1. The r.m.s. value of current for a variable current $i=i_1 \cos \omega t + i_2 \sin \omega t$:–

(1) $\frac{1}{\sqrt{2}}(i_1 + i_2)$ (2) $\frac{1}{\sqrt{2}}(i_1 + i_2)^2$

(3) $\frac{1}{\sqrt{2}}(i_1^2 + i_2^2)^{1/2}$ (4) $\frac{1}{2}(i_1^2 + i_2^2)^{1/2}$

2. The phase difference between current and voltage in an AC circuit is $\frac{\pi}{4}$ radian, If the frequency of AC is 50 Hz, then the phase difference is equivalent to the time difference:-

(1) 0.78 s (2) 15.7 ms
(3) 2.5 s (4) 2.5 ms

3. A capacitor of capacity C is connected in A.C. circuit. The applied emf is $V=V_0 \sin\omega t$, then the current is :

(1) $I = \frac{V_0}{\omega L}\sin\omega t$

(2) $I = \frac{V_0}{\omega L}\sin(\omega t + \pi/2)$

(3) $I = V_0\, \omega C \sin\omega t$
(4) $I = V_0\, \omega C \sin(\omega t + \pi/2)$

4. In the L–R circuit R = 10Ω and L = 2H. If 120 V, 60 Hz alternating voltage is applied then the flowing current in this circuit will be :-

(1) 0.32 A (2) 0.16 A
(3) 0.48 A (4) 0.80 A

5. A capacitor of capacitance 100 μF & a resistance of 100Ω is connected in series with AC supply of 220V, 50Hz. The current leads the voltage by .....

(1) $\tan^{-1}\left(\frac{1}{2\pi}\right)$ (2) $\tan^{-1}\left(\frac{1}{\pi}\right)$

(3) $\tan^{-1}\left(\frac{2}{\pi}\right)$ (4) $\tan^{-1}\left(\frac{4}{\pi}\right)$

6. For a series R-L-C circuit :-
(a) Voltage across L and C are differ by π
(b) Current through L and R are in same phase
(c) Voltage across R and L differ by π/2
(d) Voltage across L and current through C are differ by π/2

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

7. In a series LCR circuit voltage across resister, inductor and capacitor are 1V, 3V and 2V respectively. At the instant t when the source voltage is given by :
$V=V_0 \cos \omega t$, the current in the circuit will be :

(1) $I = I_0 \cos\left(\omega t + \frac{\pi}{4}\right)$ (2) $I=I_0 \cos\left(\omega t - \frac{\pi}{4}\right)$

(3) $I = I_0 \cos\left(\omega t + \frac{\pi}{3}\right)$ (4) $I=I_0 \cos\left(\omega t - \frac{\pi}{3}\right)$

8. In LCR circuit, the voltage across the terminals of a resistance, inductance & capacitance are 40V, 30V & 60V, then the voltage across the main source will be –

(1) 130 volt (2) 100 volt
(3) 70 volt (4) 50 volt

9. Which of the following combinations should be selected for better tuning of an L-C-R circuit used for communication ?
(1) R = 15 Ω, L = 3.5 H, C = 30 μF
(2) R = 25 Ω, L = 1.5 H, C = 45 μF
(3) R = 20 Ω, L = 1.5 H, C = 35 μF
(4) R = 25 Ω, L = 2.5 H, C = 45 μF

10. 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 :-

(1) 0.8 (2) 1.0 (3) 0.4 (4) 0.5

11. When 100 volts d.c. is applied across a solenoid a current of 1.0 amp. flows in it. When 100 volt a.c. is applied across the same coil, the current drops to 0.5 amp. If the frequency of the a.c. source is 50 Hz the impedance and inductance of the solenoid are :–
(1) 200 ohm and 0.55 H
(2) 100 ohm and 0.86 H
(3) 200 ohm and 1.0 H
(4) 100 ohm and 0.93 H

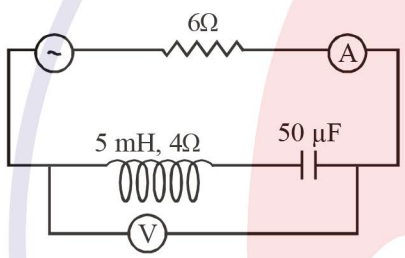
12. An inductance L, a capacitance C and resistance R may be connected to an AC source of angular frequency ω, in three different combinations of RC, RL and RLC in series. Assume that $\omega L = \frac{1}{\omega C}$. The power drawn by the three combinations are P_1, P_2, P_3 respectively. Then :-

(1) $P_1 > P_2 > P_3$ (2) $P_1 = P_2 < P_3$
(3) $P_1 = P_2 > P_3$ (4) $P_1 = P_2 = P_3$

13. The inductance of the oscillatory circuit of a radio station is 10 milli henry and its capacitance is 0.25μF. Taking the effect of the resistance negligible, wavelength of the broadcasted waves will be (velocity of light = 3.0×10^8 m/s, $\pi = 3.14$):
(1) 9.42×10^4 m (2) 18.8×10^4 m
(3) 4.5×10^4 m (4) none of these

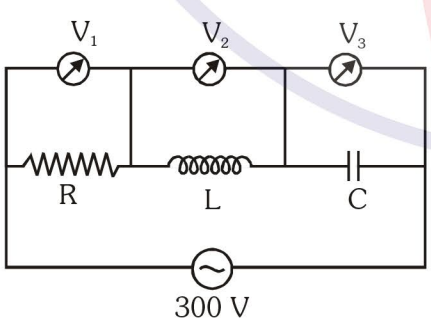
14. A coil has an inductance of 0.7 henry and is joined in series with a resistance of 220 Ω. When the alternating emf of 220 V at 50 Hz is applied to it then the phase through which current lags behind the applied emf and the wattless componenet of current in the circuit will be respectively
(1) 30°, 1 A (2) 45°, 0.5 A
(3) 60°, 1.5 A (4) none of these

