



NEET — JEE MAINS - ADVANCED

Chapter 7 : Alternating Current (50 Important MCQs)

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Notes

50 important MCQs from GSEB, CBSE, NEET and JEE exams · Answer key at the end

Section A — Multiple Choice Questions

Each question carries 1 mark. Choose the correct option.

Q.1 In a transformer, the number of turns in the primary coil is 140 and in the secondary coil 280. If the current in the primary coil is 4 A, the current in the secondary coil is

- (A) 4 A (B) 2 A (C) 6 A (D) 10 A

Q.2 The power factor of an ac circuit having resistance R and inductance L in series, at angular frequency ω , is

- (A) 0 (B) $\frac{R}{\sqrt{R^2 + \omega^2 L^2}}$ (C) $\frac{\omega L}{R}$ (D) $\frac{R}{\omega L}$

Q.3 The core of a transformer is laminated

- (A) to reduce energy losses due to eddy currents (B) to decrease the weight of the transformer
(C) to make the transformer strong and durable (D) to increase the voltage in the secondary winding

Q.4 In an oscillating LC circuit the maximum charge on the capacitor is Q . What will be the charge on the capacitor when the energies stored in the magnetic field and the electric field are equal?

- (A) $\frac{Q}{3}$ (B) $\frac{Q}{\sqrt{2}}$ (C) Q (D) $\frac{Q}{2}$

Q.5 Alternating current cannot be measured by a d.c. ammeter because

- (A) a.c. cannot pass through a d.c. ammeter
(B) a.c. changes direction
(C) the average value of current over a complete cycle is zero
(D) the d.c. ammeter will get damaged

Q.6 In an L–C–R series a.c. circuit, the voltage across each of L , C and R is 50 V. The voltage across the L–C combination will be

- (A) 50 V (B) $50\sqrt{2}$ V (C) 100 V (D) zero

Q.7 The power factor of an a.c. circuit of resistance $12\ \Omega$ and impedance $15\ \Omega$ is

- (A) 1.25 (B) 125 (C) 0.8 (D) 0.4

Q.8 The phase difference between the alternating current and emf is $\pi/2$ rad. Which of the following **cannot** be the constituents of the circuit?

- (A) L, C (B) only L (C) only C (D) R, L

Q.9 The coil of an electric fan motor has an inductance of 10 H. What capacitance should be connected in series so that maximum power is transferred at 50 Hz?

- (A) 1 μF (B) 2 μF (C) 4 μF (D) 8 μF

Q.10 In an L-C-R series circuit at resonance, the p.d. across the resistor is 100 V, $R = 1 \text{ k}\Omega$ and $C = 2 \mu\text{F}$. If the resonant angular frequency is $\omega = 200 \text{ rad/s}$, the p.d. across the inductor at resonance is

- (A) 250 V (B) $4 \times 10^{-3} \text{ V}$ (C) $2.5 \times 10^{-2} \text{ V}$ (D) 40 V

Q.11 A battery drives a steady current through a series R-L circuit. At $t = 0$ the battery is removed from the circuit (by a switch) and the R-L loop is closed on itself. At time $t = L/R$, the ratio of the p.d. across the resistor to that across the inductor is

- (A) 1 (B) -1 (C) $\frac{1-e}{e}$ (D) $\frac{e}{1-e}$

Q.12 In an a.c. circuit, $\varepsilon = 100 \sin 30t$ and $I = 20 \sin \left(30t - \frac{\pi}{4} \right)$. The average power over one period and the (rms) wattless current are

- (A) 50, 10 (B) $\frac{1000}{\sqrt{2}}, 10$ (C) $\frac{50}{\sqrt{2}}, 0$ (D) 50, 0

Q.13 The current in a wire is $I = I_1 \sin \omega t + I_2 \cos \omega t$. The rms value of the current is

- (A) $\frac{(I_1^2 + I_2^2)^{1/2}}{\sqrt{2}}$ (B) $\frac{(I_1^2 + I_2^2)^{1/2}}{2}$ (C) $\frac{(I_1^2 - I_2^2)^{1/2}}{\sqrt{2}}$ (D) $\frac{(I_1^2 - I_2^2)^{1/2}}{2}$

Q.14 A transformer has a 220 V a.c. supply on its primary. Its secondary delivers 60 W to a load with a current of 0.11 A. The transformer is

- (A) step-up (B) step-down (C) auxiliary (D) axial

Q.15 The angular frequency ω is doubled in a purely inductive circuit (same source voltage). The effect on X_L and current i is

- (A) no change (B) both are doubled
(C) X_L is doubled, current is halved (D) X_L is halved, current is doubled

Q.16 In a series LCR circuit, the resistance is increased keeping L and C the same, with the same a.c. source. Which is true?

