CHAPTER

24 Alternating Current

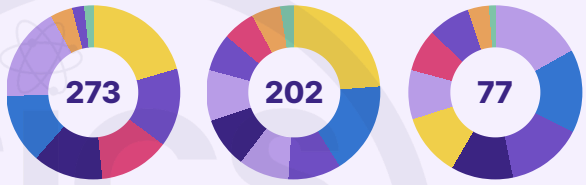
MHT CET · JEE · NEET Physics

PHYSICS CIRCLE

CONTENTS

24.1	AC Basics: Peak, RMS & Average Values	2
24.2	Phase, Phasors, Pure R & Pure L	6
24.3	Pure Capacitor & Displacement Current	9
24.4	RL & RC Series Circuits	12
24.5	Series LCR Circuit	15
24.6	Series Resonance	19
24.7	Resonance Curve, Bandwidth & Q Factor	22
24.8	Power, Power Factor & Wattless Current	25
24.9	Parallel AC Circuits	29
24.10	LC Oscillations	33
24.11	AC Generator & Transformer	36
★	**Exam-Day Card & Formula Sheet**	39

EXAM WEIGHTAGE



MHT CET 2019–2026 | **JEE Main** 2002–2026 | **NEET** 1988–2026

	CET	JEE	NEET
Resonance, Bandwidth & Q Factor	56 21%	48 24%	9 12%
Power, Power Factor & Wattless Current	35 13%	35 17%	12 16%
Pure R, L and C Circuits	40 15%	14 7%	11 14%
Series LCR Circuit	36 13%	19 9%	9 12%
AC Generator & Transformer	29 11%	19 9%	13 17%
RL and RC Series Circuits	36 13%	12 6%	6 8%
AC Basics: Peak, RMS & Average Values	19 7%	19 9%	7 9%
Inductors & DC Transients (Mixed)	6 2%	20 10%	6 8%
LC Oscillations	11 4%	11 5%	3 4%
Parallel AC Circuits	5 2%	5 2%	1 1%

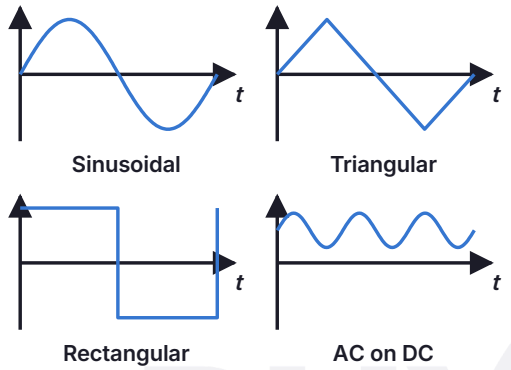
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01 CONCEPT AC Basics: Peak, RMS & Average Values

IN ONE LINE

AC changes size and direction again and again. Meters and ratings give its **rms value**, which is 0.707 of the peak.

24.1.1 What AC looks like



Some forms of alternating current

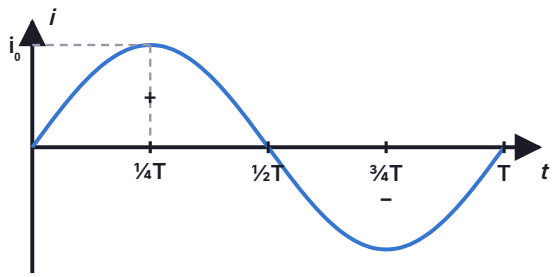
- The magnitude changes continuously with time between zero and a maximum.
- The direction reverses periodically.
- The sine form is the one used in practice.

24.1.2 Reading the terms

$$i = i_0 \sin \omega t \cdot V = V_0 \sin \omega t$$

$$\omega = 2\pi\nu = \frac{2\pi}{T}$$

Symbol	Meaning	Unit
i_0, V_0	peak value	A, V
ω	angular frequency	rad/s
ν	frequency	Hz
T	time period	s



One cycle of sinusoidal AC

- Positive for half a cycle, negative for the other half.
- Current is zero 2v times per second.
- Direction also changes 2v times per second.
- Zero to peak takes $\frac{T}{4}$

24.1.3 Time to reach a value

- Put the value in $i = i_0 \sin \omega t$ and find ωt.
- Then $t = \frac{\omega t}{2\pi} \times T$.
- With a phase term, set the full angle equal to $\frac{\pi}{2}$ for the first peak.

Change	Time
0 to peak	$\frac{T}{4}$
0 to $\frac{i_0}{2}$	$\frac{T}{12}$
0 to rms	$\frac{T}{8}$
peak to rms	$\frac{T}{8}$
peak to $\frac{i_0}{2}$	$\frac{T}{6}$

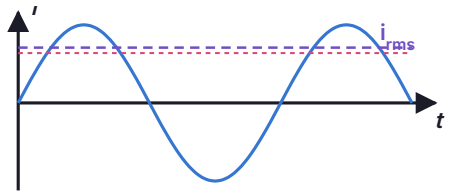
24.1.4 RMS value

$$i_{rms} = \frac{i_0}{\sqrt{2}} = 0.707\, i_0$$

$$V_{rms} = \frac{V_0}{\sqrt{2}} = 0.707\, V_0$$

- rms means root of the mean of the squares over one cycle.
- Mean of $i^2 = \frac{i_0^2}{2}$
- Also called the virtual or effective value.
- AC ratings and supply values are rms unless stated. House supply 220 V has a peak of $220\sqrt{2} = 311$ V.
- A DC equal to the rms value gives the same heat in the same resistance and time.

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The rms line sits at 0.707 of the peak

24.1.5 Average value

$$i_{av} = \frac{2i_0}{\pi} = 0.637\, i_0 \text{ (half cycle)}$$

$$V_{av} = \frac{2V_0}{\pi} = 0.637\, V_0$$

- Over a complete cycle the average is **zero**.
- Peak to peak value = $2V_0 = 2.828\, V_{rms}$.

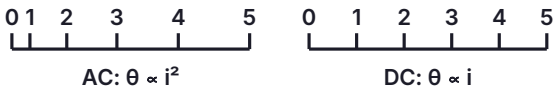
24.1.6 When the current has two parts

$$i = i_1 \sin \omega t + i_2 \cos \omega t: i_{rms} = \sqrt{\left(\frac{i_1^2 + i_2^2}{2}\right)}$$

$$i = I_{dc} + i_0 \sin \omega t: i_{rms} = \sqrt{\left(I_{dc}^2 + \frac{i_0^2}{2}\right)}$$

- V_0 for half the cycle and 0 for the rest: $V_{rms} = \frac{V_0}{\sqrt{2}}$
- Bulb rated P, V: $i_{rms} = \frac{P}{V}$ and $i_0 = \sqrt{2}\, i_{rms}$.

24.1.7 Hot wire meters

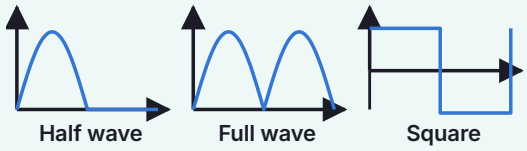


A hot wire meter has a non-linear scale

- A DC meter reads the average, which is zero for AC. So AC cannot be read on it.
- AC meters use the heating effect and read the rms value.
- A full wave rectifier gives output that flows one way but is not steady.

JEE · NEET Corner

Form factor and peak factor



Three other wave shapes

$$R_f = \frac{\text{rms value}}{\text{average value}} \cdot R_p = \frac{\text{peak value}}{\text{rms value}}$$

Wave	rms	average	R_f	R_p
Sine	$\frac{i_0}{\sqrt{2}}$	$\frac{2i_0}{\pi}$	1.11	1.41
Half wave	$\frac{i_0}{2}$	$\frac{i_0}{\pi}$	1.57	2
Full wave	$\frac{i_0}{\sqrt{2}}$	$\frac{2i_0}{\pi}$	1.11	1.41
Square	i_0	i_0	1	1

Skin effect and quick facts

- AC flows mainly along the surface of a conductor. Higher frequency gives a stronger skin effect.
- A 50 Hz bulb lights up 100 times per second.

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Solved Examples 01 AC Basics: Peak, RMS & Average Values

SOLVED 1 MHT CET 2026 · 14 May · Shift 2

An alternating voltage is E = 100 sin(ωt + $\frac{\pi}{6}$) V. The voltage will be maximum for the first time when t is (T = periodic time)

(a) $\frac{T}{12}$ (b) $\frac{T}{2}$
(c) $\frac{T}{6}$ (d) $\frac{T}{3}$

STEP 1 Maximum when $\omega t + \frac{\pi}{6} = \frac{\pi}{2}$
STEP 2 $\omega t = \frac{\pi}{3}$
STEP 3 $\frac{2\pi}{T} t = \frac{\pi}{3}$, so $t = \frac{T}{6}$

Answer: **(c)**

SOLVED 2 MHT CET 2026 · 15 May · Shift 2

An AC source is 120 V – 60 Hz. The value of voltage after $\frac{1}{720}$ s from start will be

(a) 20.2 V (b) 42.4 V
(c) 84.8 V (d) 106.9 V

STEP 1 $V_0 = 120\sqrt{2} = 169.7$ V, since 120 V is the rms value
STEP 2 $\omega t = 2\pi \times 60 \times \frac{1}{720} = \frac{\pi}{6}$
STEP 3 V = 169.7 sin 30° = **84.8 V**

Answer: **(c)**

SOLVED 3 MHT CET 2024 · 4 May · Shift 2

An alternating current is given by I = 100 sin(50πt). How many times will the current become zero in one second?

(a) 50 times (b) 25 times
(c) 40 times (d) 100 times

STEP 1 ω = 2πν = 50π, so ν = 25 Hz
STEP 2 Current is zero twice in every cycle
STEP 3 2 × 25 = **50 times**

Answer: **(a)**

SOLVED 4 MHT CET 2021 · 24 Sep · Shift 1

The peak value of an alternating emf 'e' given by e = e_0 cos ωt is 10 volt and its frequency is 50 Hz. At time t = $\frac{1}{600}$ s, the instantaneous e.m.f. is

(a) 10 V (b) $\frac{1}{\sqrt{3}}$ V
(c) 5 V (d) $5\sqrt{3}$ V

STEP 1 $\omega t = 2\pi \times 50 \times \frac{1}{600} = \frac{\pi}{6}$
STEP 2 e = 10 cos 30°
STEP 3 $e = 10 \times \frac{\sqrt{3}}{2} = 5\sqrt{3}$ **V**

Answer: **(d)**

SOLVED 5 MHT CET 2024 · 2 May · Shift 1

In an a.c. circuit I = 100 sin 200πt. The time required for the current to achieve its peak value will be

(a) $\frac{1}{100}$ s (b) $\frac{1}{200}$ s
(c) $\frac{1}{300}$ s (d) $\frac{1}{400}$ s

STEP 1 ω = 200π, so $T = \frac{2\pi}{200\pi} = \frac{1}{100}$ s
STEP 2 Zero to peak takes $\frac{T}{4}$
STEP 3 $t = \frac{1}{400}$ **s**

Answer: **(d)**

SOLVED 6 MHT CET 2026 · 16 Apr · Shift 1

An alternating e.m.f. is given by e = e_0 sin ωt. In what time the e.m.f. will have half its maximum value, if 'e' starts from zero?

(a) $\frac{T}{4}$ (b) $\frac{T}{8}$
(c) $\frac{T}{12}$ (d) $\frac{T}{16}$

STEP 1 $\frac{e_0}{2} = e_0 \sin \omega t$
STEP 2 $\omega t = \frac{\pi}{6}$
STEP 3 $\frac{2\pi}{T} t = \frac{\pi}{6}$, so $t = \frac{T}{12}$

Answer: **(c)**

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Solved Examples 01 AC Basics: Peak, RMS & Average Values (contd.)

SOLVED 7 MHT CET 2026 · 14 May · Shift 1

A resistance of 20 Ω is connected to a source of alternating potential V = 220 sin(100πt). The time taken by current to change from its peak value to r.m.s. value is

(a) 0.2 s (b) 0.25 s
(c) 25×10^{-3} s (d) 2.5×10^{-3} s

STEP 1 $T = \frac{2\pi}{100\pi} = 0.02$ s
STEP 2 Peak to rms: phase falls from $\frac{\pi}{2}$ to $\frac{\pi}{4}$, which is $\frac{T}{8}$
STEP 3 $t = \frac{0.02}{8} = \mathbf{2.5 \times 10^{-3}\ s}$

Answer: **(d)**

SOLVED 8 MHT CET 2023 · 11 May · Shift 2

The a.c. source of e.m.f. with instantaneous value 'e' is given by e = 200 sin(50t) volt. The r.m.s. value of current in a circuit of resistance 50 Ω is

(a) 0.2828 A (b) 2.828 A
(c) 28.28 A (d) 282.8 A

STEP 1 $i_0 = 200 \div 50 = 4$ A
STEP 2 $i_{rms} = \frac{i_0}{\sqrt{2}}$
STEP 3 $i_{rms} = \frac{4}{1.414} = \mathbf{2.828\ A}$

Answer: **(b)**

SOLVED 9 JEE Main 2025 · 3 Apr · Shift 2

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:

(a) 0.32 A (b) 0.64 A
(c) 0.45 A (d) 2.2 A

STEP 1 $i_{rms} = \frac{P}{V} = \frac{100}{220} = 0.45$ A
STEP 2 $i_0 = \sqrt{2}\, i_{rms}$
STEP 3 $i_0 = 1.414 \times 0.45 = \mathbf{0.64\ A}$

Answer: **(b)**

SOLVED 10 JEE Main 2022 · 27 Jul · Shift 1

A direct current of 4 A and an alternating current of peak value 4 A flow through resistance of 3 Ω and 2 Ω respectively. The ratio of heat produced in the two resistances in same interval of time will be:

(a) 3 : 2 (b) 3 : 1
(c) 3 : 4 (d) 4 : 3

STEP 1 DC: $H \propto I^2R = 16 \times 3 = 48$
STEP 2 AC: $i_{rms}^2 = \frac{16}{2} = 8$, so $H \propto 8 \times 2 = 16$
STEP 3 Ratio = 48 : 16 = **3 : 1**

Answer: **(b)**

SOLVED 11 JEE Main 2021 · 26 Feb · Shift 1

An alternating current is given by the equation $i = i_1 \sin \omega t + i_2 \cos \omega t$. The rms current will be:

(a) $\frac{1}{\sqrt{2}}(i_1^2 + i_2^2)^{1/2}$
(b) $\frac{1}{\sqrt{2}}(i_1 + i_2)$
(c) $\frac{1}{\sqrt{2}}(i_1 + i_2)^2$
(d) $\frac{1}{2}(i_1^2 + i_2^2)^{1/2}$

STEP 1 $\sin \omega t$ and $\cos \omega t$ differ by 90°
STEP 2 Peak value = $\sqrt{(i_1^2 + i_2^2)}$
STEP 3 $i_{rms} = \frac{1}{\sqrt{2}}(i_1^2 + i_2^2)^{1/2}$

Answer: **(a)**

SOLVED 12 MHT CET 2022 · 11 Aug · Shift 2

In a full wave rectifier circuit without filter, the output current is

(a) an eddy current
(b) a constant direct current
(c) a sinusoidal current
(d) unidirectional but not steady current

STEP 1 The rectifier makes both half cycles flow one way
STEP 2 The size still rises and falls with time
STEP 3 **Unidirectional but not steady**

Answer: **(d)**

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02 CONCEPT Phase, Phasors, Pure R & Pure L

IN ONE LINE
Phase tells where V and i are in their cycles. In a resistor they stay together; in an inductor **current lags voltage by 90°**.

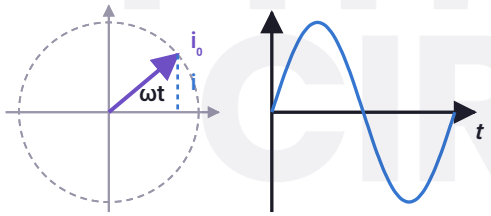
24.2.1 Phase

$$X = X_0 \sin(\omega t \pm \varphi_0)$$

- $(\omega t \pm \varphi_0)$ is the phase. Unit: radian.
- φ_0 is the initial phase.
- For $V = V_0 \sin(\omega t + \varphi_1)$ and $i = i_0 \sin(\omega t + \varphi_2)$, the difference is $\varphi = \varphi_1 - \varphi_2$.

$$\text{time difference} = \frac{T}{2\pi} \times \varphi$$

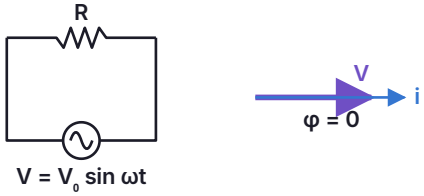
24.2.2 Phasor: a rotating arrow



The projection of a rotating arrow gives i

- A phasor has length equal to the peak value.
- It rotates anticlockwise with speed ω.
- Series circuit: **current** on the x-axis. It is common.
- Parallel circuit: **voltage** on the x-axis.

24.2.3 Pure resistor: in phase

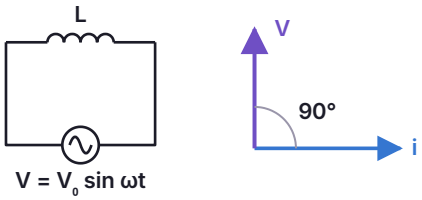


V and i reach zero and peak together

$$i = i_0 \sin \omega t \cdot i_0 = \frac{V_0}{R}$$

- $\varphi = 0$, power factor $\cos \varphi = 1$.
- Power $P = V_{rms}\, i_{rms} = \frac{V_0 i_0}{2}$

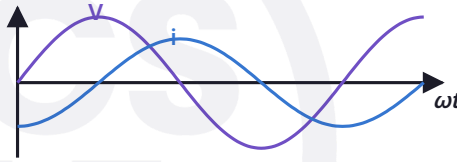
24.2.4 Pure inductor: voltage leads



Phasors in a pure inductor

$$i = i_0 \sin\left(\omega t - \frac{\pi}{2}\right)$$

$$i_0 = \frac{V_0}{X_L} = \frac{V_0}{\omega L}$$



i reaches each peak a quarter cycle after V

- $V = L\frac{di}{dt}$, so the voltage peaks first.
- If $i = I_0 \sin \omega t$, then $V_L = \omega L I_0 \cos \omega t$.
- Time difference = $\frac{T}{4}$
- Power factor = 0 and average power = 0.
- Energy stored $U = \frac{1}{2}Li^2$. It goes from maximum to zero in $\frac{T}{4}$

24.2.5 Inductive reactance

$$X_L = \omega L = 2\pi \nu L$$

- Unit: ohm. $X_L \propto L$ and $X_L \propto \nu$.
- On DC, $\nu = 0$, so $X_L = 0$.
- Ratio of reactance on AC to DC is infinite.
- If ν is halved: X_L is halved, the current doubles.

