

JEE MAIN ALTERNATING CURRENT — PYQS

Max. Marks: 68

Questions: 17

Section A (MCQ) — 10 questions

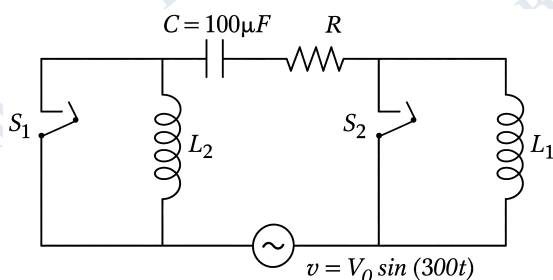
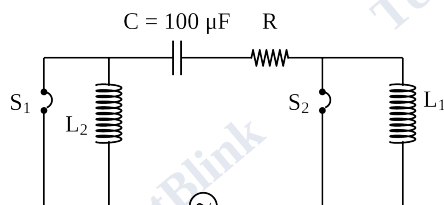
- Q.1** A LCR series circuit driven with $E_{\text{rms}} = 90 \text{ V}$ at frequency $f_d = 30 \text{ Hz}$ has resistance $R = 80 \Omega$, an inductance with inductive reactance $X_L = 20.0 \Omega$ and capacitance with capacitive reactance $X_C = 80.0 \Omega$. The power factor of the circuit is _____. [JEE Main 2026 (Online) 6th April Morning Shift]
- (1) 0.8 (2) 0.64 (3) 0.9 (4) 0.5

 Scan or tap for the
full solution


- Q.2** An a.c. source of angular frequency ω is connected across a resistor R and a capacitor C in series. The current is observed as I . Now the frequency of the source is changed to $\omega/4$, (keeping the voltage unchanged) the current is found to be $I/3$. The ratio of resistance to reactance at frequency ω is _____. [JEE Main 2026 (Online) 5th April Morning Shift]
- (1) $\sqrt{\frac{6}{7}}$ (2) $\sqrt{\frac{3}{5}}$ (3) $\sqrt{\frac{7}{8}}$ (4) $\sqrt{\frac{3}{4}}$

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- Q.3** The figure given below shows an LCR series circuit with two switches S_1 and S_2 . When switch S_1 is closed keeping S_2 open, the phase difference (ϕ) between the current and source voltage is 30° and phase difference is 60° when S_2 is closed keeping S_1 open. The value of $(3L_1 - L_2)$ is _____ H. [JEE Main 2026 (Online) 2nd April Evening Shift]



- (1) $\frac{9}{2}$ (2) $\frac{2}{9}$ (3) $\frac{1}{3}$ (4) 3

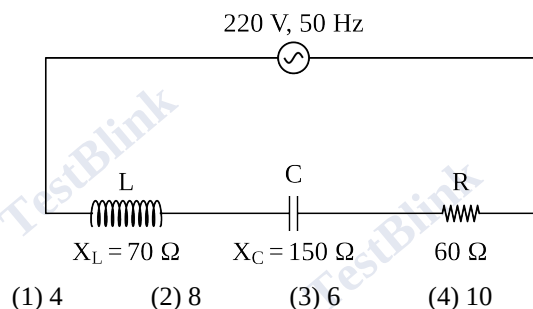
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- Q.4** The electric current in the circuit is given as $i = i_0(t/T)$. The r.m.s current for the period $t = 0$ to $t = T$ is _____. [JEE Main 2026 (Online) 28th January Morning Shift]

- (1) $\frac{i_0}{\sqrt{2}}$ (2) $\frac{i_0}{\sqrt{3}}$ (3) i_0 (4) $\frac{i_0}{\sqrt{6}}$

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full solution


- Q.5** For the series LCR circuit connected with 220 V, 50 Hz a.c. source as shown in the figure, the power factor is $\frac{\alpha}{10}$. The value of α is _____. [JEE Main 2026 (Online) 24th January Morning Shift]


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- Q.6** A capacitor C is first charged fully with potential difference of V_0 and disconnected from the battery. The charged capacitor is connected across an inductor having inductance L . In t s, 25% of the initial energy in the capacitor is transferred to the inductor. The value of t is _____ s. [JEE Main 2026 (Online) 21st January Evening Shift]

- (1) $\frac{\pi\sqrt{LC}}{3}$ (2) $\frac{\pi\sqrt{LC}}{2}$
(3) $\pi\sqrt{\frac{LC}{2}}$ (4) $\frac{\pi\sqrt{LC}}{6}$

 Scan or tap for the
full solution


Q.7 An ac current is represented as

$$i = 5\sqrt{2} + 10\cos\left(650\pi t + \frac{\pi}{6}\right) \text{ Amp}$$

The r.m.s. value of the current is

[JEE Main 2025 (Online) 7th April Morning Shift]

- (1) 10 Amp (2) $5\sqrt{2}$ Amp
(3) 100 Amp (4) 50 Amp

Scan or tap for the full solution



Q.8 An alternating current is represented by the equation, $i = 100\sqrt{2}\sin(100\pi t)$ ampere. The RMS value of current and the frequency of the given alternating current are