- (A) Quality factor and bandwidth both increase.
(B) Quality factor and bandwidth do not change.
(C) Quality factor decreases, bandwidth increases.
(D) Quality factor increases, bandwidth does not change.

Q.17 For an a.c. source of 220 V, 50 Hz, the time taken for the current to change from its peak value to its rms value is

- (A) 0.25 ms (B) 25 ms (C) 2.5 ms (D) 2.5 s

Q.18 In a series LCR circuit, $X_L = 10 \Omega$, $X_C = 4 \Omega$ and $R = 6 \Omega$. The power factor is

- (A) 2 (B) $\frac{1}{2}$ (C) $\sqrt{2}$ (D) $\frac{1}{\sqrt{2}}$

Q.19 The rms value of the conduction current in a parallel plate capacitor is 6.9 μA . If it is connected to a 230 V a.c. supply of angular frequency 600 rad/s, its capacitance is

- (A) 5 pF (B) 50 pF (C) 100 pF (D) 200 pF

Q.20 The current in an a.c. circuit is $I = 5 \sin 120\pi t$ A. How long will the current take to reach the peak value starting from zero?

- (A) $\frac{1}{60}$ s (B) 60 s (C) $\frac{1}{120}$ s (D) $\frac{1}{240}$ s

Q.21 A capacitor of $150.0 \mu\text{F}$ is connected to an alternating source $E = 36 \sin (120\pi t)$ V. The maximum current in the circuit is approximately

- (A) 2 A (B) $\frac{1}{\sqrt{2}}$ A (C) $\sqrt{2}$ A (D) $2\sqrt{2}$ A

Q.22 In a series LR circuit with $X_L = R$, the power factor is P_1 . If a capacitor with $X_C = X_L$ is added, the power factor becomes P_2 . The ratio $P_1 : P_2$ is

- (A) 1 : 3 (B) 1 : $\sqrt{2}$ (C) 1 : 1 (D) 1 : 2

Q.23 In an a.c. circuit, $V = 100 \sin (100t)$ V and $I = 100 \sin \left(100t + \frac{\pi}{3}\right)$ mA. The average power dissipated in one cycle is

- (A) 5 W (B) 10 W (C) 2.5 W (D) 25 W

Q.24 A capacitor of $100 \mu\text{F}$ is charged to 12 V and connected to a 6.4 mH inductor to produce oscillations. The maximum current in the circuit would be

- (A) 3.2 A (B) 1.5 A (C) 2.0 A (D) 1.2 A

Q.25 A charged $30 \mu\text{F}$ capacitor is connected to a 27 mH inductor. The frequency of oscillation is _____ Hz.

- (A) 613.8 (B) 176.9 (C) 267.4 (D) 111.1

Q.26 In an LCR circuit, power is dissipated

- (A) in all of the resistor, capacitor and inductor (B) only in the capacitor
(C) only in the inductor (D) only in the resistor

Q.27 A charged $25 \mu\text{F}$ capacitor is connected to a 10 mH inductor. The angular frequency of free oscillation of the circuit is

- (A) 2000 rad/s (B) 200 rad/s (C) 2.2×10^3 rad/s (D) 0.24 rad/s

Q.28 A power transmission line feeds input power at 2300 V to a step-down transformer with 5000 turns in its primary. What should be the number of turns in the secondary to get output at 230 V?

- (A) 400 (B) 600 (C) 500 (D) 2300

Q.29 The Q-factor of a series LCR circuit is given by

- (A) $\frac{1}{R}\sqrt{\frac{C}{L}}$ (B) $\frac{1}{R}\sqrt{\frac{L}{C}}$ (C) $\frac{L}{R}\sqrt{\frac{1}{C}}$ (D) $\frac{R}{L}\sqrt{\frac{1}{C}}$

Q.30 The inductive reactance of an inductor is

- (A) $\frac{1}{\omega L}$ (B) ωC (C) $\frac{1}{\omega C}$ (D) ωL

Q.31 If P_o is the output power and P_i the input power of a real step-up transformer, then

- (A) $P_o = \sqrt{2} P_i$ (B) $P_o > P_i$ (C) $P_o < P_i$ (D) $P_o = P_i$

Q.32 For a series LCR circuit with $L = 2.0$ H, $C = 32 \mu\text{F}$ and $R = 10 \Omega$, the Q value is

- (A) 40 (B) 395 (C) 279 (D) 25

Q.33 The maximum voltage of an a.c. supply is 300 V. Its rms value is _____ V.

- (A) 173 (B) 212 (C) 270 (D) 420

Q.34 In an LC oscillator, at what time (starting with the capacitor fully charged) are the energies in the capacitor and in the inductor equal for the first time?

