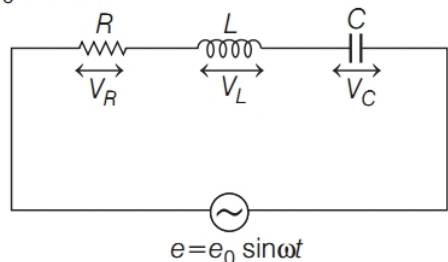
Reason Choke coil works on the principle of electromagnetic induction.

Case Based Questions

Directions (Q.No. 22) These questions are case study based questions. Attempt any 4 sub-parts from each question. Each question carries 1 mark.

22. Resonance

As shown in the following figure, suppose a resistance R , an inductance L and capacitance C are connected in series to a source of alternating emf (e) is given by $e = e_0 \sin \omega t$



$L-C-R$ circuit is said to in the resonance condition when current through it has maximum value. The frequency of AC at which current attains its peak value is called resonance frequency. $L-C-R$ series

resonance circuit is also a voltage amplification circuit because voltages appear across capacitor and inductor are maximum.

- (i) If the value of L and C are increased to double, then the value of resonance frequency becomes
 (a) same (b) half
 (c) one-third (d) one-fourth
- (ii) At resonance, condition of $L-C-R$ series circuit
 (a) $X_L = X_C$ (b) $X_L > X_C$
 (c) $X_L < X_C$ (d) $X_L = \sqrt{X_C}$
- (iii) Power factor of $L-C-R$ series resonance circuit is
 (a) less than 1 (b) more than 1
 (c) zero (d) equal to 1
- (iv) At resonance of series $L-C-R$ circuit, phase difference between voltages developed across capacitor and inductor is
 (a) 0° (b) 90°
 (c) 180° (d) None of these
- (v) Which of the following is/are correct regarding with $L-C-R$ series resonance circuit?
 (a) Phase difference between alternating current and voltage is 0° .
 (b) Resonance can occur at all values of R
 (c) $L-C-R$ series resonance circuit is also called an acceptor circuit
 (d) All of the above