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ALTERNATING CURRENT

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

312	31	10
questions	concepts	topics

CONTENTS

01	AC Basics: Peak, RMS & Average Values	Q 1–30	30 Qs
02	Pure R, L and C Circuits	Q 31–85	55 Qs
03	RL and RC Series Circuits	Q 86–112	27 Qs
04	Series LCR Circuit	Q 113–139	27 Qs
05	Resonance, Bandwidth & Q Factor	Q 140–206	67 Qs
06	Power, Power Factor & Wattless Current	Q 207–241	35 Qs
07	Parallel AC Circuits	Q 242–245	4 Qs
08	LC Oscillations	Q 246–261	16 Qs
09	AC Generator & Transformer	Q 262–302	41 Qs
10	Inductors & DC Transients (Mixed)	Q 303–312	10 Qs
	Answer key		

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TOPIC 01

AC Basics: Peak, RMS & Average Values

30 PYQs · Easy 30 · Medium 0 · Difficult 0 | MHT CET 13 · NEET 7 · JEE 10

Concepts covered: Equation, instantaneous value and time (13) · Peak, RMS and average values (12) · AC meters, waveforms and skin effect (5)

LEVEL 1 · EASY 30 questions

◆ Equation, instantaneous value and time 13 Qs

1. An alternating voltage is given by $V = V_{r0}\sin\left(\omega t + \frac{\pi}{4}\right)$. The time when the voltage is maximum for the first time is
(T = periodic time of the alternating voltage, $\cos 0^\circ = \sin 90^\circ = 1$)
MHT CET 2026 · 19 MAY · SHIFT 1
(a) $\frac{T}{4}$ (b) $\frac{T}{6}$ (c) $\frac{T}{8}$ (d) $\frac{T}{12}$

2. An AC source is 120 V - 60 Hz. The value of voltage after $\frac{1}{720}$ s from start will be $\left(\sin 30^\circ = \frac{1}{2}\right)$
MHT CET 2026 · 15 MAY · SHIFT 2
(a) 20.2 V (b) 42.4 V (c) 84.8 V (d) 106.9 V

3. An alternating voltage is $E = 100\sin\left(\omega t + \frac{\pi}{6}\right)$ V. The voltage will be maximum for the first time when t is
$\left(\sin\frac{\pi}{2} = 1\right)$ (T = Periodic time)
MHT CET 2026 · 14 MAY · SHIFT 2
(a) $\frac{T}{12}$ (b) $\frac{T}{2}$ (c) $\frac{T}{6}$ (d) $\frac{T}{3}$

4. The instantaneous value of current in an a.c. circuit is $I = 3\sin\left(50\pi t + \frac{\pi}{4}\right)$A. The current will be maximum for the first time at
MHT CET 2025 · 19 APR · SHIFT 1
(a) $\frac{1}{50}$ s (b) $\frac{1}{100}$ s (c) $\frac{1}{200}$ s (d) $\frac{1}{600}$ s

5. The alternating voltage is given by $v = v_0\sin\left(\omega t + \frac{\pi}{3}\right)$ when will be the voltage maximum for first time?
MHT CET 2024 · 16 MAY · SHIFT 1
(a) $\frac{T}{6}$ (b) $\frac{T}{3}$ (c) $\frac{T}{2}$ (d) $\frac{T}{12}$

6. An alternating current is given by $I = 100\sin(50\pi t)$. How many times will the current become zero in one second?
MHT CET 2024 · 4 MAY · SHIFT 2
(a) 50 times (b) 25 times
(c) 40 times (d) 100 times

7. In an a.c. circuit $I = 100\sin 200\pi t$. The time required for the current to achieve its peak value will be
MHT CET 2024 · 2 MAY · SHIFT 1
(a) $\frac{1}{100}$ s (b) $\frac{1}{200}$ s (c) $\frac{1}{300}$ s (d) $\frac{1}{400}$ s

8. The peak value of an alternating emf 'e' given by $e = e_0\cos\omega t$ is 10 volt and its frequency is 50 Hz. At time $t = \frac{1}{600}$ s, the instantaneous e.m.f is $\left(\cos\frac{\pi}{6} = \sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}\right)$
MHT CET 2021 · 24 SEP · SHIFT 1
(a) 10 V (b) $\frac{1}{\sqrt{3}}$ V (c) 5 V (d) $5\sqrt{3}$ V

9. An alternating voltge is represented by $V = 80\sin(100\pi t)\cos(100\pi t)$ volt. The peak voltage is
MHT CET 2021 · 21 SEP · SHIFT 1
(a) 20 V (b) 40 V (c) 30 V (d) 50 V

10. An alternating voltage is given by $E = 100\sin\left(\omega + \frac{\pi}{6}\right)$V. The voltage will be maximum for the first time when is [T = periodic time)
MHT CET 2019 · 2 MAY · SHIFT 2
(a) $\frac{T}{12}$ (b) $\frac{T}{2}$ (c) $\frac{T}{6}$ (d) $\frac{T}{3}$

11. The peak value of an alternating current is 5 A and frequency is 60 Hz. How long will the current, starting from zero, take to reach the peak value?
NEET 2026
(a) $\frac{1}{120}$ s (b) $\frac{1}{60}$ s (c) $\frac{1}{30}$ s (d) $\frac{1}{240}$ s

12. The current flowing through an ac circuit is given by
$I = 5\sin(120\pi t)$A
How long will the current take to reach the peak value starting from zero?
JEE MAIN 2022 · 27 JUN · SHIFT 1
(a) $\frac{1}{60}$ s (b) 60 s (c) $\frac{1}{120}$ s (d) $\frac{1}{240}$ s

13. An AC source rated 220 V, 50 Hz is connected to a resistor. The time taken by the current to change from its maximum to the rms value is:
JEE MAIN 2021 · 18 MAR · SHIFT 1
(a) 2.5 ms (b) 25 ms (c) 2.5 s (d) 0.25 ms

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◆ Peak, RMS and average values 12 Qs

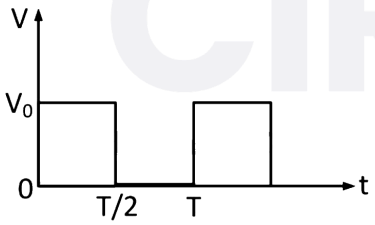
14. A group of lamps having total power rating of 1000 W is supplied by an AC voltage of $E = 200\sin(310t + 60^\circ)$, the rms value of current flowing through the circuit is
MHT CET 2023 · 13 MAY · SHIFT 2
(a) 10 A (b) $5\sqrt{2}$ A (c) 20 A (d) $10\sqrt{2}$ A

15. The a.c. source of e.m.f. with instantaneous value 'e' is given by $e = 200\sin(50t)$ volt. The r.m.s. value of current in a circuit of resistance 50Ω is
MHT CET 2023 · 11 MAY · SHIFT 2
(a) 0.2828 A (b) 2.828 A (c) 28.28 A (d) 282.8 A

16. A standard filament lamp consumes 100 W when connected to 200 V ac mains supply. The peak current through the bulb will be:
NEET 2022 · PHASE 2
(a) 2 A (b) 0.707 A (c) 1 A (d) 1.414 A

17. The peak voltage of the ac source is equal to
NEET 2022 · PHASE 1
(a) The value of voltage supplied to the circuit
(b) The rms value of the ac source
(c) $\sqrt{2}$ times the rms value of the ac source
(d) $1/\sqrt{2}$ times the rms value of the ac source

18. The r.m.s. value of potential difference V shown in the figure is
AIPMT 2011 · MAINS



(a) $\frac{V_0}{\sqrt{3}}$ (b) V0 (c) $\frac{V_0}{\sqrt{2}}$ (d) $\frac{V_0}{2}$

19. In an A.C. circuit, I_{rms} and I_0 are related as
AIPMT 1994
(a) $I_{\text{rms}} = \pi I_0$ (b) $I_{\text{rms}} = \sqrt{2}\, I_0$
(c) $I_{\text{rms}} = I_0/\pi$ (d) $I_{\text{rms}} = I_0/\sqrt{2}$

20. An ac current is represented as
$i = 5\sqrt{2} + 10\cos\left(650\pi t + \frac{\pi}{6}\right) Amp$
The r.m.s value of the current is
JEE MAIN 2025 · 7 APR · SHIFT 1
(a) 10 Amp (b) $5\sqrt{2}$ Amp
(c) 100 Amp (d) 50 Amp

21. 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 · 4 APR · SHIFT 1
(a) $\frac{100}{\sqrt{2}}$ A, 100 Hz (b) $50\sqrt{2}$ A, 50 Hz
(c) $100\sqrt{2}$ A, 100 Hz (d) 100 A, 50 Hz

22. 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 · 3 APR · SHIFT 2
(a) 0.32 A (b) 0.64 A (c) 0.45 A (d) 2.2 A

23. An alternating current is given by $I = I_A \sin\omega t + I_B \cos\omega t$. The r.m.s current will be
JEE MAIN 2025 · 24 JAN · SHIFT 1
(a) $\frac{\sqrt{I_A^2 + I_B^2}}{2}$ (b) $\sqrt{\frac{I_A^2 + I_B^2}{2}}$
(c) $\frac{|I_A + I_B|}{\sqrt{2}}$ (d) $\sqrt{I_A^2 + I_B^2}$

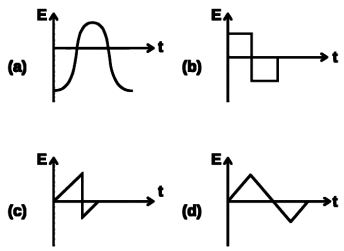
24. A direct current of 4 A and an alternating current of peak value 4 A flow through resistance of $3\,\Omega$ and $2\,\Omega$ respectively. The ratio of heat produced in the two resistances in same interval of time will be:
JEE MAIN 2022 · 27 JUL · SHIFT 1
(a) 3: 2 (b) 3: 1 (c) 3: 4 (d) 4: 3

25. An alternating current at any instant is given by $i = [6 + \sqrt{56}\sin(100\pi t + \pi/3)]$ A. The rms value of the current is _____ A.
JEE MAIN 2024 · 4 APR · SHIFT 1 *(Numerical)*

◆ AC meters, waveforms and skin effect 5 Qs

26. In a full wave rectifier circuit without filter, the output current is
MHT CET 2022 · 11 AUG · SHIFT 2
(a) an eddy current
(b) a constant direct current
(c) a sinusoidal current
(d) unidirectional but not steady current

27. The variation of EMF with time for four types of generators are shown in the figures. Which amongst them can be called AC?
NEET 2019



(a) Only (a) (b) (a) and (d)
(c) (a), (b), (c), (d) (d) (a) and (b)

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28. Two cables of copper are of equal lengths. One of them has a single wire of area of cross-section A, while other has 10 wires of cross-sectional area $A/10$ each. Give their suitability for transporting A.C. and D.C.

AIPMT 1994 ***(Not in current JEE/NEET syllabus)***

(a) only multiple strands for A.C., either for D.C.
(b) only multiple strands for A.C., only single strand for D.C.
(c) only single strand for D.C., either for A.C.
(d) only single strand for A.C., either for D.C.

---

29. The AC voltage across a resistance can be measured using a:

JEE MAIN 2015 · 11 APR · SHIFT 1

(a) potentiometer
(b) moving coil galvanometer
(c) moving magnet galvanometer
(d) hot wire voltmeter

---

30. Alternating current can not be measured by $D.C.$ ammeter because

AIEEE 2004

(a) Average value of current for complete cycle is zero
(b) $A.C.$ Changes direction
(c) $A.C.$ can not pass through $D.C.$ Ammeter
(d) $D.C.$ Ammeter will get damaged.

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TOPIC 02

Pure R, L and C Circuits

55 PYQs · Easy 55 · Medium 0 · Difficult 0 | MHT CET 37 · NEET 9 · JEE 9

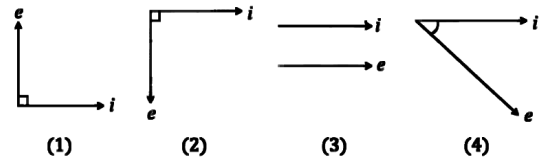
Concepts covered: Phase relations in pure R, L and C (13) · Inductive reactance (16) · Capacitive reactance (24) · Displacement current in a capacitor (2)

LEVEL 1 · EASY 55 questions

◆ Phase relations in pure R, L and C 13 Qs

31. The correct phasor diagram for an a.c. circuit containing only pure capacitor.

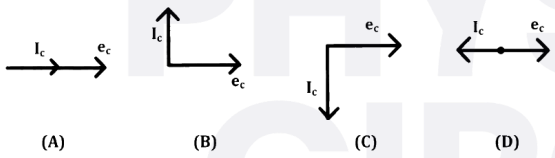
MHT CET 2026 · 20 MAY · SHIFT 1



(a) (3) (b) (2) (c) (1) (d) (4)

32. When a.c. source is connected across a pure capacitor, the correct phase relation between current and emf is shown in figure.

MHT CET 2026 · 19 APR · SHIFT 2



(a) (C) (b) (A) (c) (B) (d) (D)

33. In an a.c. circuit with pure capacitance 'C' and a.c. source $E = E_0 \sin \omega t$, the equation of instantaneous current is given by

MHT CET 2026 · 17 APR · SHIFT 2

(a) $I = E_0\, \omega C \cdot \sin(\omega t)$

(b) $I = E_0 \omega C \sin\left(\omega t + \frac{\pi}{2}\right)$

(c) $I = \frac{E_0}{\omega C} \sin(\omega t)$

(d) $I = \frac{E_0}{\omega C} \sin\left(\omega t + \frac{\pi}{2}\right)$

34. An a. c. voltage is applied to pure inductor. The current in the inductor

MHT CET 2025 · 25 APR · SHIFT 1

(a) leads the voltage by $\left(\frac{\pi}{4}\right)^c$

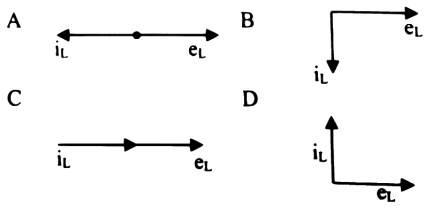
(b) leads the voltage by $\left(\frac{\pi}{2}\right)^c$

(c) lags behind the voltage by $\left(\frac{\pi}{2}\right)^c$

(d) lags behind the voltage by $\left(\frac{3\pi}{4}\right)^c$

35. An a. c. source is connected across a pure inductor. Which one of the following figures shows the correct phase relation between the current and e.m.f.?

MHT CET 2025 · 23 APR · SHIFT 1



(a) D (b) B (c) A (d) C

36. In an a.c. circuit with pure capacitance ' C ' and a.c. source $E = E_0 \sin \omega t$, the equation of instantaneous current is given by

MHT CET 2025 · 23 APR · SHIFT 1

(a) $\mathrm{I} = \mathrm{E}_0 \omega \mathrm{c} \sin(\omega \mathrm{t})$

(b) $I = E_0 \omega c \sin\left(\omega t + \frac{\pi}{2}\right)$

(c) $\mathrm{I} = \frac{\mathrm{E}_0}{\omega \mathrm{c}} \sin(\omega \mathrm{t})$

(d) $\mathrm{I} = \frac{\mathrm{E}_0}{\omega \mathrm{c}} \sin\left(\omega \mathrm{t} + \frac{\pi}{2}\right)$

37. In an a.c. circuit the instantaneous current and emf are represented as $\mathrm{I} = \mathrm{I}_0, \sin[\omega \mathrm{t} - \pi/6]$ and $\mathrm{E} = \mathrm{E}_0 \sin[\omega \mathrm{t} + \pi/3]$ respectively. The voltage leads the current by

MHT CET 2023 · 13 MAY · SHIFT 1

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$

38. In the graphical representation of e.m.f. 'e' and current 'i' versus 'ωt' for an a.c. circuit, both emf and current reach zero, minimum and maximum value at the same time. The circuit element connected to the source will be

MHT CET 2021 · 21 SEP · SHIFT 1

(a) pure capacitor

(b) combination of capacitor and inductor

(c) pure resistor

(d) pure inductor

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39. Given below are two statements

Statement I: In an a.c circuit, the current through a capacitor leads the voltage across it. Statement II: In a.c circuit containing pure capacitance only, the phase difference between the current and voltage is π.

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

NEET 2022 · PHASE 2

(a) Statement I is incorrect but Statement II is correct
(b) Both Statement I and Statement II are correct
(c) Both Statement I and Statement II are incorrect
(d) Statement I is correct but Statement II is incorrect

40. A small signal voltage V(t) = V0 $\sin\omega t$ is applied across an ideal capacitor C

NEET 2016 · PHASE 1

(a) Current $I(t)$ is in phase with voltage $V(t)$.
(b) Current $I(t)$ leads voltage V(t) by 180°
(c) Current $I(t)$, lags voltage $V(t)$ by 90°.
(d) Over a full cycle the capacitor C does not consume any energy from the voltage source.