[JEE Main 2025 (Online) 4th April Morning Shift]

- (1) $\frac{100}{\sqrt{2}}$ A, 100 Hz (2) $50\sqrt{2}$ A, 50 Hz
(3) $100\sqrt{2}$ A, 100 Hz (4) 100 A, 50 Hz

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Q.9 An electric bulb rated as 100 W – 220 V is connected to an ac source of rms voltage 220 V. The peak value of current through the bulb is:

[JEE Main 2025 (Online) 3rd April Evening Shift]

- (1) 0.32 A (2) 0.64 A (3) 0.45 A (4) 2.2 A

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Q.10 Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): Choke coil is simply a coil having a large inductance but a small resistance. Choke coils are used with fluorescent mercury-tube fittings. If household electric power is directly connected to a mercury tube, the tube will be damaged.

Reason (R): By using the choke coil, the voltage across the tube is reduced by a factor $\left(\frac{R}{\sqrt{R^2 + \omega^2 L^2}}\right)$, where ω is frequency of the supply across resistor R and inductor L. If the choke coil were not used, the voltage across the resistor would be the same as the applied voltage.

In the light of the above statements, choose the most appropriate answer from the options given below :

[JEE Main 2025 (Online) 29th January Morning Shift]

- (1) (A) is true but (R) is false
(2) Both (A) and (R) are true and (R) is the correct explanation of (A).
(3) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(4) (A) is false but (R) is true

Scan or tap for the full solution



Section B (Numerical) — 7 questions

Q.11 A series LCR circuit with $R = 20 \Omega$, $L = 1.6 \text{ H}$ and $C = 40 \mu\text{F}$ is connected to a variable frequency a.c. source. The inductive reactance at resonant frequency is _____ Ω .

[JEE Main 2026 (Online) 5th April Evening Shift]

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Q.12 An inductor of 10 mH, capacitor of $0.1 \mu\text{F}$ and a resistor of 100Ω are connected in series across an a.c. power supply 220 V, 70 Hz. The power factor of the given circuit is 0.5. The difference in the inductive reactance and capacitive reactance is $\sqrt{3} \alpha \Omega$. The value of α is _____.

[JEE Main 2026 (Online) 4th April Morning Shift]

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Q.13 An inductor stores 16 J of magnetic field energy and dissipates 32 W of thermal energy due to its resistance when an a.c. current of 2 A (rms) and frequency 50 Hz flows through it. The ratio of inductive reactance to its resistance is _____. ($\pi = 3.14$)

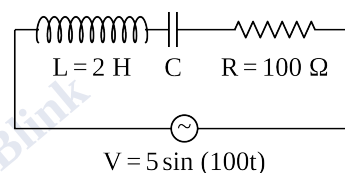
[JEE Main 2026 (Online) 28th January Evening Shift]

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Q.14 Using a variable frequency a.c. voltage source the maximum current measured in the given LCR circuit is 50 mA for $V = 5\sin(100t)$. The values of L and R are shown in the figure. The capacitance of the capacitor (C) used is _____ μF .

[JEE Main 2026 (Online) 23rd January Morning Shift]

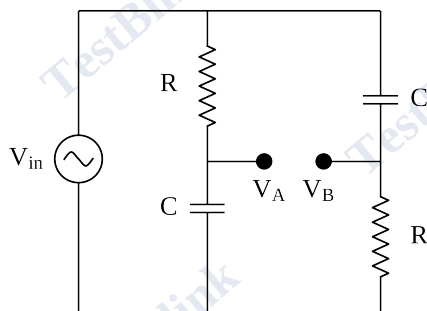


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Q.15 For ac circuit shown in figure, $R = 100 \text{ k}\Omega$ and $C = 100 \text{ pF}$ and the phase difference between V_{in} and $(V_B - V_A)$ is 90° . The input signal frequency is 10^x rad/sec , where 'x' is _____.

[JEE Main 2025 (Online) 7th April Morning Shift]



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- Q.16** An inductor of reactance $100\ \Omega$, a capacitor of reactance $50\ \Omega$, and a resistor of resistance $50\ \Omega$ are connected in series with an AC source of $10\ \text{V}$, $50\ \text{Hz}$. Average power dissipated by the circuit is _____ W .

[JEE Main 2025 (Online) 7th April Evening Shift]

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- Q.17** An inductor of self inductance $1\ \text{H}$ is connected in series with a resistor of $100\pi\ \text{ohm}$ and an ac supply of $100\pi\ \text{volt}$, $50\ \text{Hz}$. Maximum current flowing in the circuit is _____ A .

[JEE Main 2025 (Online) 4th April Evening Shift]

Scan or tap for the full solution



ANSWER KEY

Section A (MCQ) — 10 questions

Ques.	1	2	3	4	5	6	7	8	9	10	
Ans.	1	3	2	2	3	4	1	4	2	2	

Section B (Numerical) — 7 questions

Ques.	11	12	13	14	15	16	17
Ans.	200	100	314	50	5	1	1