

Mastering Physics With Physics Guruji

DPP - Daily Practice Problems

Chapter-wise Sheets

Date : Start Time : End Time :

PHYSICS

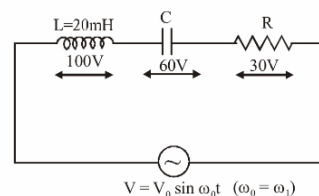
CP21

SYLLABUS : Alternating Current

Max. Marks : 120 **Marking Scheme :** (+4) for correct & (-1) for incorrect answer **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 30 MCQs. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. A coil of inductance 300 mH and resistance 2Ω is connected to a source of voltage 2V. The current reaches half of its steady state value in
(a) 0.1 s (b) 0.05 s (c) 0.3 s (d) 0.15 s
2. 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 :
(a) $V_a > V_b$ (b) $i_a > i_b$ (c) $V_a = V_b$ (d) $V_a < V_b$
3. Consider the RLC circuit shown below connected to an AC source of constant peak voltage V_0 and variable frequency ω_0 . The value of L is 20 mH. For a certain value $\omega_0 = \omega_1$, rms voltage across L, C, R are shown in the diagram. At $\omega_0 = \omega_2$, it is found that rms voltage across resistance is 50V. Then



- The value of ω_2 is
- (a) $\sqrt{\frac{3}{5}}\omega_1$ (b) $\sqrt{\frac{5}{3}}\omega_1$ (c) $\frac{5}{3}\omega_1$ (d) $\frac{3}{5}\omega_1$
4. A bulb is rated at 100 V, 100 W, it can be treated as a resistor. Find out the inductance of an inductor (called choke coil) that should be connected in series with the bulb to operate the bulb at its rated power with the help of an ac source of 200 V and 50 Hz.
(a) $\frac{\pi}{\sqrt{3}}\text{H}$ (b) 100 H (c) $\frac{\sqrt{2}}{\pi}\text{H}$ (d) $\frac{\sqrt{3}}{\pi}\text{H}$

RESPONSE GRID

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

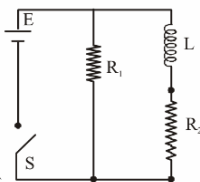
Space for Rough Work

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5. An inductor of inductance $L = 400$ mH and resistors of resistance $R_1 = 2\Omega$ and $R_2 = 2\Omega$ are connected to a battery of emf 12 V as shown in the figure. The internal resistance of the battery is negligible. The switch S is closed at $t = 0$. The potential drop across L as a function of time is



- (a) $\frac{12}{t} e^{-3t}$ V (b) $6(1 - e^{-t/0.2})$ V
 (c) $12e^{-5t}$ V (d) $6e^{-5t}$ V
6. An ac source of angular frequency ω is fed across a resistor r and a capacitor C in series. The current registered is I . If now the frequency of source is changed to $\omega/3$ (but maintaining the same voltage), the current in the circuit is found to be halved. The ratio of reactance to resistance at the original frequency ω is

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

7. An ideal coil of 10 H is connected in series with a resistance of 5Ω and a battery of 5 V. 2 second after the connection is made, the current flowing in ampere in the circuit is

- (a) $(1 - e^{-1})$ (b) $(1 - e)$ (c) e (d) e^{-1}

8. In a series LCR circuit $R = 200\Omega$ and the voltage and the frequency of the main supply is 220 V and 50 Hz respectively. On taking out the capacitance from the circuit the current lags behind the voltage by 30° . On taking out the inductor from the circuit the current leads the voltage by 30° . The power dissipated in the LCR circuit is

- (a) 305 W (b) 210 W (c) Zero W (d) 242 W

9. A fully charged capacitor C with initial charge q_0 is connected to a coil of self inductance L at $t = 0$. The time at which the energy is stored equally between the electric and the magnetic fields is:

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

10. Combination of two identical capacitors, a resistor R and a dc voltage source of voltage 6 V is used in an experiment on a (C-R) circuit. It is found that for a parallel combination of the capacitor the time in which the voltage of the fully charged combination reduces to half its original voltage is

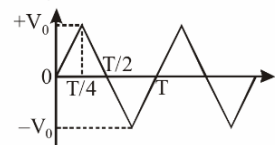
10 second. For series combination the time for needed for reducing the voltage of the fully charged series combination by half is

- (a) 10 second (b) 5 second
 (c) 2.5 second (d) 20 second

11. 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

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

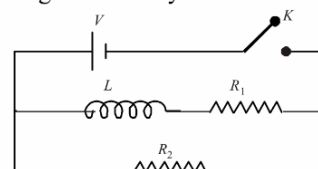
12. The voltage time (V-t) graph for triangular wave having peak value V_0 is as shown in figure. The rms value of V in time interval from $t = 0$ to $T/4$ is



$\frac{V_0}{\sqrt{x}}$ then find the value of x .