41. In an ac circuit, the instantaneous current is zero, when the instantaneous voltage is maximum. In this case, the source may be connected to:

A. pure inductor.
B. pure capacitor.
C. pure resistor.
D. combination of an inductor and capacitor.

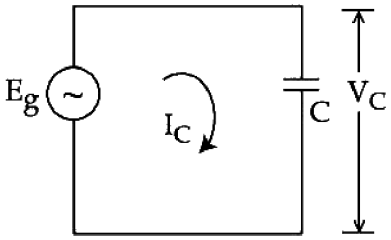
Choose the correct answer from the options given below:

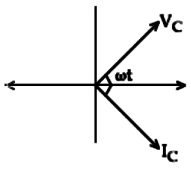
JEE MAIN 2024 · 4 APR · SHIFT 1

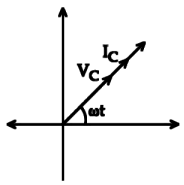
(a) A, B and C only (b) A and B only
(c) A, B and D only (d) B, C and D only

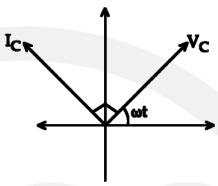
42. In a circuit consisting of a capacitance and a generator with alternating emf Eg = Eg0 sinωt, VC and IC are the voltage and current. Correct phasor diagram for such circuit is

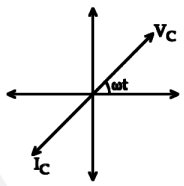
JEE MAIN 2021 · 22 JUL · SHIFT 2



(a)


(b)


(c)


(d)


43. Match List - I with List - II

	List - I		List - II
(a)	Phase difference between current and voltage in a purely resistive AC circuit	(i)	$\frac{\pi}{2}$; current leads voltage
(b)	Phase difference between current and voltage in a pure inductive AC circuit	(ii)	zero
(c)	Phase difference between current and voltage in a pure capacitive AC circuit	(iii)	$\frac{\pi}{2}$; current lags voltage
(d)	Phase difference between current and voltage in an LCR series circuit	(iv)	$\tan^{-1}\left(\frac{X_C - X_L}{R}\right)$

Choose the most appropriate answer from the options given below:

JEE MAIN 2021 · 17 MAR · SHIFT 2

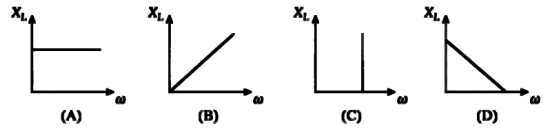
(a) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)
(b) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)
(c) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
(d) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

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◆ Inductive reactance 16 Qs

44. Which one of the following graph represents the correct variation of inductive reactance (X_L) with angular frequency (ω)?

MHT CET 2026 · 15 MAY · SHIFT 1



(a) A (b) B (c) C (d) D

45. An inductance of negligible resistance, whose reactance is 120 Ω at 200 Hz is connected to a 240 V, 60 Hz Power line. The current in the inductor is

MHT CET 2026 · 13 MAY · SHIFT 2

(a) 6.66 A (b) 6.60 A (c) 5.45 A (d) 54.5 A

46. A coil has inductive reactance 3 H. The ratio of its reactance when it is first connected to an a.c. source and then to d.c. source is

MHT CET 2026 · 15 APR · SHIFT 1

(a) zero (b) 3 (c) infinite (d) 1.5

47. A coil has inductance 2 H. The ratio of its reactance when it is connected first to an a.c. source and then to a d.c. source is

MHT CET 2025 · 22 APR · SHIFT 2

(a) -1 (b) zero (c) ∞ (d) +1

48. A coil has inductance H. The ratio of its reactance when it is connected first to an a.c. source and then to d.c. source is

MHT CET 2024 · 15 MAY · SHIFT 2

(a) ∞ (b) zero (c) one (d) two

49. The inductive reactance of a coil is ' R ' Ω. If inductance of a coil is tripled and frequency of a.c supply is also tripled, then new inductive reactance will be

MHT CET 2024 · 10 MAY · SHIFT 1

(a) $\frac{R}{9}$ (b) $\frac{R}{3}$ (c) 3R (d) 9R

50. A 42 mH inductor is connected to 200 V, 50 Hz a.c. supply. The r.m.s. value of current in the circuit will be nearly [Take $\pi = \frac{22}{7}$]

MHT CET 2024 · 3 MAY · SHIFT 2

(a) 15.15 A (b) 9.15 A (c) 8.15 A (d) 6. 15 A

51. The inductive reactance of a coil is 'X_L'. If the inductance of a coil is tripled and frequency of a.c. supply is doubled, then the new inductive reactance will be

MHT CET 2023 · 10 MAY · SHIFT 1

(a) $\frac{2}{3}X_L$ (b) $\frac{3}{2}X_L$ (c) $\frac{1}{6}X_L$ (d) $6X_L$

52. The resistance offered by an inductor (X_L) in an a.c. circuit is

MHT CET 2022 · 11 AUG · SHIFT 2

(a) inversely proportional to inductance and frequency of the alternating current
(b) inversely proportional to frequency of alternating current and directly proportional to inductance
(c) inversely proportional to inductance and directly proportional to the frequency of alternating current
(d) directly proportional to inductance and frequency of alternating current

53. If we increase the frequency of an a.c. supply, then inductive reactance

MHT CET 2021 · 23 SEP · SHIFT 1

(a) increases directly with the square of frequency
(b) increases as it directly proportional to frequency
(c) decreases inversely with the square of frequency
(d) decreases as it is inversely proportional to the frequency

54. The inductive reactance of a coil is R Ω. If the inductance of a coil is doubled and frequency of a.c. supply is also doubled then the new inductive reactance will be

MHT CET 2021 · 21 SEP · SHIFT 2

(a) 2R (b) 8R (c) $\frac{R}{2}$ (d) 4R

55. A coil has inductance 2 H. The ratio of its reactance, when it is connected first to an AC source and then to DC source, is

MHT CET 2019 · 3 MAY · SHIFT 1

(a) zero (b) 1
(c) less than 1 (d) infinity

56. An inductor of inductance 2 mH is connected to a 220 V, 50 Hz ac source. Let the inductive reactance in the circuit is X1. If a 220 V dc source replace the ac source in the circuit, then the inductive reactance in the circuit is X2. X1 and X2 respectively are:

NEET 2022 · PHASE 2

(a) 0.628 Ω, infinity (b) 6.28 Ω, zero
(c) 6.28 Ω, infinity (d) 0.628 Ω, zero

57. An alternating voltage source $V = 260\sin(628t)$ is connected across a pure inductor of 5mH. Inductive reactance in the circuit is:

JEE MAIN 2023 · 31 JAN · SHIFT 2

(a) 6.28Ω (b) 0.318Ω (c) 0.5Ω (d) 3.14Ω

58. An alternating emf $E = 440\sin 100\pi t$ is applied to a circuit containing an inductance of $\frac{\sqrt{2}}{\pi}$H. If an a.c. ammeter is connected in the circuit, its reading will be:

JEE MAIN 2022 · 29 JUL · SHIFT 1

(a) 4.4 A (b) 1.55 A (c) 2.2 A (d) 3.11 A

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59. What happens to the inductive reactance and the current in a purely inductive circuit if the frequency is halved?

JEE MAIN 2021 · 17 MAR · SHIFT 2

(a) Both, inducting reactance and current will be doubled.
(b) Inductive reactance will be doubled and current will be halved.
(c) Both, inductive reactance and current will be halved.
(d) Inductive reactance will be halved and current will be doubled.

◆ Capacitive reactance 24 Qs

60. An alternating voltage $V = 200\sqrt{2}\sin(100t)$ volt is connected to $1\,\mu F$ capacitor through ammeter (AC). The reading of ammeter is (in mA)

MHT CET 2026 · 15 MAY · SHIFT 2

(a) 5 (b) 10 (c) 15 (d) 20

61. An alternating voltage $V = 200\sqrt{2}\sin(100t)$ volt is connected to $1\,\mu F$ capacitor through a.c. ammeter. The reading of ammeter is

MHT CET 2026 · 15 MAY · SHIFT 1

(a) 5 mA (b) 10 mA (c) 15 mA (d) 20 mA

62. In an a.c. circuit, if the frequency is doubled, what happens to the capacitive reactance (X_c) and the current (I)?

MHT CET 2026 · 14 MAY · SHIFT 1

(a) X_c is halved and I is doubled
(b) X_c is doubled, I is halved
(c) Both X_c and I are halved
(d) Both X_c and I are doubled

63. An alternating voltage $V = 200\sqrt{2}\sin(100t)$ volt is connected to a $1\ \mu$F capacitor through an a.c. ammeter. The reading of the ammeter will be

MHT CET 2026 · 13 MAY · SHIFT 2

(a) 10 mA (b) 20 mA (c) 40 mA (d) 80 mA

64. A capacitor of $10\,\mu F$ has reactance $2 \times 10^{-3}\,\Omega$. The corresponding frequency is

MHT CET 2026 · 12 MAY · SHIFT 2

(a) $\frac{-\cdot\cdot}{__}\,MHz^{25}$ (b) $\frac{-\cdot\cdot}{__}\,Hz^{25}$
(c) 2.5 MHz (d) $\frac{-\cdot\cdot}{__}\,MHz^{2.5}\,\pi\,\pi\,\pi$

65. An alternating voltage $e = 150\sqrt{2}\ \sin\ 100t$ volt is applied to a capacitor of capacity 2 μF. The root mean square value of current in the circuit is

MHT CET 2026 · 19 APR · SHIFT 1

(a) 300 mA (b) 150 mA (c) 30 mA (d) 15 mA

66. In LCR circuit, at a particular angular frequency the capacitive reactance and inductive reactance is same. If the angular frequency is doubled, the ratio of the reactance of the capacitor to that of the inductor will be

MHT CET 2026 · 17 APR · SHIFT 2

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) 1 (d) 4

67. Determine the frequency for which a $10\ \mu$F capacitor has a reactance of $2 \times 10^{-3}\,\Omega$.

MHT CET 2026 · 15 APR · SHIFT 1

(a) $__^{25}$ MHz (b) $__^{20}$ MHz
(c) 2×10^{-3} MHz (d) 10π MHz $\pi\ \pi$

68. The reactance of a capacitor is X_C. If the frequency and the capacitance are doubled, then the new reactance will be

MHT CET 2025 · 25 APR · SHIFT 1

(a) $\frac{X_C}{2}$ (b) X_C (c) $\frac{X_C}{4}$ (d) $2X_C$

69. Same current is flowing in two different a.c. circuits. First circuit contains only inductance and second contains only capacitance. If the frequency of a.c. is increased in both circuits, the current will

MHT CET 2025 · 23 APR · SHIFT 2

(a) increase in the first circuit and decrease in second.
(b) increase in both circuits.
(c) decrease in both circuits.
(d) decrease in first circuit and increase in second.

70. An alternating voltage $E = 100\sqrt{2}\sin(50t)$ is connected to a 2μ F capacitor through an a.c. ammeter. The ammeter reading will be

MHT CET 2025 · 19 APR · SHIFT 1

(a) 10 mA (b) 5 mA (c) 20 mA (d) 30 mA

71. An alternating voltage $v = 200\sqrt{2}\sin(100t)$ is connected to a 1μ F capacitor through an a. c. ammeter. The reading of the ammeter shall be

MHT CET 2024 · 3 MAY · SHIFT 1

(a) 10 mA (b) 20 mA (c) 40 mA (d) 80 mA

72. An alternating voltage $E = 200\sqrt{2}\sin(100t)$ volt is connected to a 1μF capacitor through an a.c. ammeter. The reading of the ammeter shall be

MHT CET 2023 · 14 MAY · SHIFT 2

(a) 10 mA (b) 20 mA (c) 40 mA (d) 80 mA

73. At a particular angular frequency, the reactance of capacitor and that of inductor is same. If the angular frequency is doubled, the ratio of the reactance of the capacitor to that of the inductor will be

MHT CET 2023 · 13 MAY · SHIFT 2

(a) 1/4 (b) 1/2 (c) 2 (d) 4

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74. The capacitive reactance of a capacitor 'C' is $X\Omega$. Both, the frequency of a.c. supply and capacitance of the above capacitor are doubled. The new capacitive reactance will be

MHT CET 2023 · 10 MAY · SHIFT 2

(a) $\frac{X}{4}\Omega$ (b) $\frac{X}{2}\Omega$ (c) $2X\Omega$ (d) $4X\Omega$

75. The reactance of capacitor at $50\,Hz$ is 5Ω. If the frequency is increased to $100\,Hz$, the new reactance is

MHT CET 2023 · 9 MAY · SHIFT 2

(a) 5Ω (b) 10Ω (c) 2.5Ω (d) 125Ω

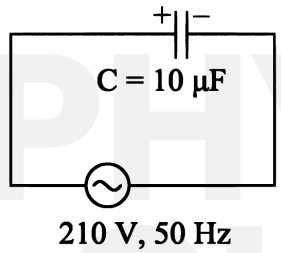
76. A capacitor of capacitance $50\mu F$ is connected to a.c. source $e = 220\sin 50t$ (e in volt, t in second). The value of peak current is

MHT CET 2022 · 11 AUG · SHIFT 2

(a) $\frac{0.55}{\sqrt{2}}$ A (b) $\frac{\sqrt{2}}{0.55}$ A (c) 0.55 A (d) $\sqrt{2}$ A

77. A $10\mu F$ capacitor is connected to a $210\,V, 50\,Hz$ source as shown in figure. The peak current in the circuit is nearly ($\pi = 3.14$):

NEET 2024



(a) 0.58 A (b) 0.93 A (c) 1.20 A (d) 0.35 A

78. A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly:

NEET 2020 · PHASE 1

(a) 2.05 A (b) 2.5 A (c) 25.1 A (d) 1.7 A

79. In the ac circuit an alternating voltage e = $200\sqrt{2}$ sin100t volts is connected to a capacitor of capacity 1 μF. The r.m.s. value of the current in the circuit is

AIPMT 2011 · PRELIMS

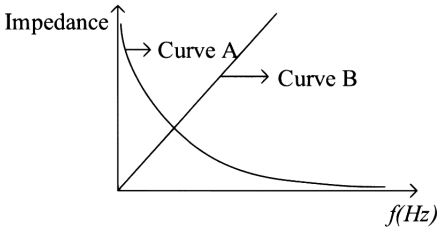
(a) 10 mA (b) 100 mA (c) 200 mA (d) 20 mA

80. A capacitor of capacity C has reactance X. If capacitance and frequency become double then reactance will be

AIPMT 2001

(a) 4X (b) X/2 (c) X/4 (d) 2X

81.



As per the given graph, choose the correct representation for curve A and curve B. Where X_C = reactance of pure capacitive circuit connected with A.C. source

X_L = reactance of pure inductive circuit connected with A.C. source

R = impedance of pure resistive circuit connected with A.C. source.

Z = Impedance of the LCR series circuit

JEE MAIN 2023 · 11 APR · SHIFT 1

(a) $A = X_L, B = R$ (b) $A = X_L, B = Z$

(c) $A = X_C, B = X_L$ (d) $A = X_C, B = R$

82. A capacitor of capacitance $150.0\ \mu F$ is connected to an alternating source of emf given by $E = 36\sin(120\pi t)V$. The maximum value of current in the circuit is approximately equal to:

JEE MAIN 2023 · 6 APR · SHIFT 2

(a) $\frac{1}{\sqrt{2}}A$ (b) $2\sqrt{2}A$ (c) $\sqrt{2}A$ (d) $2A$

83. An alternating emf $E = 110\sqrt{2}\sin 100t$ volt is applied to a capacitor of $2\mu F$, the rms value of current in the circuit is _____ mA.

JEE MAIN 2024 · 8 APR · SHIFT 2 *(Numerical)*

◆ Displacement current in a capacitor 2 Qs

84. An ac source is connected to a capacitor C. Due to decrease in its operating frequency

NEET 2023

(a) displacement current increases.
(b) displacement current decreases.
(c) capacitive reactance remains constant.
(d) capacitive reactance decreases.