15. In the circuit shown in the figure, the A.C. source gives a voltage V = 20 cos (2000 t) volt neglecting source resistance, the voltmeter and ammeter readings will be :



(1) 0V, 1.4A (2) 5.6V, 1.4A
(3) 0V, 0.47 A (4) 1.68 V, 0.47 A

16. The figure shows a LCR network connected to 300 V a.c. supply. The circuit elements are such that $R = X_L = X_C = 10\Omega$. V_1, V_2 and V_3 are three a.c. voltmeters connected as shown in the figure. Which of the following represents the correct set of readings of the voltmeters ?



(1) $V_1 = 100$ V, $V_2 = 100$ V, $V_3 = 100$ V
(2) $V_1 = 150$ V, $V_2 = 0$ V, $V_3 = 150$ V
(3) $V_1 = 300$ V, $V_2 = 100$ V, $V_3 = 100$ V
(4) $V_1 = 300$ V, $V_2 = 300$ V, $V_3 = 300$ V

17. In a series resonant R-L-C circuit, if L is increased by 25% and C is decreased by 20%, then the resonant frequency will :
(1) Increases by 10% (2) Decreases by 10%
(3) Remain unchanged (4) Increases by 2.5%

18. In a series R-L-C circuit, the frequency of the source is half of the resonance frequency. The nature of the circuit will be
(1) capacitive (2) inductive
(3) purely resistive (4) data insufficient

19. An ideal efficient transformer has a primary power input of 10kW. The secondary current when the transformer is on load is 25A. If the primary : secondary turns ratio is 8 : 1, then the potential difference applied to the primary coil is

(1) $\frac{10^4 \times 8^2}{25}$ V (2) $\frac{10^4 \times 8}{25}$ V

(3) $\frac{10^4}{25 \times 8}$ V (4) $\frac{10^4}{25 \times 8^2}$ V

20. The core of any transformer is laminated so as to -
(1) Make it light weight
(2) Make it robust and strong
(3) Increase the secondary voltage
(4) Reduce the energy loss due to eddy current

21. If $\vec{E}$ and $\vec{B}$ are the electric and magnetic field vectors of electromagnetic waves then the direction of propagation of electromagnetic wave is along the direction of –

(1) $\vec{E}$ (2) $\vec{B}$

(3) $\vec{E} \times \vec{B}$ (4) none of these

22. In an electromagnetic wave the average energy density is associated with –
(1) electric field only
(2) magnetic field only
(3) equally with electric and magnetic fields
(4) average energy density is zero

23. Electromagnetic wave of intensity 1400 W/m² falls on metal surface on area 1.5 m² is completely absorbed by it. Find out force exerted by beam.
(1) 14×10^{-5} N (2) 14×10^{-6} N
(3) 7×10^{-5} N (4) 7×10^{-6} N

24. A point source of power 15 W is placed at a certain point in the space. The amplitude of magnetic field at a distance of 2 meter from source is :
(1) 5×10^{-8} T (2) 6×10^{-8} T
(3) 10×10^{-8} T (4) 1×10^{-8} T

25. For an EMWave,

$$E = E_0 \sin 12 \times 10^6 [Z - 2 \times 10^8 t] \frac{N}{C}$$

in a medium, then its refractive index is
(1) 2/3 (2) 3/2 (3) 4/3 (4) 5/3

26. The dimensions of $(\mu_0 \in_0)^{-1/2}$ are :
(1) $[L^{1/2}T^{-1/2}]$ (2) $[L^{-1}T]$
(3) $[LT^{-1}]$ (4) $[L^{-1/2}T^{1/2}]$

27. The electric and the magnetic field, associated with an e.m. wave, propagating along the +z-axis, can be represented by :-

(1) $\left[\vec{E} = E_0\hat{i}, \vec{B} = B_0\hat{j}\right]$

(2) $\left[\vec{E} = E_0\hat{k}, \vec{B} = B_0\hat{i}\right]$

(3) $\left[\vec{E} = E_0\hat{j}, \vec{B} = B_0\hat{i}\right]$

(4) $\left[\vec{E} = E_0\hat{j}, \vec{B} = B_0\hat{k}\right]$

28. The decreasing order of wavelength of infrared, microwave, ultraviolet and gamma rays is :
(1) microwave, infrared, ultraviolet, gamma rays
(2) gamma rays, ultraviolet, infrared, microwaves
(3) microwaves, gamma rays, infrared, ultraviolet
(4) infrared, microwave, ultraviolet, gamma rays

29. A radiation of energy 'E' falls normally on a perfectly reflecting surface. The momentum transferred to the surface is (C = Velocity of light) :-

(1) $\frac{2E}{C}$ (2) $\frac{2E}{C^2}$ (3) $\frac{E}{C^2}$ (4) $\frac{E}{C}$

30. A source of power 600 kW emits photon which incident on a surface 2.5 m away out of which 50% is reflected back, what is the radiation pressure on the surface ?
(1) 3.9×10^{-5} Pa
(2) 7.8×10^{-5} Pa
(3) 11.7×10^{-5} Pa
(4) 15.6×10^{-5} Pa

ANSWER KEY — Exercise-I

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	4	4	2	2	4	2	4	1	1
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	1	2	1	2	2	4	3	1	2	4
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	3	3	4	1	2	3	1	1	1	1