- (a) 5 (b) 4 (c) 7 (d) 3

13. In the circuit shown below, the key K is closed at $t = 0$. The current through the battery is



- (a) $\frac{VR_1R_2}{\sqrt{R_1^2 + R_2^2}}$ at $t = 0$ and $\frac{V}{R_2}$ at $t = \infty$

- (b) $\frac{V}{R_2}$ at $t = 0$ and $\frac{V(R_1 + R_2)}{R_1R_2}$ at $t = \infty$

- (c) $\frac{V}{R_2}$ at $t = 0$ and $\frac{VR_1R_2}{\sqrt{R_1^2 + R_2^2}}$ at $t = \infty$

- (d) $\frac{V(R_1 + R_2)}{R_1R_2}$ at $t = 0$ and $\frac{V}{R_2}$ at $t = \infty$

**RESPONSE
GRID**

5. (a)(b)(c)(d)

6. (a)(b)(c)(d)

7. (a)(b)(c)(d)

8. (a)(b)(c)(d)

9. (a)(b)(c)(d)

10. (a)(b)(c)(d)

11. (a)(b)(c)(d)

12. (a)(b)(c)(d)

13. (a)(b)(c)(d)

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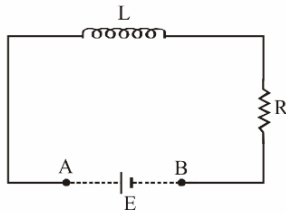
14. The tuning circuit of a radio receiver has a resistance of $50\ \Omega$, an inductor of $10\ \text{mH}$ and a variable capacitor. A $1\ \text{MHz}$ radio wave produces a potential difference of $0.1\ \text{mV}$. The values of the capacitor to produce resonance is (Take $\pi^2 = 10$)
 (a) $2.5\ \text{pF}$ (b) $5.0\ \text{pF}$ (c) $25\ \text{pF}$ (d) $50\ \text{pF}$
15. The instantaneous values of alternating current and voltages in a circuit are given as

$$i = \frac{1}{\sqrt{2}} \sin(100\pi t) \text{ amper}$$

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

The average power in Watts consumed in the circuit is :

- (a) $\frac{1}{4}$ (b) $\frac{\sqrt{3}}{4}$ (c) $\frac{1}{2}$ (d) $\frac{1}{8}$
16. An inductor ($L = 100\ \text{mH}$), a resistor ($R = 100\ \Omega$) and a battery ($E = 100\ \text{V}$) are initially connected in series as shown in the figure. After a long time the battery is disconnected after short circuiting the points A and B . The current in the circuit $1\ \text{ms}$ after the short circuit is

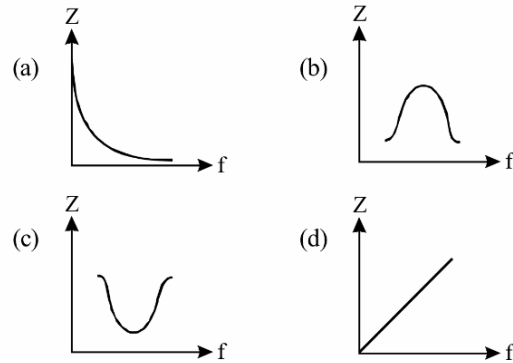


- (a) $1/eA$ (b) eA (c) $0.1\ \text{A}$ (d) $1\ \text{A}$
17. In an alternating current circuit in which an inductance and capacitance are joined in series, current is found to be maximum when the value of inductance is $0.5\ \text{henry}$ and the value of capacitance is $8\ \mu\text{F}$. The angular frequency of applied alternating voltage will be
 (a) $5000\ \text{rad/sec}$ (b) $4000\ \text{rad/sec}$
 (c) $2 \times 10^5\ \text{rad/sec}$ (d) $500\ \text{rad/sec}$

18. A coil has resistance $30\ \text{ohm}$ and inductive reactance $20\ \text{ohm}$ at $50\ \text{Hz}$ frequency. If an ac source, of $200\ \text{volt}$, $100\ \text{Hz}$, is connected across the coil, the current in the coil will be

- (a) $4.0\ \text{A}$ (b) $8.0\ \text{A}$ (c) $\frac{20}{\sqrt{13}}\ \text{A}$ (d) $2.0\ \text{A}$

19. Which one of the following curves represents the variation of impedance (Z) with frequency f in series LCR circuit?



20. The primary and secondary coil of a transformer have 50 and 1500 turns respectively. If the magnetic flux ϕ linked with the primary coil is given by $\phi = \phi_0 + 4t$, where ϕ is in webers, t is time in seconds and ϕ_0 is a constant, the output voltage across the secondary coil is
 (a) $120\ \text{volts}$ (b) $220\ \text{volts}$
 (c) $30\ \text{volts}$ (d) $90\ \text{volts}$