85. A capacitor of capacitance 'C', is connected across an ac source of voltage V, given by V = V0sinωt

The displacement current between the plates of the capacitor, would then be given by:

NEET 2021

(a) $I_d = V_0\omega C\sin\omega t$ (b) $I_d = V_0\omega C\cos\omega t$

(c) $I_d = \frac{V_0}{\omega C}\cos\omega t$ (d) $I_d = \frac{V_0}{\omega C}\sin\omega t$

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TOPIC 03

RL and RC Series Circuits

27 PYQs · Easy 27 · Medium 0 · Difficult 0 | MHT CET 20 · NEET 5 · JEE 2

Concepts covered: RL circuit (17) · RC circuit (1) · Coil on DC and on AC (1) · Bulb brightness with L or C (8)

LEVEL 1 · EASY 27 questions

◆ RL circuit 17 Qs

86. An inductor of self inductance 1H connected in series with a resistor of $100\,\pi\,\Omega$ and an a.c. supply of $100\,\pi$ V, 50 Hz. Maximum current flowing in the circuit in ampere is

MHT CET 2026 · 12 MAY · SHIFT 2

(a) 0.5 (b) 1 (c) 1.5 (d) 2

87. In a L-R circuit of 4 mH inductance and $3\,\Omega$ resistance, e.m.f. $E = \cos(1000t)$ V is applied. The amplitude of current is

MHT CET 2026 · 20 APR · SHIFT 2

(a) 1.6 A (b) 1 A (c) 0.2 A (d) 0.4 A

88. In an a.c. circuit, a resistance R is connected in series with an inductance 'L'. If phase angle between voltage and current is 45°, the value of inductive reactance will be

$(\sin 45^\circ = \dfrac{1}{\sqrt{2}} = \cos 45^\circ)$

MHT CET 2026 · 18 APR · SHIFT 1

(a) $2R$ (b) R (c) $\sqrt{2}R$ (d) $\dfrac{1}{\sqrt{2}}R$

89. In an LR circuit, the value of L is $\left(\frac{0.3}{\pi}\right)$ henry and the value of R is 40Ω, If in the circuit, an alternating e.m.f of 230 V at 50 cycles per second is connected, the impedance of the circuit and current will be respectively

MHT CET 2025 · 25 APR · SHIFT 2

(a) 12.5Ω, 9.2 A (b) 46.4Ω, 6.4 A
(c) 23.2Ω, 5 A (d) 50Ω, 4.6 A

90. In an a.c. circuit, a resistance ' R ' is connected in series with an inductance ' L '. If phase angle between voltage and current is 45°, the value of inductive reactance will be $(\tan 45^\circ = 1)$

MHT CET 2025 · 25 APR · SHIFT 2

(a) R (b) $\frac{R}{2}$ (c) $\frac{R}{4}$ (d) $\frac{R}{\sqrt{2}}$

91. An a.c. source of frequency ' f ' is connected to a circuit containing an inductance ' L ' and resistance ' R ' in series. The impedance of this circuit is

MHT CET 2025 · 25 APR · SHIFT 2

(a) $\sqrt{R^2 + 2\pi fL^2}$ (b) $\sqrt{R^2 + L^2}$
(c) $R + 2\pi fL$ (d) $\sqrt{R^2 + 4\pi^2 f^2 L^2}$

92. An ideal inductor of $\left(\frac{1}{\pi}\right)$H is connected in series with a 300Ω resistor. If a 20 V, 200 Hz alternating source is connected across the combination, the phase difference between the voltage and current is

MHT CET 2025 · 21 APR · SHIFT 2

(a) $\tan^{-1}\left(\frac{3}{4}\right)$ (b) $\tan^{-1}\left(\frac{4}{3}\right)$
(c) $\tan^{-1}\left(\frac{5}{4}\right)$ (d) $\tan^{-1}\left(\frac{4}{5}\right)$

93. A resistance of 200Ω and an inductor of $\frac{1}{2\pi}$H are connected in series to a.c. voltage of 40 V and 100 Hz frequency. The phase angle between the voltage and current is

MHT CET 2025 · 20 APR · SHIFT 1

(a) $\tan^{-1}(1/5)$ (b) $\tan^{-1}(1/4)$
(c) $\tan^{-1}(1/3)$ (d) $\tan^{-1}(0.5)$

94. A coil of resistance 450Ω and self-inductance 1.5 henry is connected to an a.c. source of frequency $\frac{150}{\pi}$ Hz. The phase difference between voltage and current is

MHT CET 2025 · 19 APR · SHIFT 2

(a) $\tan^{-1}(0.5)$ (b) $\tan^{-1}(1)$
(c) $\tan^{-1}(1.5)$ (d) $\tan^{-1}(2.0)$

95. In an a.c. circuit, the reactance of a coil is $\sqrt{3}$ times its resistance. The phase difference between the voltage across the coil to the current through the coil will be

MHT CET 2024 · 15 MAY · SHIFT 1

(a) $\tan^{-1}(0)$ (b) $\tan^{-1}\frac{1}{\sqrt{3}}$
(c) $\tan^{-1}(1)$ (d) $\tan^{-1}(\sqrt{3})$

96. A coil having an inductance of $\frac{1}{\pi}$H is connected in series with a resistance of 300Ω. If 20 V from a 200 Hz source are impressed across the combination, the value of the phase angle between the voltage and the current is

MHT CET 2023 · 14 MAY · SHIFT 2

(a) $\tan^{-1}\left(\frac{5}{4}\right)$ (b) $\tan_{-1}\left(\frac{4}{5}\right)$
(c) $\tan^{-1}\left(\frac{3}{4}\right)$ (d) $\tan^{-1}\left(\frac{4}{3}\right)$

97. An e.m.f. $E = 4\cos(1000t)$ volt is applied to an LR circuit of inductance 3 mH and resistance $4\,\Omega$. The maximum current in the circuit is

MHT CET 2023 · 9 MAY · SHIFT 2

(a) $\frac{4}{\sqrt{7}}$ A (b) 1.0 A (c) $\frac{4}{7}$ A (d) 0.8 A

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98. A coil having an inductance of $\frac{1}{\pi}$H is connected in series with a resistance of 300Ω. If A.C. Source $(20\text{ V} - 200\text{ Hz})$ is connected across the combination, the phase angle between voltage and current is

MHT CET 2022 · 11 AUG · SHIFT 2

(a) $\tan^{-1}\left(\frac{3}{4}\right)$ (b) $\tan^{-1}\left(\frac{4}{3}\right)$
(c) $\tan^{-1}\left(\frac{5}{4}\right)$ (d) $\tan^{-1}\left(\frac{4}{5}\right)$

99. In an a.c. circuit, a resistance R = 40 Ω and an inductance 'L' are connected in series. If the phase angle between voltage and current is 45 °, then the value of the inductive reactance is (tan 45° = 1)

MHT CET 2021 · 22 SEP · SHIFT 1

(a) 50Ω (b) 40Ω (c) 10Ω (d) 20Ω

100. An AC circuit contains resistance of 12Ω and inductive reactance 5Ω. The phase angle between current and potential difference will be

MHT CET 2020 · 19 OCT · SHIFT 2

(a) $\sin^{-1}\left(\frac{12}{13}\right)$ (b) $\cos^{-1}\left(\frac{5}{12}\right)$
(c) $\sin^{-1}\left(\frac{5}{12}\right)$ (d) $\cos^{-1}\left(\frac{12}{13}\right)$

101. An ac voltage is applied to a resistance R and an inductor L in series. If R and the inductive reactance are both equal to 3 Ω, the phase difference between the applied voltage and the current in the circuit is

AIPMT 2011 · PRELIMS

(a) $\pi/6$ (b) $\pi/4$ (c) $\pi/2$ (d) zero

102. An inductor of self inductance 1 H is connected in series with a resistor of 100π ohm and an ac supply of 100π volt, 50 Hz. Maximum current flowing in the circuit is _____ A.

JEE MAIN 2025 · 4 APR · SHIFT 2 *(Numerical)*

◆ RC circuit 1 Q

103. A series R-C circuit is connected to an alternating voltage source. Consider two situations: (a) When capacitor is air filled.
(b) When capacitor is mica filled.
Current through resistor is I and voltage across capacitor is V then

AIPMT 2015

(a) $i_a > i_b$ (b) $V_a = V_b$ (c) $V_a < V_b$ (d) $V_a > V_b$

◆ Coil on DC and on AC 1 Q

104. A circuit when connected to an AC source of 12 V gives a current of 0.2 A. The same circuit when connected to a DC source of 12 V, gives a current of 0.4 A. The circuit is

NEET 2019

(a) Series LCR (b) Series LR
(c) Series RC (d) Series LC

◆ Bulb brightness with L or C 8 Qs

105. A coil of self inductance L is connected in series with a bulb B and an a.c. source. Brightness of the bulb decreases when

MHT CET 2026 · 14 MAY · SHIFT 1

(a) frequency of a.c. source is decreased
(b) number of turns in the coil is reduced
(c) an iron rod is inserted in the coil
(d) a capacitance of reactance X_c is included in the same circuit

106. An electric lamp connected in series with a capacitor and an a.c source is glowing with certain brightness. On reducing the frequency of source the brightness of the lamp

MHT CET 2026 · 15 APR · SHIFT 2

(a) is increased (b) is reduced
(c) remain the same (d) becomes zero

107. A coil of self-inductance L is connected in series with a bulb and an a. c. source. Brightness of the bulb decreases when

MHT CET 2025 · 20 APR · SHIFT 1

(a) an iron rod is inserted in the coil.
(b) frequency of a.c. source is decreased.
(c) number of turns in the coil is reduced.
(d) a capacitance of reactance $(X_C - X_L)$ is included in the same circuit.

108. An electric lamp connected in series with a capacitor and an a.c. source is glowing with certain brightness. On increasing the value of capacitance the brightness of the lamp

MHT CET 2024 · 16 MAY · SHIFT 1

(a) is increased. (b) is decreased.
(c) remains the same. (d) becomes zero.

109. A coil of self inductance L is connected in series with a bulb B and an a.c. source. Brightness of the bulb decreases when

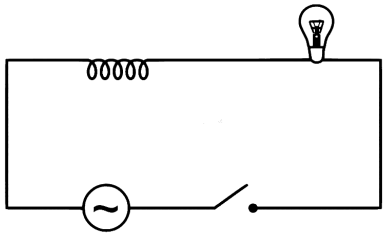
MHT CET 2024 · 4 MAY · SHIFT 2

(a) frequency of a.c. source is decreased.
(b) number of turns in the coil is reduced.
(c) a capacitance of reactance $(X_L - X_C)$ is included in the same circuit.
(d) an iron rod is inserted in the coil.

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110. A light bulb and an inductor coil are connected to an ac source through a key as shown in the figure below. The key is closed and after sometime an iron rod is inserted into the interior of the inductor. The glow of the light bulb

NEET 2020 · PHASE 2



(a) increases
(b) decreases
(c) remains unchanged
(d) will fluctuate

111. A coil of self-inductance L is connected in series with a bulb B and an AC source. Brightness of the bulb decreases when

NEET 2013

(a) a capacitance of reactance XC = XL is included in the same citcuit.
(b) an iron rod is inserted in the coil.
(c) frequency of the AC source is decreased.
(d) number of turns in the coil is reduced.

112. A bulb and a capacitor are connected in series across an ac supply. A dielectric is then placed between the plates of the capacitor. The glow of the bulb:

JEE MAIN 2024 · 9 APR · SHIFT 1

(a) becomes zero
(b) remains same
(c) increases
(d) decreases

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TOPIC 04

Series LCR Circuit

27 PYQs · Easy 27 · Medium 0 · Difficult 0 | MHT CET 17 · NEET 5 · JEE 5

Concepts covered: Voltages and the phasor sum (10) · Impedance and current (16) · Phase angle: leading or lagging (1)

LEVEL 1 · EASY 27 questions

◆ Voltages and the phasor sum 10 Qs

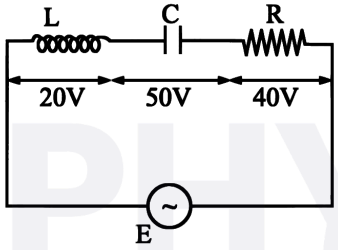
113. In an LCR series circuit, the potential difference across the terminals of the inductor, capacitor and resistor is 60 V, 30 V and 40 V respectively. Then supply voltage will be equal to

MHT CET 2026 · 18 APR · SHIFT 2

(a) 10 V (b) 50 V (c) 70 V (d) 130 V

114. The value of alternating e.m.f. (E) in the given circuit is

MHT CET 2025 · 5 MAY · SHIFT 2



(a) 30 V (b) 60 V (c) 50 V (d) 110 V

115. In an LCR circuit, if ' V ' is the effective value of the applied voltage, V_R is the voltage across ' R ', ' V_L ' and ' V_C ' is the effective voltage across ' L ' and ' C ' respectively then

MHT CET 2024 · 16 MAY · SHIFT 2

(a) $V = V_R + V_L + V_C$

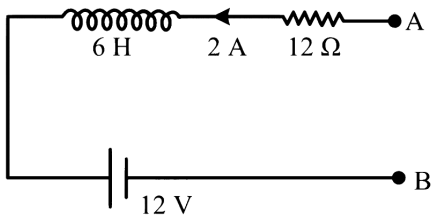
(b) $V^2 = V_R^2 + V_L^2 + V_C^2$

(c) $V^2 = V_R^2 + (V_L - V_c)^2$

(d) $V^2 = V_L^2 + (V_R - V_C)^2$

116. In the given circuit, if $\frac{dI}{dt} = -1\ A/s$ then the value of $(V_A - V_B)$ at this instance will be

MHT CET 2023 · 12 MAY · SHIFT 1



(a) 30 V (b) 24 V (c) 18 V (d) 9 V

117. The a.c. source is connected to series LCR circuit. If voltage across R is 40 V, that across L is 80 V and that across C is 40 V, then the e.m.f. 'e' of a.c. source is

MHT CET 2023 · 11 MAY · SHIFT 2

(a) 40 V (b) $40\sqrt{2}$ V (c) 80 V (d) 160 V

118. In series LCR circuit, the voltage across the inductance and the capacitance are not

MHT CET 2023 · 11 MAY · SHIFT 1

(a) out of phase with the voltage across the resistance by 90°.

(b) equal in magnitude at resonance.

(c) out of phase with each other by 180°.

(d) in phase with the source voltage.

119. For series LCR circuit, which one of the following is a CORRECT statement?

MHT CET 2021 · 23 SEP · SHIFT 1

(a) Potential difference across resistance R and that across capacitor have phase difference $\frac{\pi^c}{2}$.

(b) Applied e.m.f. and potential difference across resistance 'R' are in the same phase

(c) Applied e.m.f. and potential difference inductor coil has phase difference of $\frac{\pi^c}{2}$

(d) Potential difference across capacitor and that across inductor have phase difference of $\frac{\pi^c}{2}$.

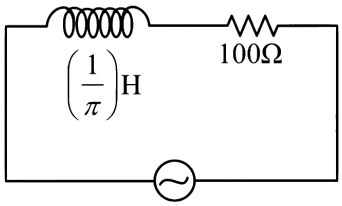
120. In an LCR series a.c. circuit, the voltage across each of the components L, C and R is 60 V. The voltage across the LC combination is

MHT CET 2021 · 23 SEP · SHIFT 1

(a) 120 V (b) 60 V (c) zero V (d) $\frac{60}{\sqrt{3}}$ V

121. An ac source is connected in the given circuit. The value of ϕ will be:

NEET 2023



$V = 220 \sin(100\pi t + \phi)$ Volt

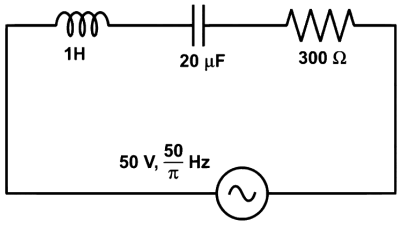
(a) 60° (b) 90° (c) 30° (d) 45°

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122. In an LCR series $a.c.$ circuit, the voltage across each of the components, L, C and R is $50V$. The voltage across the $L.C$ combination will be:
AIEEE 2004
(a) $100V$ (b) $50\sqrt{2}$
(c) $50\ V$ (d) $0\ V$ (zero)

◆ Impedance and current 16 Qs

123. In the series LCR circuit shown in figure the impedance is
MHT CET 2026 · 18 APR · SHIFT 2



(a) $300\ \Omega$ (b) $500\ \Omega$ (c) $700\ \Omega$ (d) $900\ \Omega$

124. Series LCR circuit containing an a.c. source of 100V has a inductor and a capacitor of reactance $24\ \Omega$ and $16\ \Omega$ respectively. If a resistance of $6\ \Omega$ is connected in series, then the potential difference across the series combination of inductor and capacitor only is
MHT CET 2026 · 16 APR · SHIFT 2
(a) 80V (b) 8V (c) 40V (d) 20V

125. When a capacitor is connected in series LR circuit, the alternating current flowing in the circuit
MHT CET 2026 · 16 APR · SHIFT 1
(a) increases (b) decreases
(c) remains constant (d) is zero

126. When a capacitor is connected in series LR circuit, the alternating current flowing in the circuit
MHT CET 2025 · 22 APR · SHIFT 2
(a) remains constant (b) increases
(c) decreases (d) is zero

127. When a capacitor is connected in series LR circuit, the alternating current flowing in the circuit
MHT CET 2024 · 9 MAY · SHIFT 2
(a) is zero. (b) remains constant.
(c) increases. (d) decreases.

128. When a capacitor is connected in series LR circuit, the alternating current flowing in the circuit
MHT CET 2024 · 9 MAY · SHIFT 1
(a) is zero. (b) increases.
(c) decreases. (d) remain constant.

129. The reciprocal of the total effective resistance of LCR a.c. circuit is called
MHT CET 2023 · 14 MAY · SHIFT 1
(a) impedance
(b) admittance
(c) resistance
(d) inductive and capacitive reactance

130. In a series LCR circuit $R = 300\Omega, L = 0.9\text{H}$, $C = 2\mu\,\text{F}, \omega = 1000\text{rad/s}$. The impedance of the circuit is
MHT CET 2019 · 2 MAY · SHIFT 1
(a) 500Ω (b) 1300Ω (c) 400Ω (d) 900Ω

131. An ac voltage $V = 220\sin\left(2\times10^3 t\right)$ Volt is applied to a series LCR circuit. Then the current amplitude in this circuit is:
(Given: $L = 10\text{mH}, C = 25\mu\,\text{F}, R = 100\Omega$)
RE-NEET 2026
(a) 22.0 A (b) 2.2 A (c) 5.5 A (d) 11.0 A

132. To an ac power supply of 220 V at 50 Hz, a resistor of 20Ω, a capacitor of reactance 25Ω and an inductor of reactance 45Ω are connected in series. The corresponding current in the circuit and the phase angle between the current and the voltage is, respectively
NEET 2025
(a) 15.6 A and 30° (b) 15.6 A and 45°
(c) 7.8 A and 30° (d) 7.8 A and 45°

133. If Z_1 and Z_2 are the impedances of the given circuits (a) and (b) as shown in figures, then choose the correct option
NEET 2023

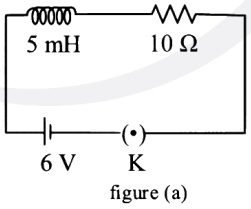


figure (a)

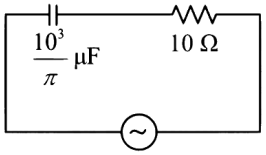
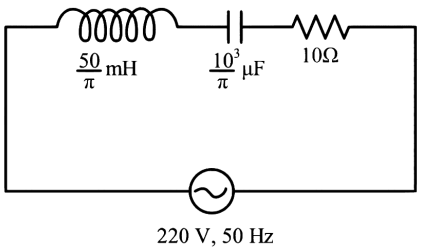


figure (b)

(a) $Z_1 < Z_2$ (b) $Z_1 + Z_2 = 20\ \Omega$
(c) $Z_1 = Z_2$ (d) $Z_1 > Z_2$

134. The net impedance of circuit (as shown in figure) will be:
NEET 2023



(a) 15Ω (b) $5\sqrt{5}\Omega$ (c) 25Ω (d) $10\sqrt{2}\Omega$

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135. A series LCR circuit is subjected to an ac signal of $200\ \mathrm{V}, 50\ \mathrm{Hz}$. If the voltage across the inductor $(\mathrm{L} = 10\ \mathrm{mH})$ is $31.4\ \mathrm{V}$, then the current in this circuit is _____.