- (A) $\frac{T}{8}$ (B) $\frac{T}{4}$ (C) $\frac{T}{2}$ (D) T

Q.35 A pure inductor of 50.0 mH is connected to a 220 V, 50 Hz source. The rms current in the circuit is

- (A) 28 A (B) 7 A (C) 14 A (D) 21 A

Q.36 A pure inductor of 25.48 mH and a pure resistor of $8\ \Omega$ are connected in series with an a.c. source of 50 Hz. The phase difference between the current and voltage is

- (A) 45° (B) 30° (C) 60° (D) 90°

Q.37 A charged 10 μF capacitor is connected to a 16 mH inductor. The angular frequency of free oscillations is

- (A) 1111 rad s^{-1} (B) 25 rad s^{-1} (C) 250 rad s^{-1} (D) 2500 rad s^{-1}

Q.38 For an ideal transformer, if $N_s > N_p$, then

- (A) $V_s < V_p$ (B) $V_s > V_p$ (C) $V_s = V_p$ (D) none of these

Q.39 For a series LCR circuit with $L = 25\ \text{mH}$, $R = 3\ \Omega$ and $C = 62.5\ \mu\text{F}$, the resonant frequency of the source is

- (A) 127.39 Hz (B) 100 Hz (C) 35.40 Hz (D) 21 Hz

Q.40 A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit with $R = 3\ \Omega$, $L = 25.48\ \text{mH}$ and $C = 796\ \mu\text{F}$. At resonance, the impedance of the circuit is

- (A) $15\ \Omega$ (B) $5\ \Omega$ (C) $3\ \Omega$ (D) $4\ \Omega$

Q.41 A capacitor of capacitance C is connected to a d.c. source. The reactance of the capacitor is

- (A) zero (B) high (C) low (D) infinite

Q.42 For an a.c. given by $I = 50 \cos (100t + 45^\circ)$ A, the rms value is

- (A) $50\sqrt{2}$ A (B) $25\sqrt{2}$ A (C) 25 A (D) zero

Q.43 In an a.c. circuit the current is 3 A, the voltage 210 V and the power 63 W. The power factor is

- (A) 0.09 (B) 0.10 (C) 0.08 (D) 0.11

Q.44 For an LCR circuit, the resonant frequency is 5000 Hz and the frequencies at the half-power points are 4950 Hz and 5050 Hz. The Q-factor is

- (A) 100 (B) 0.02 (C) 50 (D) 0.01

Q.45 In an a.c. circuit having only a capacitor, the current

- (A) lags behind the voltage by $\pi/2$ (B) leads the voltage by $\pi/2$
(C) leads the voltage by π (D) lags behind the voltage by π

Q.46 An electric current has a d.c. component of 8 A and an a.c. component $I = 6 \sin \omega t$ A. The rms value of the resultant current is

- (A) 8.05 A (B) 9.05 A (C) 11.58 A (D) 13.58 A

Q.47 A lamp consumes only 50% of the maximum power in an a.c. circuit. The phase difference between the applied voltage and the circuit current is

- (A) $\frac{\pi}{6}$ rad (B) $\frac{\pi}{3}$ rad (C) $\frac{\pi}{4}$ rad (D) $\frac{\pi}{2}$ rad

Q.48 In a series LCR circuit, the p.d. across the resistor, inductor and capacitor is 10 V each. When the capacitor is short-circuited, the p.d. across the inductor will be

- (A) 10 V (B) $10\sqrt{2}$ V (C) $\frac{10}{\sqrt{2}}$ V (D) 20 V

Q.49 If the frequency of the voltage supplied to an RL series circuit is ν , the impedance of the circuit is

- (A) $\sqrt{R^2 + (2\pi\nu L)^2}$ (B) $R^2 + (2\pi\nu^2)^2$ (C) $\sqrt{R^2 + L\pi\nu^2}$ (D) $R^2 + (2\pi\nu)^2$

Q.50 In an ideal transformer, the turns ratio is $\frac{N_p}{N_s} = \frac{1}{2}$. The ratio $V_s : V_p$ is

- (A) 1 : 1 (B) 1 : 4 (C) 1 : 2 (D) 2 : 1



Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	11	B	21	A	31	C	41	D
2	B	12	B	22	B	32	D	42	B
3	A	13	A	23	C	33	B	43	B
4	B	14	A	24	B	34	A	44	C
5	C	15	C	25	B	35	C	45	B
6	D	16	C	26	D	36	A	46	B
7	C	17	C	27	A	37	D	47	B
8	D	18	D	28	C	38	B	48	C
9	A	19	B	29	B	39	A	49	A
10	A	20	D	30	D	40	C	50	D