21. The primary winding of a transformer has 100 turns and its secondary winding has 200 turns. The primary is connected to an A.C. supply of $120\ \text{V}$ and the current flowing in it is $10\ \text{A}$. The voltage and the current in the secondary are
 (a) $240\ \text{V}, 5\ \text{A}$ (b) $240\ \text{V}, 10\ \text{A}$
 (c) $60\ \text{V}, 20\ \text{A}$ (d) $120\ \text{V}, 20\ \text{A}$

22. The current in a LR circuit builds up to $\frac{3}{4}$ th of its steady state value in $4\ \text{s}$. The time constant of this circuit is
 (a) $\frac{1}{\ln 2}\ \text{s}$ (b) $\frac{2}{\ln 2}\ \text{s}$ (c) $\frac{3}{\ln 2}\ \text{s}$ (d) $\frac{4}{\ln 2}\ \text{s}$

**RESPONSE
GRID**

14. (a) (b) (c) (d) 15. (a) (b) (c) (d) 16. (a) (b) (c) (d) 17. (a) (b) (c) (d) 18. (a) (b) (c) (d)
 19. (a) (b) (c) (d) 20. (a) (b) (c) (d) 21. (a) (b) (c) (d) 22. (a) (b) (c) (d)

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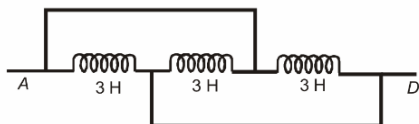
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23. A coil of resistance $50\ \Omega$ is connected across a $5.0\ \text{V}$ battery. $0.1\ \text{s}$ after the battery is connected, the current in the coil is $60\ \text{mA}$. Calculate the inductance of the coil.
 (a) $5.5\ \text{H}$ (b) $1.5\ \text{H}$ (c) $2.5\ \text{H}$ (d) $9.5\ \text{H}$

24. The inductance between A and D is



- (a) $3.66\ \text{H}$ (b) $9\ \text{H}$ (c) $0.66\ \text{H}$ (d) $1\ \text{H}$
25. An LCR series circuit is connected to a source of alternating current. At resonance, the applied voltage and the current flowing through the circuit will have a phase difference of

- (a) π (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{4}$ (d) 0

26. In an electrical circuit R , L , C and an a.c. voltage source are all connected in series. When L is removed from the circuit, the phase difference between the voltage the current in the circuit is $\pi/3$. If instead, C is removed from the circuit, the phase difference is again $\pi/3$. The power factor of the circuit is:

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

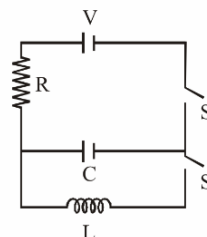
27. A $100\ \mu\text{F}$ capacitor in series with a $40\ \Omega$ resistance is connected to a $110\ \text{V}$, $60\ \text{Hz}$ supply.

What is the maximum current in the circuit?

- (a) $3.24\ \text{A}$ (b) $4.25\ \text{A}$ (c) $2.25\ \text{A}$ (d) $5.20\ \text{A}$

28. The core of any transformer is laminated so as to
 (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

29. In an LCR circuit as shown below both switches are open initially. Now switch S_1 is closed, S_2 kept open. (q is charge on the capacitor and $\tau = RC$ is Capacitive time constant). Which of the following statement is correct?



- (a) Work done by the battery is half of the energy dissipated in the resistor
 (b) At, $t = \tau$, $q = CV/2$
 (c) At, $t = 2\tau$, $q = CV(1 - e^{-2})$
 (d) At, $t = 2\tau$, $q = CV(1 - e^{-1})$

30. An AC generator of $220\ \text{V}$ having internal resistance $r = 10\ \Omega$ and external resistance $R = 100\ \Omega$. What is the power developed in the external circuit?

- (a) $484\ \text{W}$ (b) $400\ \text{W}$ (c) $441\ \text{W}$ (d) $369\ \text{W}$

**RESPONSE
GRID**

23. (a)(b)(c)(d) 24. (a)(b)(c)(d) 25. (a)(b)(c)(d) 26. (a)(b)(c)(d) 27. (a)(b)(c)(d)
 28. (a)(b)(c)(d) 29. (a)(b)(c)(d) 30. (a)(b)(c)(d)

DAILY PRACTICE PROBLEM DPP CHAPTERWISE CP21 - PHYSICS

Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	45	Qualifying Score	60
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct \times 4) – (Incorrect \times 1)			

Space for Rough Work