JEE MAIN 2024 · 5 APR · SHIFT 2

(a) 10 A (b) 10 mA (c) 68 A (d) 63 A

136. If $\mathrm{R}, \mathrm{X_L}$, and $\mathrm{X_C}$ represent resistance, inductive reactance and capacitive reactance. Then which of the following is dimensionless:

JEE MAIN 2023 · 31 JAN · SHIFT 1

(a) $\frac{R}{X_L X_C}$ (b) $RX_L X_C$ (c) $\frac{R}{\sqrt{X_L X_C}}$ (d) $R\frac{X_L}{X_C}$

137. If L, C and R are the self inductance, capacitance and resistance respectively, which of the following does not have the dimension of time?

JEE MAIN 2022 · 27 JUN · SHIFT 2

(a) RC (b) $\frac{L}{R}$ (c) $\sqrt{LC}$ (d) $\frac{L}{C}$

138. In an ac circuit, an inductor, a capacitor and a resistor are connected in series with XL = R = XC. Impedance of this circuit is:

JEE MAIN 2021 · 31 AUG · SHIFT 1

(a) 2R2 (b) Zero (c) R (d) $\mathrm{R}\sqrt{2}$

◆ Phase angle: leading or lagging 1 Q

139. L, C and R are connected in series to an a. c. source. Which one of the following is true? Phase relation between current and voltage is such that

MHT CET 2025 · 26 APR · SHIFT 1

(a) both are out of phase with each other in ' R '.
(b) both are in phase in ' L ' and out of phase in ' C '.
(c) both are out of phase in ' L ' and in phase in 'C'.
(d) both are out of phase in both ' C ' and ' L '.

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TOPIC 05

Resonance, Bandwidth & Q Factor

67 PYQs · Easy 67 · Medium 0 · Difficult 0 | MHT CET 33 · NEET 6 · JEE 28

Concepts covered: Resonance condition and resonant frequency (27) · Current and voltages at resonance (20) · Behaviour with frequency and graphs (10) · Bandwidth and Q factor (10)

LEVEL 1 · EASY 67 questions

◆ Resonance condition and resonant frequency 27 Qs

140. To reduce the resonant frequency in an L-C-R series circuit with a generator,
MHT CET 2026 · 19 MAY · SHIFT 2
(a) the iron core of the inductor should be removed and the value of the capacitor is kept constant.
(b) the dielectric in the capacitor should be removed and the value of the inductor is kept constant.
(c) the generator frequency should be reduced.
(d) another capacitor should be added in parallel to the first capacitor and the value of the inductor is kept constant.

141. What is the value of inductance L for which the current is maximum in series LCR circuit with $C = 10\ \mu$F and $\omega = 1000$/s?
MHT CET 2026 · 13 MAY · SHIFT 1
(a) 100 mH (b) 1 mH (c) 10 mH (d) 1000 mH

142. In a series LCR circuit, the inductance $L = 20$ mH, capacitor $C = 2\ \mu$F and resistance $R = 100$ ohm. The frequency at which resonance occurs is
MHT CET 2026 · 12 MAY · SHIFT 1
(a) $\frac{(10)^2}{2\pi}$ (b) $\frac{(10)^3}{3\pi}$ (c) $\frac{(10)^4}{4\pi}$ (d) $\frac{10}{}\ \pi$

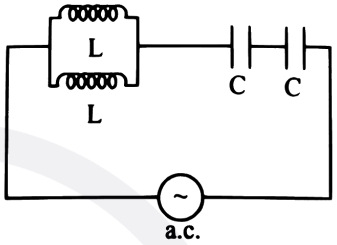
143. The LC series resonant circuit produces a resonant frequency 'f'. If L is tripled and 'C' is increased by 3C, the resonant frequency will be
MHT CET 2026 · 17 APR · SHIFT 1
(a) $\frac{f}{3}$ (b) $\frac{f}{2\sqrt{3}}$ (c) $6f$ (d) $\frac{f}{3\sqrt{2}}$

144. An inductor of inductance 2 μH is connected in series with a resistance, a variable capacitor and an a.c. source of 10 kHz. The value of capacitance for which maximum current is drawn in to the circuit is $\frac{1}{x}$ F, where the value of x is (Take $\pi^2 = 10$)
MHT CET 2026 · 16 APR · SHIFT 2
(a) 8000 (b) 600 (c) 400 (d) 1600

145. A series resonant circuit consists of an inductor 'L' and capacitor 'C' which produces resonant frequency 'f'. If 'L' is increased by '2L' and 'C' is changed to '9C' the resonant frequency will be
MHT CET 2026 · 15 APR · SHIFT 2
(a) $\frac{f}{3}$ (b) $\frac{f}{2}$ (c) $\frac{f}{2\sqrt{2}}$ (d) $\frac{f}{3\sqrt{3}}$

146. In an LC circuit, angular frequency at resonance is ω. The new angular frequency when inductance is made four times and capacitance is made eight times is
MHT CET 2025 · 5 MAY · SHIFT 2
(a) $\frac{\omega}{2\sqrt{2}}$ (b) $\frac{\omega}{4\sqrt{2}}$ (c) $\frac{\omega}{4}$ (d) $\frac{\omega}{\sqrt{2}}$

147. The frequency at resonance for the circuit is
MHT CET 2025 · 26 APR · SHIFT 2



(a) $\frac{1}{4\pi\sqrt{LC}}$ (b) $\frac{1}{2\pi\sqrt{LC}}$ (c) $\frac{1}{\pi\sqrt{LC}}$ (d) $\frac{2}{\pi\sqrt{LC}}$

148. A 20Ω resistance, 10 mH inductance coil and 15μ F capacitor are joined in series. When a suitable frequency alternating current source is joined to this combination, the circuit resonates. If the resistance is made $\frac{1}{3}$rd, the resonant frequency
MHT CET 2025 · 20 APR · SHIFT 1
(a) remains unchanged. (b) is doubled.
(c) is quadrupled. (d) is halved.

149. A series resonant circuit consists of inductor 'L' of negligible resistance and a capacitor 'C' which produces resonant frequency 'f'. If L is changed to 3 L and 'C' is changed to 6 C, the resonant frequency will become.
MHT CET 2024 · 10 MAY · SHIFT 1
(a) $\frac{f}{6}$ (b) $\frac{f}{3}$ (c) $\frac{f}{2\sqrt{2}}$ (d) $\frac{f}{3\sqrt{2}}$

150. LC series resonant circuit produces resonant frequency 'f'. If 'L' is tripled and 'C' is increased by $3C$, the resonant frequency will be
MHT CET 2024 · 9 MAY · SHIFT 1
(a) $\frac{f}{3}$ (b) $\frac{f}{2\sqrt{3}}$ (c) 6f (d) $\frac{f}{2\sqrt{2}}$

151. In series LCR resonant circuit, the capacitance is changed from C to 3 C. To obtain the same resonant frequency, the inductance should be changed from L to
MHT CET 2024 · 4 MAY · SHIFT 2
(a) $\frac{L}{3}$ (b) $\frac{L}{2}$ (c) $\frac{L}{\sqrt{3}}$ (d) 3L

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152. An inductor of inductance 2μH is connected in series with a resistance, a variable capacitor and an a.c. source of frequency 5 kHz. The value of capacitance for which maximum current is drawn into the circuit is $\frac{1}{x}$F, where the value of 'x' is (Take $\pi^2 = 10$)

MHT CET 2024 · 4 MAY · SHIFT 1

(a) 500 (b) 1000 (c) 2000 (d) 4000

153. An ac circuit contains a resistance of $1\text{k}\Omega$, a capacitor of 0.1μ F and an inductor of 1 mH connected in series. The resonance frequency of the circuit is approximately:

NEET 2026

(a) 13.5 kHz (b) 10.1 kHz (c) 20.7 kHz (d) 15.9 kHz

154. In a series LCR circuit, the inductance L is 10 mH, capacitance C is 1 μF and resistance R is 100 Ω. The frequency at which resonance occurs is :-

NEET 2023

(a) 15.9 kHz (b) 1.59 rad/s
(c) 1.59 kHz (d) 15.9 rad/s

155. What is the value of inductance L for which the current is maximum in a series LCR circuit with C = 10 μF and $\omega = 1000\ \text{s}^{-1}$?

AIPMT 2007

(a) 1 mH
(b) cannot be calculated unless R is known
(c) 10 mH
(d) 100 mH

156. In series LCR circuit, the capacitance is changed from C to $4C$. To keep the resonance frequency unchanged, the new inductance should be:

JEE MAIN 2024 · 1 FEB · SHIFT 1

(a) increased by 2 L (b) reduced by $\frac{1}{4}$ L_4
(c) reduced by $\frac{3}{4}$ L_4 (d) increased to 4 L

157. To increase the resonant frequency in series LCR circuit,

JEE MAIN 2022 · 25 JUL · SHIFT 1

(a) source frequency should be increased.
(b) another resistance should be added in series with the first resistance.
(c) another capacitor should be added in series with the first capacitor.
(d) the source frequency should be decreased.

158. In a LCR circuit capacitance is changed from C to $2\,C$. For the resonant frequency to remain unchaged, the inductance should be changed from L to

AIEEE 2004

(a) $L/2$ (b) $2L$ (c) $4L$ (d) $L/4$

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

JEE MAIN 2026 · 5 APR · SHIFT 2 *(Numerical)*

160. In a series LCR circuit, a resistor of 300Ω, a capacitor of 25 nF and an inductor of 100 mH are used. For maximum current in the circuit, the angular frequency of the ac source is _____ $\times 10^4$ radians s^{-1}

JEE MAIN 2025 · 23 JAN · SHIFT 2 *(Numerical)*

161. For a given series LCR circuit it is found that maximum current is drawn when value of variable capacitance is $2.5\,\text{nF}$. If resistance of 200Ω and $100\,\text{mH}$ inductor is being used in the given circuit. The frequency of ac source is _____ $\times 10^3$ Hz (given $\pi^2 = 10$)

JEE MAIN 2024 · 6 APR · SHIFT 2 *(Numerical)*

162. An inductor of inductance 2 μH is connected in series with a resistance, a variable capacitor and an AC source of frequency 7 kHz. The value of capacitance for which maximum current is drawn into the circuit $\frac{1}{x}$F, where the value of x is _____.
(Take $\pi = \frac{22}{7}$)

JEE MAIN 2023 · 29 JAN · SHIFT 2 *(Numerical)*

163. An LCR series circuit of capacitance 62.5 nF and resistance of 50 Ω, is connected to an A.C. source of frequency 2.0 kHz. For maximum value of amplitude of current in circuit, the value of inductance is _____ mH.
(Take $\pi^2 = 10$)

JEE MAIN 2023 · 25 JAN · SHIFT 1 *(Numerical)*

164. A series LCR circuit with $R = \frac{250}{11}\ \Omega$ and $X_L = \frac{70}{11}\ \Omega$ is connected across a 220 V, 50 Hz supply. The value of capacitance needed to maximize the average power of the circuit will be _____ μF. (Take: $\pi = \frac{22}{7}$)

JEE MAIN 2022 · 30 JUN · SHIFT 1 *(Numerical)*

165. An inductor of 0.5 mH, a capacitor of 200 μF and a resistor of 2 Ω are connected in series with a 220 V ac source. If the current is in phase with the emf, the frequency of ac source will be _____ $\times$ 102 Hz.

JEE MAIN 2022 · 29 JUN · SHIFT 2 *(Numerical)*

166. In an LCR series circuit, an inductor 30 mH and a resistor 1 Ω are connected to an AC source of angular frequency 300 rad/s. The value of capacitance for which, the current leads the voltage by 45 $^\circ$ is $\frac{1}{x} \times 10^{-3}$ F. Then the value of x is _____.

JEE MAIN 2021 · 20 JUL · SHIFT 1 *(Numerical)*

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◆ Current and voltages at resonance 20 Qs

167. In an LCR circuit at resonance, the a.c. source current is

A) maximum in a series LCR circuit only.

B) maximum in a parallel LCR circuit only.

C) maximum in both series and parallel LCR circuits.

D) minimum in both series and parallel LCR circuits.

The correct answer is

MHT CET 2026 · 19 APR · SHIFT 1

(a) B (b) D (c) C (d) A

168. In LCR series circuit at resonance

MHT CET 2026 · 17 APR · SHIFT 1

(a) the current is minimum.

(b) the impedance is maximum.

(c) the current leads the voltage by $\frac{\pi}{2}$

(d) the current and voltage are in phase.

169. In an LCR series circuit, at resonance,

MHT CET 2026 · 15 APR · SHIFT 2

(a) the impedance is maximum

(b) the current is minimum

(c) the current leads the voltage by $\frac{\pi}{2}$

(d) the current and voltage are in phase

170. An inductor of 0.5 mH, a capacitor of 20 μF and resistance 20 Ω are connected in series with a 220 V ac source. If the current is in phase with the emf, the amplitude of current of the circuit is $[x]^{1/2}$ A. The value of x is

MHT CET 2026 · 13 APR · SHIFT 2

(a) 61 (b) 121 (c) 242 (d) 442

171. In LCR resonant circuit, the current and voltage have phase difference

MHT CET 2024 · 11 MAY · SHIFT 2

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$ (c) $-\frac{\pi}{2}$ (d) zero

172. Resistor of 2Ω, inductor of 100μH and capacitor of 400pF are connected in series across a source of $e_{rms} = 0.1$ Volt. At resonance, voltage drop across inductor is

MHT CET 2023 · 12 MAY · SHIFT 2

(a) 25 V (b) 2.5 V (c) 250 V (d) 20 V

173. An inductor of 0.5 mH, a capacitor of 20 μF and a resistance of 20Ω are connected in series with a 220 V a.c. source. If the current is in phase with the e.m.f. the maximum current in the circuit is $\sqrt{x}A$. The value of 'x' is

MHT CET 2023 · 12 MAY · SHIFT 1

(a) 44 (b) 82 (c) 146 (d) 242

174. In series LCR circuit, at resonance the peak value of current will be [E_0 is peak emf, R is resistance, ωL is inductive reactance and ωC is capacitive]

MHT CET 2021 · 24 SEP · SHIFT 2

(a) $\frac{E_0}{R}$ (b) $\frac{E_0}{\sqrt{2}R}$

(c) $\frac{E_0}{\sqrt{R^2+\left(\omega L-\frac{1}{\omega C}\right)^2}}$ (d) $\frac{E_0}{\sqrt{2}\sqrt{R^2+\left(\omega L-\frac{1}{\omega C}\right)^2}}$

175. In LCR series resonant circuit, at resonance, voltage across 'L' and 'C' will cancel each other because they are

MHT CET 2021 · 21 SEP · SHIFT 2

(a) 90° out of phase (b) 90° in phase

(c) 180° in phase (d) 180° out of phase

176. An alternating emf of 0.2 V is applied across an L-C-R series circuit having $R = 4\Omega, C = 80\mu$F and $L = 200$ mH. At resonance the voltage drop across the inductor is

MHT CET 2020 · 16 OCT · SHIFT 1

(a) 10V (b) 2.5V (c) 1V (d) 5V

177. A series L-C-R circuit is connected to a source of A.C. current. At resonance, the phase difference between the applied voltage and the current in the circuit, is

AIPMT 1994

(a) π (b) zero (c) $\pi/4$ (d) $\pi/2$

178. A series LCR circuit is connected to an alternating source of emf E. The current amplitude at resonant frequency is I_0. If the value of resistance R becomes twice of its initial value then amplitude of current at resonance will be

JEE MAIN 2025 · 22 JAN · SHIFT 2

(a) $\frac{I_0}{2}$ (b) $\frac{I_0}{\sqrt{2}}$ (c) $2I_0$ (d) I_0

179. A LCR circuit is at resonance for a capacitor C, inductance L and resistance R. Now the value of resistance is halved keeping all other parameters same. The current amplitude at resonance will be now:

JEE MAIN 2024 · 8 APR · SHIFT 1

(a) halved (b) same (c) Zero (d) double

180. Given below are two statements:

Statement I: In an LCR series circuit, current is maximum at resonance.

Statement II: Current in a purely resistive circuit can never be less than that in a series LCR circuit when connected to same voltage source.

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

JEE MAIN 2024 · 6 APR · SHIFT 1

(a) Statement I is true but Statement II is false

(b) Statement I is false but Statement II is true

(c) Both Statement I and Statement II are true

(d) Both Statement I and Statement II are false

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181. Given below are two statements:

Statement I: An AC circuit undergoes electrical resonance if it contains either a capacitor or an inductor.

Statement II: An AC circuit containing a pure capacitor or a pure inductor consumes high power due to its non-zero power factor.

In the light of above statements, choose the correct answer form the options given below:

JEE MAIN 2023 · 13 APR · SHIFT 2

(a) Both Statement I and Statement II are false
(b) Statement I is true but statement II is false
(c) Statement I is false but statement II is true
(d) Both Statement I and Statement II are true

182. Given below are two statements:

Statement I: The reactance of an ac circuit is zero. It is possible that the circuit contains a capacitor and an inductor.

Statement II: In ac circuit, the average power delivered by the source never becomes zero. In the light of the above statements, choose the correct answer from the options given below.

JEE MAIN 2022 · 24 JUN · SHIFT 2

(a) Both Statement I and Statement II are true.
(b) Both Statement I and Statement II are false.
(c) Statement I is true but Statement II is false.
(d) Statement I is false but Statement II is true.

183. When resonance is produced in a series LCR circuit, then which of the following is not correct?

JEE MAIN 2013 · 25 APR · SHIFT 1

(a) Current in the circuit is in phase with the applied voltage.
(b) Inductive and capacitive reactances are equal.
(c) If R is reduced, the voltage across capacitor will increase.
(d) Impedance of the circuit is maximum.

184. An inductor of $0.5\,\text{mH}$, a capacitor of $20\,\mu\text{F}$ and resistance of $20\,\Omega$ are connected in series with a 220 V ac source. If the current is in phase with the emf, the amplitude of current of the circuit is $\sqrt{x}$ A. The value of x is _____

JEE MAIN 2023 · 31 JAN · SHIFT 1 *(Numerical)*

185. A series LCR circuit of R = 5Ω, L = 20 mH and C = 0.5 μF is connected across an AC supply of 250 V, having variable frequency. The power dissipated at resonance condition is _____ × 102 W.

JEE MAIN 2021 · 20 JUL · SHIFT 2 *(Numerical)*

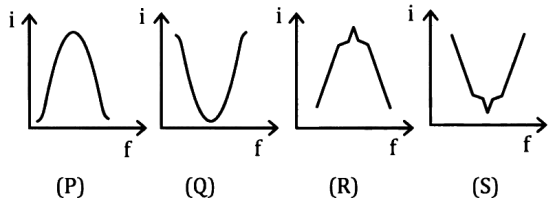
186. A sinusoidal voltage of peak value 250 V is applied to a series LCR circuit, in which R = 8Ω, L = 24 mH and C = 60 μF. The value of power dissipated at resonant condition is 'x' kW. The value of x to the nearest integer is _____.

JEE MAIN 2021 · 16 MAR · SHIFT 1 *(Numerical)*

◆ Behaviour with frequency and graphs 10 Qs

187. Which graph shows the correct variation of r.m.s. current 'i' with frequency 'f' of a.c. in case of series resonant circuit?

MHT CET 2026 · 20 APR · SHIFT 1



(a) (R) (b) (P) (c) (S) (d) (Q)

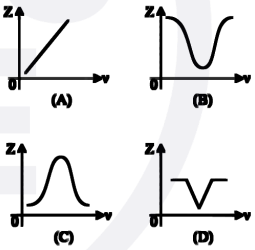
188. With gradual increase in frequency of an a.c. supply, the impedance of an LCR series circuit

MHT CET 2026 · 16 APR · SHIFT 1

(a) increases
(b) decreases
(c) remains constant
(d) first decreases, becomes minimum and then increases

189. Which one of the following graphs correctly represents the variation of impedance (Z) of a series LCR circuit with the frequency (v) of applied a.c.?

MHT CET 2024 · 15 MAY · SHIFT 2



(a) A (b) B (c) C (d) D

190. With gradual increase in frequency of an a.c. supply, the impedance of an LCR series circuit

MHT CET 2024 · 11 MAY · SHIFT 1

(a) increases.
(b) decreases.
(c) remains constant
(d) first decreases, becomes minimum and then increases.

191. In LCR series circuit if the frequency is increased, the impedance of the circuit

MHT CET 2024 · 4 MAY · SHIFT 1

(a) increases
(b) decreases
(c) either increases or decreases
(d) first decreases then become minimum and then increases.

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192. With increase in frequency of a.c. supply, the impedance of an L-C-R series circuit
MHT CET 2023 · 13 MAY · SHIFT 1
(a) remains constant.
(b) increases.
(c) decreases.
(d) decreases at first, becomes minimum and then increases.

193. With the gradual increase in frequency of an a. c. source, the impedance of an LCR series circuit
MHT CET 2023 · 11 MAY · SHIFT 1
(a) first decreases, becomes minimum and then increases.
(b) increases.
(c) decreases.
(d) remains constant.

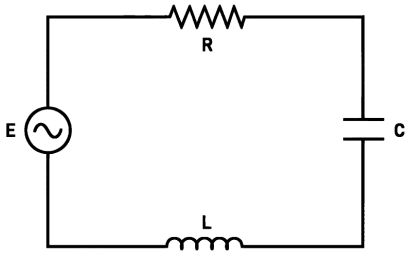
194. A capacitor, an inductor and an electric bulb are connected in series to an a.c. supply of variable frequency. As the frequency of the supply is increased gradually, then the electric bulb is found to
MHT CET 2023 · 9 MAY · SHIFT 1
(a) increase in brightness.
(b) decrease in brightness.
(c) increase, reach a maximum and then decrease in brightness.
(d) show no change in brightness.

195. Given below are two statements:
Statement I: When the frequency of an a.c source in a series LCR circuit increases, the current in the circuit first increases, attains a maximum value and then decreases.
Statement II: In a series LCR circuit, the value of power factor at resonance is one. In the light of given statements, choose the most appropriate answer from the options given below.
JEE MAIN 2023 · 12 APR · SHIFT 1
(a) Both Statement I and Statement II are False.
(b) Statement I is incorrect but Statement II is true.
(c) Both Statement I and Statement II are true.
(d) Statement I is correct but Statement II is false.

196. When you walk through a metal detector carrying a metal object in your pocket, it raises an alarm. This phenomenon works on:
JEE MAIN 2022 · 25 JUL · SHIFT 2
(a) Electromagnetic induction
(b) Resonance in ac circuits
(c) Mutual induction in ac circuits
(d) Interference of electromagnetic waves

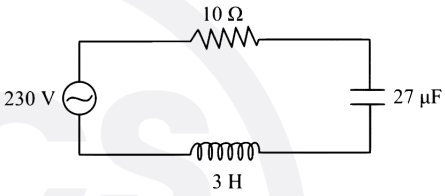
◆ Bandwidth and Q factor 10 Qs

197. In the circuit shown, the ratio of the quality factor and the band width is
(Given: band width = R/L)
MHT CET 2026 · 13 APR · SHIFT 2



(a) $\sqrt{\frac{1}{LC}\frac{L^2}{R^2}}$ (b) $\sqrt{\frac{1}{LC}}$
(c) $\sqrt{\frac{1}{LC}\frac{L}{R}}$ (d) $\sqrt{\frac{1}{LC}\frac{R}{L}}$

198. In the circuit shown the ratio of quality factor and the bandwidth is
MHT CET 2023 · 10 MAY · SHIFT 1



(a) 10 s (b) 8 s (c) 6 s (d) 4 s

199. Which of the following combinations should be selected for better tuning of an L-C-R circuit used for combination?
NEET 2016 · PHASE 2
(a) R = 20 Ω, L = 1.5 H, C = 35 μF
(b) R = 25 Ω, L = 2.5 H, C = 45 μF
(c) R = 15 Ω, L = 3.5 H, C = 30 μF
(d) R = 25 Ω, L = 1.5 H, C = 45 μF

200. A wire of resistance R is connected in series with an inductor of reactance ωL. Then quality factor of RL circuit is
AIPMT 2000
(a) $\frac{R}{\omega L}$ (b) $\frac{\omega L}{R}$
(c) $\frac{R}{\sqrt{R^2+\omega^2L^2}}$ (d) $\frac{\omega L}{\sqrt{R^2+\omega^2L^2}}$

201. In a series LCR resonance circuit, if we change the resistance only, from a lower to higher value:
JEE MAIN 2021 · 18 MAR · SHIFT 1
(a) The bandwidth of resonance circuit will increase.
(b) The resonance frequency will increase.
(c) The quality factor will increase.
(d) The quality factor and the resonance frequency will remain constant.

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202. An AC circuit has R= 100 Ω, C = 2 μF and L = 80 mH, connected in series. The quality factor of the circuit is:

JEE MAIN 2020 · 6 SEP · SHIFT 1 *(Not in current JEE/NEET syllabus)*

(a) 20 (b) 2 (c) 0.5 (d) 400

203. For an RLC circuit driven with voltage of amplitude vm and frequency $\omega_0 = \frac{1}{\sqrt{LC}}$ the current exhibits resonance. The quality factor, Q is given by:

JEE MAIN 2018 *(Not in current JEE/NEET syllabus)*

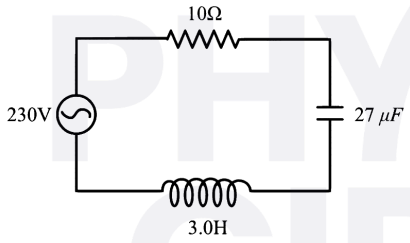
(a) $\frac{CR}{\omega_0}$ (b) $\frac{\omega_0 L}{R}$ (c) $\frac{\omega_0 R}{L}$ (d) $\frac{R}{(\omega_0 C)}$

204. A series combination of resistor of resistance 100 Ω, inductor of inductance 1 H and capacitor of capacitance 6.25 μF is connected to an ac source. The quality factor of the circuit will be _____

JEE MAIN 2023 · 8 APR · SHIFT 2 *(Numerical)* *(Not in current JEE/NEET syllabus)*

205. In the circuit shown in the figure, the ratio of the quality factor and the band width is _____ s.

JEE MAIN 2023 · 24 JAN · SHIFT 1 *(Numerical)* *(Not in current JEE/NEET syllabus)*



206. A resonance circuit having inductance and resistance 2 $\times 10^{-4}$ H and 6.28Ω respectively oscillates at 10 MHz frequency. The value of quality factor of this resonator is _____. [π = 3.14]

JEE MAIN 2021 · 24 FEB · SHIFT 1 *(Numerical)* *(Not in current JEE/NEET syllabus)*

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TOPIC 06

Power, Power Factor & Wattless Current

35 PYQs · Easy 35 · Medium 0 · Difficult 0 | MHT CET 16 · NEET 8 · JEE 11

Concepts covered: Average power (18) · Power factor (13) · Wattless current and choke coil (4)

LEVEL 1 · EASY 35 questions

◆ Average power 18 Qs

207. In a series LCR circuit alternating e.m.f. and current are given by the equations $V = V_0 \sin(\omega t)$ and $I = I_0 \sin\left(\omega t + \frac{\pi}{3}\right)$ respectively. The average power dissipated in the circuit over one cycle of a.c. is $(\cos 60^\circ = 0.5)$

MHT CET 2026 · 17 APR · SHIFT 2

(a) zero (b) $\frac{V_0 I_0}{2}$ (c) $\frac{V_0 I_0 \sqrt{3}}{2}$ (d) $\frac{V_0 I_0}{4}$

208. In series LCR circuit, resistance is $18\,\Omega$ and impedance $33\,\Omega$. An r.m.s. Voltage of 220 V is applied across the circuit. The true power consumed in a c. circuit is

MHT CET 2026 · 11 APR · SHIFT 2

(a) 400 W (b) 600 W (c) 200 W (d) 800 W

209. In an AC circuit $E = 50\sin(500t)$, $I = 600 \sin\left(500t + \frac{\pi}{3}\right) m\,A$. What is the power dissipated in the circuit? $[\cos 60^\circ = 0.5]$

MHT CET 2026 · 11 APR · SHIFT 1

(a) 10 W (b) 75 W (c) 7.5 W (d) 50 W

210. In series LCR circuit $R = 18\Omega$ and impedance is 30Ω. An rms voltage 210 V is applied across the circuit. The true power consumed in AC circuit is nearly

MHT CET 2025 · 26 APR · SHIFT 2

(a) 210 W (b) 400 W (c) 882 W (d) 900 W

211. In LCR series circuit, R = 18 Ω and impedance 33Ω. An r.m.s. voltage of 220 V is applied across the circuit. The true power consumed in a.c. circuit is

MHT CET 2025 · 21 APR · SHIFT 1

(a) 400 W (b) 600 W (c) 800 W (d) 900 W

212. In LCR series circuit, an alternating e.m.f. 'e' and current 'i' are given by equations $e = 160\sin(100t)$ Volt and $i = 250 \sin\left(100t + \frac{\pi}{3}\right) mA$. The average power dissipated in the circuit is

MHT CET 2024 · 16 MAY · SHIFT 1

(a) 2.5 W (b) 4.0 W (c) 10 W (d) 100 W

213. In an AC circuit $E = 200\sin(50t)$ volt and $I = 100 \sin\left(50t + \frac{\pi}{3}\right) mA$. The power dissipated in the circuit is $\left(\begin{smallmatrix}\sin 30^\circ = \cos 60^\circ = 0.5 \\ \sin 60^\circ = \cos 30^\circ = \sqrt{3}/2\end{smallmatrix}\right)$

MHT CET 2024 · 3 MAY · SHIFT 1

(a) 20 watt (b) 15 watt (c) 10 watt (d) 5 watt

214. In an A.C. circuit, the potential difference 'V' and current 'I' are given respectively by $V = 100\sin(100t) V, I = 100 \sin\left(100t + \frac{\pi}{3}\right) mA$ The power dissipated in the circuit will be [Given $\rightarrow \cos\frac{\pi}{3} = \frac{1}{2}$]

MHT CET 2024 · 2 MAY · SHIFT 1

(a) 10^4 W (b) 10 W (c) 2.5 W (d) 5 W

215. In an AC circuit, the current is $i = 5 \sin\left(100t - \frac{\pi}{2}\right) A$ and voltage is $e = 200\sin(100t)$ volt. Power consumption in the circuit is $(\cos 90^\circ = 0)$

MHT CET 2023 · 9 MAY · SHIFT 1

(a) 200 W (b) 0 W (c) 40 W (d) 1000 W

216. The instantaneous values of alternating current and voltage in a circuit are given as $i = \frac{1}{\sqrt{2}} \sin(100\,\pi t)$ ampere

$e = \frac{1}{\sqrt{2}} \sin\left(100\pi t + \frac{\pi}{3}\right)$ Volt

The average power in watts consumed in the circuit is

AIPMT 2012 · MAINS

(a) $\frac{1}{4}$ (b) $\frac{\sqrt{3}}{4}$ (c) $\frac{1}{2}$ (d) $\frac{1}{8}$

217. Power dissipated in an LCR series circuit connected to an A.C. source of emf ε is

AIPMT 2009

(a) $\frac{\varepsilon^2\left[R^2+\left(L\omega-\frac{1}{C\omega}\right)^2\right]}{R}$ (b) $\frac{\varepsilon^2\sqrt{R^2+\left(L\omega-\frac{1}{C\omega}\right)^2}}{R}$

(c) $\frac{\varepsilon^2 R}{\sqrt{R^2+\left(L\omega-\frac{1}{C\omega}\right)^2}}$ (d) $\frac{\varepsilon^2 R}{\left[R^2+\left(L\omega-\frac{1}{C\omega}\right)^2\right]}$

218. In an a.c. circuit the e.m.f. (ε) and the current (i) at any instant are given respectively by $\varepsilon = E0\sin\omega t$, $i = I0\sin(\omega t - \phi)$

The average power in the circuit over one cycle of a.c. is

AIPMT 2008

(a) $\frac{E_0 I_0}{2}\cos\phi$ (b) $E_0 I_0$ (c) $\frac{E_0 I_0}{2}$ (d) $\frac{E_0 I_0}{2}\sin\phi$

219. For a series LCR circuit the power loss at resonance is

AIPMT 2002

(a) $\frac{V^2}{\left[\omega L - \frac{1}{\omega C}\right]}$ (b) $I^2 L\omega$ (c) $I^2 R$ (d) $\frac{V^2}{C\omega}$

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220. In an a.c. circuit with phase voltage V and current I, the power dissipated is
AIPMT 1997
(a) $V \cdot I$
(b) depends on phase angle between V and I
(c) $\frac{1}{2} \times V \cdot I$
(d) $\frac{1}{\sqrt{2}} \times V \cdot I$

221. In an A.C. circuit, the current flowing is $I = 5\sin(100t - \pi/2)$ ampere and the potential difference is $V = 200\sin(100t)$ volts. The power consumption is equal to
AIPMT 1995
(a) 20 W (b) 0 W (c) 1000 W (d) 40 W

222. An AC voltage $V = 20\sin 200\pi t$ is applied to a series LCR circuit which drives a current $I = 10\sin\left(200\pi t + \frac{\pi}{3}\right)$. The average power dissipated is:
JEE MAIN 2024 · 31 JAN · SHIFT 2
(a) 21.6 W (b) 200 W (c) 173.2 W (d) 50 W

223. In an a.c. circuit, voltage and current are given by:
$V = 100\sin(100t)V$ and $I = 100\sin\left(100t + \frac{\pi}{3}\right)$mA respectively.
The average power dissipated in one cycle is:
JEE MAIN 2024 · 29 JAN · SHIFT 2
(a) 5 W (b) 25 W (c) 2.5 W (d) 10 W

224. In an $a.c.$ circuit the voltage applied is $E = E_0 \sin \omega t$. The resulting current in the circuit is $I = I_0 \sin\left(\omega t - \frac{\pi}{2}\right)$. The power consumption in the circuit is given by
AIEEE 2007
(a) $P = \sqrt{2}E_0I_0$ (b) $P = \frac{E_0I_0}{\sqrt{2}}$
(c) $P = zero$ (d) $P = \frac{E_0I_0}{2}$

◆ Power factor 13 Qs

225. In an a.c. circuit, if the power factor changes from 0.5 to 0.25 then the increase in impedance is
MHT CET 2026 · 13 MAY · SHIFT 2
(a) twice (b) half
(c) four times (d) eight times

226. In an a.c. circuit containing L, C and R in series, the ratio of apparent power to the true power is (Z= impedance of the circuit and R= resistance)
MHT CET 2026 · 11 APR · SHIFT 2
(a) RZ (b) $\cos\phi$ (c) $\cot\phi$ (d) $\frac{Z}{R}$

227. In an a.c. circuit containing L, C, R in series the ratio of true power to apparent power is (Z = impedance of the circuit and R is the resistance)
MHT CET 2025 · 26 APR · SHIFT 2
(a) $\frac{Z}{R}$ (b) $\tan\phi$ (c) $\cot\phi$ (d) $\frac{R}{Z}$

228. If the power factor changes from 0.5 to 0.25 because impedance changes from Z_1 to Z_2 then $Z_1 = xZ_2$. The value of x is (Resistance remains constant)
MHT CET 2025 · 23 APR · SHIFT 2
(a) 0.1 (b) 0.5 (c) 0.7 (d) 0.4

229. For a purely inductive or a purely capacitive circuit, the power factor is
MHT CET 2023 · 14 MAY · SHIFT 1
(a) zero (b) 0.5 (c) 1 (d) ∞

230. The maximum power is dissipated for an ac in a/an:
NEET 2023
(a) resistive circuit (b) LC circuit
(c) inductive circuit (d) capacitive circuit

231. The potential differences across the resistance, capacitance and inductance are 80 V, 40 V and 100 V respectively in an L-C-R circuit. The power factor of this circuit is
NEET 2016 · PHASE 2
(a) 0.4 (b) 0.5 (c) 0.8 (d) 1.0

232. A LCR series circuit driven with $E_{rms} = 90$ V at frequency $f_d = 30$ 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 · 6 APR · SHIFT 1
(a) 0.8 (b) 0.64 (c) 0.9 (d) 0.5

233. Given below are two statements:
Statement I: Maximum power is dissipated in a circuit containing an inductor, a capacitor and a resistor connected in series with an AC source, when resonance occurs
Statement II: Maximum power is dissipated in a circuit containing pure resistor due to zero phase difference between current and voltage.
In the light of the above statements, choose the correct answer from the options given below:
JEE MAIN 2023 · 10 APR · SHIFT 1
(a) Statement I is false but Statement II is true
(b) Both Statement I and Statement II are false
(c) Statement I is true but Statement II is false
(d) Both Statement I and Statement II are true

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234. In a series LCR circuit, the inductive reactance (XL) is 10Ω and the capacitive reactance (XC) is 4Ω. The resistance (R) in the circuit is 6Ω. The power factor of the circuit is:

JEE MAIN 2021 · 18 MAR · SHIFT 2

(a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2\sqrt{2}}$

235. A circuit has a resistance of 12 ohm and an impedance of 15 ohm. The power factor of the circuit will be

AIEEE 2005

(a) 0.4 (b) 0.8 (c) 0.125 (d) 1.25

236. The power factor of AC circuit having resistance (R) and inductance (L) connected in series and an angular velocity ω is

AIEEE 2002

(a) $R/\omega L$ (b) $R/\left(R^2+\omega^2L^2\right)^{1/2}$

(c) $\omega L/R$ (d) $R/\left(R^2-\omega^2L^2\right)^{1/2}$

237. A series LCR circuit with $\mathrm{L}=\frac{100}{\pi}\mathrm{mH}, \mathrm{C}=\frac{10^{-3}}{\pi}\mathrm{F}$ and $\mathrm{R}=10\Omega$, is connected across an ac source of $220\,\mathrm{V}, 50\,\mathrm{Hz}$ supply. The power factor of the circuit would be _____.

JEE MAIN 2024 · 27 JAN · SHIFT 2 *(Numerical)*

◆ Wattless current and choke coil 4 Qs

238. Average power associated with an ideal inductor and ideal capacitor over a complete cycle of a.c. is respectively

MHT CET 2024 · 9 MAY · SHIFT 1

(a) zero, one (b) one, zero

(c) zero, zero (d) one, one

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

MHT CET 2023 · 14 MAY · SHIFT 2

(a) 60° (b) 45° (c) 90° (d) 180°

240. 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 $\left(R/\sqrt{R^2+\omega^2L^2}\right)$, 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 · 29 JAN · SHIFT 1

(a) (A) is true but (R) is false

(b) Both $(\mathbf{A})$ and $(\mathbf{R})$ are true and $(\mathbf{R})$ is the correct explanation of $(\mathbf{A})$ 3.

(c) Both $(\mathbf{A})$ and $(\mathbf{R})$ are true but $(\mathbf{R})$ is not the correct explanation of $(\mathbf{A})$

(d) (A) is false but (R) is true

241. If wattless current flows in the AC circuit, then the circuit is:

JEE MAIN 2022 · 25 JUN · SHIFT 1

(a) Purely Resistive circuit

(b) Purely Inductive circuit

(c) LCR series circuit

(d) RC series circuit only

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TOPIC 07

Parallel AC Circuits

4 PYQs · Easy 4 · Medium 0 · Difficult 0 | MHT CET 4 · NEET 0 · JEE 0

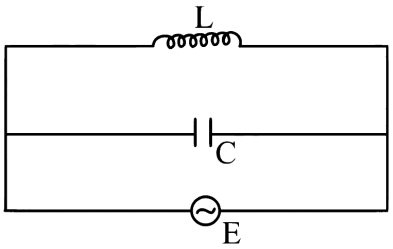
Concepts covered: Currents and impedance in parallel branches (1) · Parallel resonance and frequency limits (3)

LEVEL 1 · EASY 4 questions

◆ Currents and impedance in parallel branches 1 Q

242. In the circuit given below, the current through inductor is 0.9 A and through the capacitor is 0.6 A. The current drawn from the a.c. source is

MHT CET 2023 · 10 MAY · SHIFT 2



(a) 1.5 A (b) 0.9 A (c) 0.6 A (d) 0.3 A

◆ Parallel resonance and frequency limits 3 Qs

243. An alternating voltage of frequency 'ω' is induced in electric circuit consisting of an inductance 'L' and capacitance 'C', connected in parallel. Then across the inductance coil

MHT CET 2023 · 9 MAY · SHIFT 2

(a) current is maximum when $\omega^2 = \frac{1}{LC}$

(b) current is zero

(c) voltage is minimum when $\omega^2 = \frac{1}{LC}$

(d) voltage is maximum when $\omega^2 = \frac{1}{LC}$

244. A rejector circuit is the resonant circuit in which

MHT CET 2021 · 24 SEP · SHIFT 2

(a) L – C – R are connected in parallel.

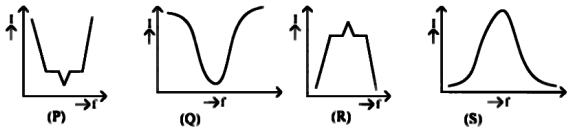
(b) L – C – R are connected in series.

(c) C – R are connected in series.

(d) L-R are connected in series.

245. Which graph shows the correct variation of r.m.s. current 'I' with frequency 'f' of a.c. in case of (LCR) parallel resonance circuit?

MHT CET 2021 · 24 SEP · SHIFT 1



(a) Q (b) P (c) R (d) S

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TOPIC 08

LC Oscillations

16 PYQs · Easy 16 · Medium 0 · Difficult 0 | MHT CET 10 · NEET 2 · JEE 4

Concepts covered: Frequency of LC oscillations (4) · Maximum current and energy (8) · Equal energy: charge and time (4)

LEVEL 1 · EASY 16 questions

◆ Frequency of LC oscillations 4 Qs

246. The natural frequency of L-C circuit is 125000 Hz. Then the capacitor C is replaced by another capacitor with a dielectric medium of dielectric constant K. Now the frequency decreases by 25 KHz. The value of K is
MHT CET 2026 · 15 MAY · SHIFT 1
(a) 3.0 (b) 2.1 (c) 1.56 (d) 1.7

247. The frequency of the output signal of an LC oscillator circuit is 'F' Hz with a capacitance of 0.1 μF. If the value of the capacitor is increased to 0.2 μF, then the frequency of the output signal will be
MHT CET 2021 · 22 SEP · SHIFT 1
(a) $\frac{F}{\sqrt{2}}$ Hz (b) $\frac{F}{\sqrt{3}}$ Hz (c) $\frac{F}{2}$ Hz (d) 2 F Hz

248. A transistor-oscillator using a resonant circuit with an inductor L (of negligible resistance) and a capacitor C in series produce oscillations of frequency f. If L is doubled and C is changed to 4C, the frequency will be
AIPMT 2006
(a) $f/2$ (b) $f/4$ (c) $8f$ (d) $f/2\sqrt{2}$

249. In an LC oscillator, if values of inductance and capacitance become twice and eight times, respectively, then the resonant frequency of oscillator becomes x times its initial resonant frequency ω_0. The value of x is:
JEE MAIN 2023 · 25 JAN · SHIFT 1
(a) 1/4 (b) 1/16 (c) 4 (d) 16

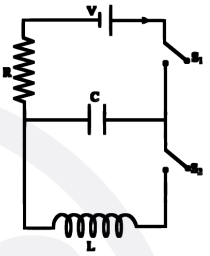
◆ Maximum current and energy 8 Qs

250. A 40 μF capacitor is charged to 10 volts of potential. The battery is disconnected, and a pure 100 mH coil is connected across the capacitor so that LC oscillations are set up. Then, the maximum current in the coil is:
MHT CET 2026 · 19 MAY · SHIFT 2
(a) 0.25 A (b) 0.10 A (c) 0.30 A (d) 0.20 A

251. A 10 μF capacitor is charged to 25 V of potential. The battery is then disconnected and a pure 100 mH coil is connected across the capacitor so that L-C oscillations are set up. The maximum current in the coil is
MHT CET 2026 · 14 MAY · SHIFT 2
(a) 0.25 A (b) 0.01 A (c) 2.5 A (d) 1.6 A

252. A 1μ F capacitor is charged to 50 V and is then discharged through 10 mH inductor of negligible resistance. The maximum current in the inductor is
MHT CET 2024 · 11 MAY · SHIFT 2
(a) 0.5 A (b) 1.5 A (c) 1 A (d) 0.15 A

253. In the given circuit, when S_1 is closed, the capacitor gets fully charged. Now S_1 is open and S_2 is closed. Then
MHT CET 2024 · 2 MAY · SHIFT 1



(a) there is no exchange of energy between L and C.
(b) the current in the circuit is in the same direction.
(c) the instantaneous current in the circuit may be $V\left(\sqrt{\frac{C}{L}}\right)$.
(d) the energy stored in the circuit is purely in the form of magnetic energy.

254. A capacitor of capacity 'C' is charged to a potential 'V'. It is connected in parallel to an inductor of inductance 'L'. The maximum current that will flow in the circuit is
MHT CET 2021 · 22 SEP · SHIFT 2
(a) $V\sqrt{\frac{L}{C}}$ (b) $V\sqrt{LC}$ (c) $V\sqrt{\frac{C}{L}}$ (d) $\frac{VC^2}{L}$

255. A condenser of capacity C is charged to a potential difference of V1. The plates of th condenser are then connected to an ideal inductor of inductance L. The current through the inductor when the potential difference across the condenser reduces to V2 is
AIPMT 2010 · MAINS
(a) $\left(\frac{C(V_1-V_2)^2}{L}\right)^{\frac{1}{2}}$ (b) $\frac{C(V_1^2-V_2^2)}{L}$
(c) $\frac{C(V_1^2+V_2^2)}{L}$ (d) $\left(\frac{C(V_1^2-V_2^2)}{L}\right)^{\frac{1}{2}}$

256. A capacitor of capacitance 100μF is charged to a potential of 12 V and connected to a 6.4 mH inductor to produce oscillations. The maximum current in the circuit would be:
JEE MAIN 2024 · 29 JAN · SHIFT 1
(a) 2.0 A (b) 3.2 A (c) 1.5 A (d) 1.2 A

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257. An oscillating LC circuit consists of a $75\ \text{mH}$ inductor and a $1.2\ \mu\text{F}$ capacitor. If the maximum charge to the capacitor is $2.7\ \mu\text{C}$. The maximum current in the circuit will be _____ mA

JEE MAIN 2023 · 8 APR · SHIFT 1 *(Numerical)*

◆ Equal energy: charge and time 4 Qs

258. In an oscillating LC circuit the maximum charge on the capacitor is Q. When the energy is stored equally between the electric and magnetic fields, the charge on the capacitor (q) is

MHT CET 2026 · 19 APR · SHIFT 2

(a) Q (b) $\frac{Q}{2}$ (c) $\frac{Q}{\sqrt{2}}$ (d) $\frac{Q}{\sqrt{3}}$

259. In an oscillating LC circuit, the maximum charge on the capacitor is Q. When the energy is stored equally between the electric and magnetic fields, the charge on the capacitor becomes

MHT CET 2026 · 18 APR · SHIFT 1

(a) $\frac{Q}{\sqrt{2}}$ (b) $Q\sqrt{3}$ (c) $\frac{Q}{2}$ (d) $\frac{Q}{4}$

260. In an oscillating LC circuit, the maximum charge on the capacitor is 'Q'. When the energy is stored equally between the electric and magnetic fields, the charge on the capacitor becomes

MHT CET 2023 · 13 MAY · SHIFT 1

(a) $\frac{Q}{4}$ (b) $\frac{Q}{2}$ (c) $\frac{Q}{\sqrt{2}}$ (d) $\frac{Q}{\sqrt{3}}$

261. In an oscillating LC circuit the maximum charge on the capacitor is Q. The charge on the capacitor when the energy is stored equally between the electric and magnetic field is

AIEEE 2003

(a) $\frac{Q}{2}$ (b) $\frac{Q}{\sqrt{3}}$ (c) $\frac{Q}{\sqrt{2}}$ (d) Q

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TOPIC 09

AC Generator & Transformer

41 PYQs · Easy 41 · Medium 0 · Difficult 0 | MHT CET 18 · NEET 11 · JEE 12

Concepts covered: AC generator (6) · Transformer ratios (24) · Efficiency and energy losses (11)

LEVEL 1 · EASY 41 questions

◆ AC generator 6 Qs

262. The coil of an a.c. generator has 100 turns, each of cross-sectional area $2\,m^2$. It is rotating at constant angular speed $30\,rad/s$, in a uniform magnetic field of $2 \times 10^{-2}\,T$. If the total resistance of the circuit is $600\,\Omega$ then maximum power dissipated in the circuit is

MHT CET 2023 · 9 MAY · SHIFT 1

(a) 6 W (b) 9 W (c) 12 W (d) 24 W

263. Match List - I with List - II:

	List I		List II
A.	AC generator	I.	Presence of both L and C
B.	Transformer	II.	Electromagnetic Induction
C.	Resonance phenomenon to occur	III.	Quality factor
D.	Sharpness of resonance	IV.	Mutual Induction

Choose the correct answer from the options given below:

JEE MAIN 2023 · 1 FEB · SHIFT 1

(a) A-II, B-I, C-III, D-IV
(b) A-IV, B-III, C-I, D-II
(c) A-II, B-IV, C-I, D-III
(d) A-IV, B-II, C-I, D-III

264. Match List-I with List-II.

	List - I		List -II
(A)	AC generator	(I)	Detects the presence of current in the circuit
(B)	Galvanometer	(II)	Converts mechanical energy into electrical energy
(C)	Transformer	(III)	Works on the principle of resonance in AC circuit
(D)	Metal detector	(IV)	Changes an alternating voltage for smaller or greater value

Choose the correct answer from the options given below:

JEE MAIN 2022 · 25 JUN · SHIFT 1

(a) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
(b) (A) - (II), (B) - (I), (C) - (III), (D) - (IV)
(c) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)
(d) (A) - (III), (B) - (I), (C) - (II), (D) - (IV)

265. Match List I with List II.

	List I		List II
(a)	Rectifier	(i)	Used either for stepping up or stepping down the a.c. voltage
(b)	Stabilizer	(ii)	Used to convert a.c. voltage into d.c. voltage
(c)	Transformer	(iii)	Used to remove any ripple in the rectified output voltage
(d)	Filter	(iv)	Used for constant output voltage even when the input voltage or load current change

Choose the correct answer from the options given below:

JEE MAIN 2021 · 25 FEB · SHIFT 2

(a) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
(b) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
(c) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
(d) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)

266. In an AC generator, a coil with N turns, all of the same area A and total resistance R, rotates with frequency ω in a magnetic field B. The maximum value of emf generated in the coil is

AIEEE 2006

(a) $N.A.B.R.\omega$ (b) $N.A.B$
(c) $N.A.B.R.$ (d) $N.A.B.\omega$

267. In an ac generator, a rectangular coil of 100 turns each having area $14 \times 10^{-2}\,m^2$ is rotated at $360\,rev/min$ about an axis perpendicular to a uniform magnetic field of magnitude $3.0\,T$. The maximum value of the emf produced will be _____ V.
(Take $\pi = \frac{22}{7}$)

JEE MAIN 2023 · 30 JAN · SHIFT 2 *(Numerical)*

◆ Transformer ratios 24 Qs

268. A step down transformer has 50 turns on secondary and 1000 turns on primary winding. If a transformer is connected to 220 V and 1 A a.c. source, what is the output current of the transformer?

MHT CET 2026 · 13 MAY · SHIFT 2

(a) $\frac{1}{20}$ A (b) 20 A (c) 100 A (d) 2 A

269. A transformer has 120 turns in the primary coil and carries 5A current. Input power is one kilowatt. To have 560 V output, the number of turns in secondary coil will be

MHT CET 2026 · 17 APR · SHIFT 1

(a) 168 (b) 200 (c) 336 (d) 400

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270. A step down transformer has turns ratio 20:1. If 8V are applied across $0.4\,\Omega$ secondary then the primary current will be

MHT CET 2026 · 16 APR · SHIFT 1

(a) 0.5 A (b) 1 A (c) 2 A (d) 4 A

271. An ideal transformer converts 220V a.c. to 3.3 KV a.c. to transmit a power of 4.4 KW. If primary coil has 600 turns then alternating current in the secondary coil is

MHT CET 2026 · 11 APR · SHIFT 2

(a) $\frac{4}{3}$ A (b) $\frac{3}{4}$ A (c) $\frac{1}{3}$ A (d) $\frac{2}{3}$ A

272. An ideal transformer converts 220 a.c. to 3.3 kV a.c. to transmit a power of 4.4 kW. If primary coil has 600 turns then alternating current in secondary coil is

MHT CET 2025 · 20 APR · SHIFT 2

(a) $\frac{5}{3}$ A (b) $\frac{1}{4}$ A (c) $\frac{4}{3}$ A (d) $\frac{2}{3}$ A

273. A transformer has 120 turns in the primary coil and carries 5 A current. Input power is one kilowatt. To have 560 V output, the number of turns in secondary coil will be

MHT CET 2024 · 10 MAY · SHIFT 2

(a) 168 (b) 200 (c) 336 (d) 400

274. A transformer is used to set up an alternating e.m.f. of 220 V to 4.4 kV to transmit 6.6 kW of power. The primary coil has 1000 turns. The current rating of the secondary coil is (Transformer is ideal)

MHT CET 2024 · 3 MAY · SHIFT 2

(a) 0.8 A (b) 1.2 A (c) 1.5 A (d) 1.8 A

275. The number of turns in the primary and the secondary of a transformer are 1000 and 3000, respectively. If 80 V AC is applied to the primary coil of the transformer, then the potential difference per turn of the secondary coil would be

MHT CET 2023 · 13 MAY · SHIFT 2

(a) 240 V (b) 2400 V (c) 0.24 V (d) 0.08 V

276. A step up transformer operates on 220 V and supplies current of 2 A. The ratio of primary and secondary windings is 1 : 20. The current in the primary is

MHT CET 2021 · 24 SEP · SHIFT 1

(a) 5 A (b) 2 A (c) 40 A (d) 20 A

277. A step down transformer has turns ratio 20 : 1. If 8 V is applied across 0.4 ohm secondary then the primary current will be

MHT CET 2021 · 22 SEP · SHIFT 2

(a) 2 A (b) 1 A (c) 0.5 A (d) 4 A

278. In a step up transformer, which one of the following statements is correct?

MHT CET 2021 · 21 SEP · SHIFT 2

(a) Number of turns in the secondary coil is less than in primary coil.
(b) Voltage in secondary coil is less than voltage is primary coil.
(c) Current in the primary coil is more than current in the secondary coil.
(d) Current in the primary coil is equal to current in the secondary coil.

279. In an ideal step down transformer, out of the following quantities, which quantity increases in the secondary coil?

MHT CET 2021 · 20 SEP · SHIFT 2

(a) Power (b) Voltage
(c) Current (d) Frequency

280. A step-up transformer has 300 turns of primary winding and 450 turns of secondary winding. A primary is connected to 150 V and the current flowing through it is 9A. The current and voltage in the secondary are

MHT CET 2020 · 16 OCT · SHIFT 2

(a) 13.5 A, 100 V (b) 13.5 A, 225 V
(c) 4.5 A, 100 V (d) 6.0 A, 225 V

281. A step up transformer is connected to an ac mains supply of 220 V to operate at 11000 V, 88 watt. The current in the secondary circuit, ignoring the power loss in the transformer, is

NEET 2024

(a) 8 mA (b) 4 mA (c) 0.4 A (d) 4 A

282. In an ideal transformer, the turns ratio is $\frac{N_P}{N_S} = \frac{1}{2}$. The ratio $V_S : V_P$ is equal to (the symbols carry their usual meaning):

NEET 2024

(a) 1 : 2 (b) 2 : 1 (c) 1 : 1 (d) 1 : 4

283. A 12 V, 60 W lamp is connected to the secondary of a step down transformer, whose primary is connected to ac mains of 220 V. Assuming the transformer to be ideal, what is the current in the primary winding?

NEET 2023

(a) 2.7 A (b) 3.7 A (c) 0.37 A (d) 0.27 A

284. A step down transformer connected to an ac mains supply of 220 V is made to operate at 11 V, 44W lamp. Ignoring power losses in the transformer, what is the current in the primary circuit?

NEET 2021

(a) 4A (b) 0.2A (c) 0.4A (d) 2A

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285. The primary of a transformer when connected to a dc battery of 10 Volt draws a current of 1 mA. The number of turns of the primary and secondary windings are 50 and 100 respectively. The voltage in the secondary and the current drawn by the circuit in the secondary are respectively

NEET 2013

(a) 20 V and 2.0 mA
(b) 10 V and 0.5 mA
(c) Zero volt and therefore no current
(d) 20 V and 0.5 mA

286. A step-up transformer operates on a 230 V line and supplies current of 2 A to a load. The ratio of the primary and secondary windings is 1 : 25. The current in the primary coil is

AIPMT 1998

(a) 15 A (b) 50 A (c) 25 A (d) 12.5 A

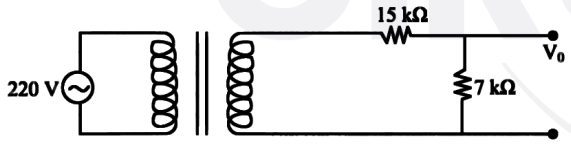
287. The primary winding of a transformer has 500 turns whereas its secondary has 5000 turns. The primary is connected to an A.C. supply 20 V, 50 Hz. The secondary will have an output of

AIPMT 1997

(a) 2 V, 50 Hz (b) 2 V, 5 Hz
(c) 200 V, 50 Hz (d) 200 V, 500 Hz

288. Primary coil of a transformer is connected to 220 V ac. Primary and secondary turns of the transformer are 100 and 10 respectively. Secondary coil of transformer is connected to two series resistances shown in figure. The output voltage (V_0) is:

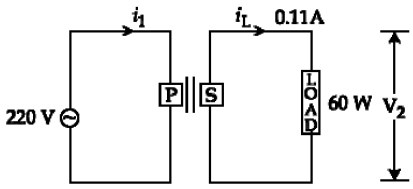
JEE MAIN 2024 · 30 JAN · SHIFT 1



(a) 7 V (b) 44 V (c) 22 V (d) 15 V

289. For the given circuit, comment on the type of transformer used.

JEE MAIN 2021 · 16 MAR · SHIFT 2



(a) Auxiliary transformer
(b) Step down transformer
(c) Step-up transformer
(d) Auto transformer

290. A power transmission line feeds input power at 2300 V to a step down transformer with its primary windings having 4000 turns, giving the output power at 230 V. If the current in the primary of the transformer is 5 A, and its efficiency is 90%, the output current would be;

JEE MAIN 2018 · 16 APR · SHIFT 1

(a) 50 A (b) 45 A (c) 25 A (d) 20 A

291. In a transformer, number of turns in the primary coil are 140 and that in the secondary coil are 280. If current in primary coil is $4A$, then that in the secondary coil is

AIEEE 2002

(a) $4A$ (b) $2A$ (c) $6A$ (d) $10A$

◆ Efficiency and energy losses 11 Qs

292. A current of 5 A is flowing at 220 V in a primary coil of a transformer. If the voltage produced in the secondary coil is 2200 V and 50% of power is lost, then the current in the secondary coil will be

MHT CET 2025 · 23 APR · SHIFT 1

(a) 2.5 A (b) 5 A
(c) 0.25 A (d) 0.025 A

293. The core used in transformers are laminated to

MHT CET 2024 · 15 MAY · SHIFT 2

(a) increase the magnetic field.
(b) increase the level of the magnetic saturation of the core.
(c) reduce the residual magnetism in the core.
(d) reduce eddy current losses in the core.

294. The core used in transformer and other electromagnetic devices is laminated to

MHT CET 2024 · 2 MAY · SHIFT 2

(a) increase the magnetic field.
(b) increase the level of magnetic saturation of the core.
(c) reduce the residual magnetism in the core.
(d) reduce eddy current.

295. A 220 V input is supplied to a transformer. The output circuit draws a current of 2.0 A at 440 V. If the ratio of output to input power is 0.8, then the current drawn by primary winding is

MHT CET 2019 · 3 MAY · SHIFT 1

(a) 3.6 A (b) 5.0 A (c) 2.5 A (d) 2.8 A

296. A transformer having efficiency of 90% is working on 200 V and 3 kW power supply. If the current in the secondary coil is 6 A, the voltage across the secondary coil and the current in the primary coil respectively are

AIPMT 2014

(a) 300 V, 15 A (b) 450 V, 15 A
(c) 450 V, 13.5 A (d) 600 V, 15 A

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297. A 220 volt input is supplied to a transformer. The output circuit draws a current of 2.0 ampere at 440 volts. If the efficiency of the transformer is 80%, the current drwn by the primary windings of the transformer is

AIPMT 2010 · PRELIMS

(a) 3.6 ampere (b) 2.8 ampere
(c) 2.5 ampere (d) 5.0 ampere

298. A transformer is used to light a 100 W and 110 V lamp from a 220 V mains. If the main current is 0.5 amp, the efficiency of the transformer is approximately

AIPMT 2007

(a) 50% (b) 90% (c) 10% (d) 30%

299. The core of a transformer is laminated because

AIPMT 2006

(a) ratio of voltage in primary and secondary may be increased
(b) energy losses due to eddy currents may be minimised
(c) the weight of the transformer may be reduced
(d) rusting of the core may be prevented.

300. A transformer has an efficiency of 80% and works at 10 V and 4 kW. If the secondary voltage is 240 V, then the current in the secondary coil is:

JEE MAIN 2024 · 1 FEB · SHIFT 2

(a) 1.33 A (b) 13.33 A (c) 1.59 A (d) 15.1 A

301. A transformer consisting of 300 turns in the primary and 150 turns in the secondary gives output power of 2.2 kW. If the current in the secondary coil is 10A, then the input voltage and current in the primary coil are:

JEE MAIN 2019 · 10 APR · SHIFT 1

(a) 220 V and 20 A (b) 220 V and 10A
(c) 440 V and 5A (d) 440 V and 20 A

302. The core of any transformer is laminated so as to

AIEEE 2003

(a) reduce the energy loss due to eddy currents
(b) make it light weight
(c) make it robust and strong
(d) increase the secondary voltage

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TOPIC 10

Inductors & DC Transients (Mixed)

10 PYQs · Easy 10 · Medium 0 · Difficult 0 | MHT CET 3 · NEET 4 · JEE 3

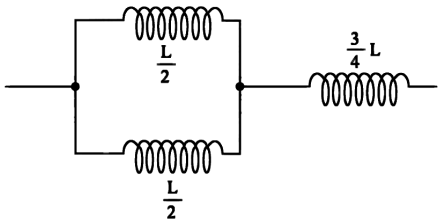
Concepts covered: Inductor energy and combinations (5) · LR and RC circuits on DC (5)

LEVEL 1 · EASY 10 questions

◆ Inductor energy and combinations 5 Qs

303. Three inductances are connected as shown in figure. The equivalent inductance is

MHT CET 2024 · 3 MAY · SHIFT 1



(a) $\frac{L}{4}$ (b) $\frac{5}{4}$ L (c) $\frac{7}{4}$ L (d) L

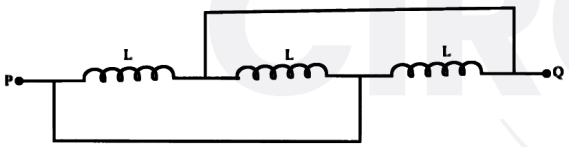
304. A 100 mH coil carries a current of 1 A. Energy stored in the form of magnetic field is

MHT CET 2023 · 10 MAY · SHIFT 2

(a) 0.025 J (b) 0.050 J (c) 0.075 J (d) 0.100 J

305. Three pure inductors each of inductance 6H are connected as shown in the figure. Their equivalent inductance between the points 'P' and 'Q' is

MHT CET 2021 · 21 SEP · SHIFT 2



(a) 0.5 H (b) 18 H (c) 6.3 H (d) 2 H

306. The magnetic energy stored in an inductor of inductance 4 μH carrying a current of 2 A is:

NEET 2023

(a) 4 mJ (b) 8 mJ (c) 8 μJ (d) 4 μJ

307. The magnetic potential energy stored in a certain inductor is 25 mJ, when the current in the inductor is 60 mA. This inductor is of inductance

NEET 2018

(a) 0.138 H (b) 138.88 H (c) 1.389 H (d) 13.89 H

◆ LR and RC circuits on DC 5 Qs

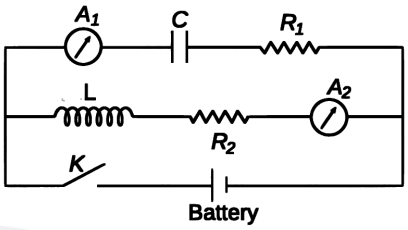
308. A coil of 40 henry inductance is connected in series with a resistance of 8 ohm and the combination is joined to the terminals of a 2 volt battery. The time constant of the circuit is

AIPMT 2004

(a) 5 seconds (b) 1/5 seconds
(c) 40 seconds (d) 20 seconds

309. In a circuit inductance L and capacitance C are connected as shown in figure. A_1 and A_2 are ammeters. When key K is pressed to complete the circuit, then just after closing key (K), the reading of current will be

AIPMT 1999



(a) zero in both A_1 and A_2
(b) maximum in both A_1 and A_2
(c) zero in A_1 and maximum in A_2
(d) maximum in A_1 and zero in A_2

310. A coil of inductance 1 H and resistance 100 Ω is connected to a battery of 6 V. Determine approximately:

(a) The time elapsed before the current acquires half of its steady - state value.

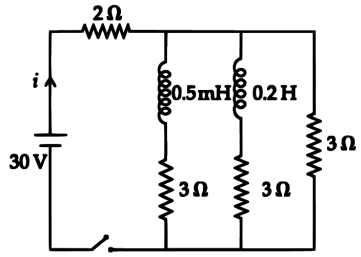
(b) The energy stored in the magnetic field associated with the coil at an instant 15 ms after the circuit is switched on. (Given $\ln 2 = 0.693, e^{-3/2} = 0.25$)

JEE MAIN 2022 · 29 JUL · SHIFT 1

(a) t = 10 ms; U = 2 mJ (b) t = 10 ms; U = 1 mJ
(c) t = 7 ms; U = 1 mJ (d) t = 7 ms; U = 2 mJ

311. For the given circuit the current i through the battery when the key is closed and the steady state has been reached is _____.

JEE MAIN 2021 · 1 SEP · SHIFT 2



(a) 6 A (b) 25 A (c) 10 A (d) 0 A

312. An inductor of 10 mH is connected to a 20V battery through a resistor of 10 kΩ and a switch. After a long time, when maximum current is set up in the circuit, the current is switched off. The current in the circuit after 1 μ s is $\frac{x}{100}$ mA. Then x is equal to _____. (Take $e^{-1} = 0.37$)

JEE MAIN 2021 · 25 JUL · SHIFT 1 *(Numerical)*

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ANSWER KEY

Shaded by level: **Easy**

01 AC Basics: Peak, RMS & Average Values

1. (c)	2. (c)	3. (c)	4. (c)	5. (d)	6. (a)	7. (d)	8. (d)	9. (b)	10. (c)
11. (d)	12. (d)	13. (a)	14. (b)	15. (b)	16. (b)	17. (c)	18. (c)	19. (d)	20. (a)
21. (d)	22. (b)	23. (b)	24. (b)	25. 8	26. (d)	27. (c)	28. (a)	29. (d)	30. (a)

02 Pure R, L and C Circuits

31. (b)	32. (c)	33. (b)	34. (c)	35. (b)	36. (b)	37. (a)	38. (c)	39. (d)	40. (d)
41. (c)	42. (c)	43. (a)	44. (b)	45. (a)	46. (c)	47. (c)	48. (a)	49. (d)	50. (a)
51. (d)	52. (d)	53. (b)	54. (d)	55. (d)	56. (d)	57. (d)	58. (c)	59. (d)	60. (d)
61. (d)	62. (a)	63. (b)	64. (a)	65. (c)	66. (a)	67. (a)	68. (c)	69. (d)	70. (a)
71. (b)	72. (b)	73. (a)	74. (a)	75. (c)	76. (c)	77. (b)	78. (b)	79. (d)	80. (c)
81. (c)	82. (d)	83. 22	84. (b)	85. (b)					

03 RL and RC Series Circuits

86. (b)	87. (c)	88. (b)	89. (d)	90. (a)	91. (d)	92. (b)	93. (d)	94. (b)	95. (d)
96. (d)	97. (d)	98. (b)	99. (b)	100. (d)	101. (b)	102. 1	103. (d)	104. (b)	105. (c)
106. (b)	107. (a)	108. (a)	109. (d)	110. (b)	111. (b)	112. (c)			

04 Series LCR Circuit

113. (b)	114. (c)	115. (c)	116. (a)	117. (b)	118. (d)	119. (a)	120. (c)	121. (d)	122. (d)
123. (b)	124. (a)	125. (a)	126. (b)	127. (c)	128. (b)	129. (b)	130. (a)	131. (b)	132. (d)
133. (a)	134. (b)	135. (a)	136. (c)	137. (d)	138. (c)	139. (d)			

05 Resonance, Bandwidth & Q Factor

140. (d)	141. (a)	142. (c)	143. (b)	144. (a)	145. (d)	146. (b)	147. (c)	148. (a)	149. (d)
150. (b)	151. (a)	152. (c)	153. (d)	154. (c)	155. (d)	156. (c)	157. (c)	158. (a)	159. 200
160. 2	161. 10	162. 3872	163. 100	164. 500	165. 5	166. 3	167. (d)	168. (d)	169. (d)
170. (c)	171. (d)	172. (a)	173. (d)	174. (a)	175. (d)	176. (b)	177. (b)	178. (a)	179. (d)
180. (c)	181. (a)	182. (c)	183. (d)	184. 242	185. 125	186. 4	187. (b)	188. (d)	189. (b)
190. (d)	191. (d)	192. (d)	193. (a)	194. (c)	195. (c)	196. (b)	197. (a)	198. (a)	199. (c)
200. (b)	201. (a)	202. (b)	203. (b)	204. 4	205. 10	206. 2000			

06 Power, Power Factor & Wattless Current

207. (d)	208. (d)	209. (c)	210. (c)	211. (c)	212. (c)	213. (d)	214. (c)	215. (b)	216. (d)
217. (d)	218. (a)	219. (c)	220. (b)	221. (b)	222. (d)	223. (c)	224. (c)	225. (a)	226. (d)
227. (d)	228. (b)	229. (a)	230. (a)	231. (c)	232. (a)	233. (d)	234. (c)	235. (b)	236. (b)
237. 1	238. (c)	239. (c)	240. (b)	241. (b)					

07 Parallel AC Circuits

242. (d)	243. (d)	244. (a)	245. (a)						

08 LC Oscillations

246. (c)	247. (a)	248. (d)	249. (a)	250. (d)	251. (a)	252. (a)	253. (c)	254. (c)	255. (d)
256. (c)	257. 9	258. (c)	259. (a)	260. (c)	261. (c)				

09 AC Generator & Transformer

262. (c)	263. (c)	264. (a)	265. (a)	266. (d)	267. 1584	268. (b)	269. (c)	270. (b)	271. (a)
272. (c)	273. (c)	274. (c)	275. (d)	276. (c)	277. (b)	278. (c)	279. (c)	280. (d)	281. (a)
282. (b)	283. (d)	284. (b)	285. (c)	286. (b)	287. (c)	288. (a)	289. (c)	290. (b)	291. (b)
292. (c)	293. (d)	294. (d)	295. (b)	296. (b)	297. (d)	298. (b)	299. (b)	300. (b)	301. (c)
302. (a)									

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10 Inductors & DC Transients (Mixed)

303. (d)	304. (b)	305. (d)	306. (c)	307. (d)	308. (a)	309. (d)	310. (c)	311. (c)	312. 74

Note: *"Bonus" = no option is correct as the question is printed (dropped in the official key). Numerical questions show the numerical answer.*

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