

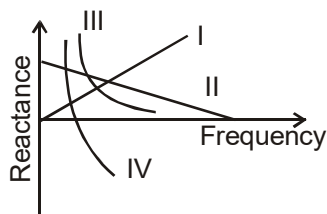
Choose the correct answer :

1. An L - R circuit has a cell of emf E , which is switched on at time $t = 0$. The current in the circuit after switched on at $t = 0$, will be
 - (1) Zero
 - (2) $\frac{E}{R}$
 - (3) $\frac{E}{L}$
 - (4) $\frac{E}{\sqrt{L^2 + R^2}}$
2. The ratio of secondary to the primary turns in a transformer is 5 : 4. If the power output be P , then the input power neglecting all losses must be equal to
 - (1) $1.25 P$
 - (2) $0.8 P$
 - (3) P
 - (4) $1.44 P$
3. Power delivered by the source of the alternating circuit to a series LCR circuit becomes maximum when
 - (1) $\omega L = \omega C$
 - (2) $\omega L = \frac{1}{\omega C}$
 - (3) $\omega L = \left(\frac{1}{\omega C}\right)^2$
 - (4) $\omega L = \sqrt{\omega C}$
4. A circuit consists of 3 ohm resistance and 4 ohm reactance. The power factor of the circuit is
 - (1) 0.4
 - (2) 0.6
 - (3) 0.8
 - (4) 1.0
5. The phase difference between the current and voltage of LCR circuit in series combination at resonance is
 - (1) 0
 - (2) $\frac{\pi}{2}$
 - (3) π
 - (4) $-\pi$
6. In an ac circuit, the current lags behind the voltage by $\frac{\pi}{3}$. The components in the circuit are
 - (1) R and L
 - (2) R and C
 - (3) L and C
 - (4) Only R
7. Two coils have a mutual inductance 0.05 H. The current changes in the first coil according the equation $I = I_0 \sin \omega t$, where $I_0 = 5A$ and $\omega = 50\pi$ rad/s. The maximum value of emf in the second coil is
 - (1) 1.25π
 - (2) 12.5π
 - (3) 25.0π
 - (4) 2.5π
8. The dimension of the quantity $\frac{RCV}{L}$ is
 - (1) $[MLTA^{-1}]$
 - (2) $[M^0L^0TA^{-2}]$
 - (3) $[M^0LTA^0]$
 - (4) $[M^0L^0T^0A]$
9. A capacitor of capacitance C and resistance R are joined in series and connected by a source of frequency ω . Power dissipated in the circuit is
 - (1) $\left(R^2 + \frac{1}{\omega^2 C^2}\right)$
 - (2) $\frac{V^2 R}{\left(R^2 + \frac{1}{\omega^2 C^2}\right)}$
 - (3) $\frac{V}{\left(R^2 + \frac{1}{\omega^2 C^2}\right)}$
 - (4) $\frac{\sqrt{R^2 + \frac{1}{\omega^2 C^2}}}{V^2}$
10. An inductor L and a capacitor C are connected in the circuit as shown in the figure. The frequency of power supply is equal to the resonant frequency of the circuit. Which ammeter will read zero?

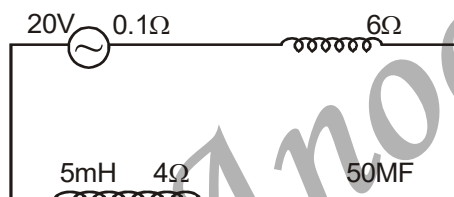
$E = E_0 \sin \omega t$

 - (1) A_1
 - (2) A_2
 - (3) A_3
 - (4) None of there
11. For a series RLC circuit, $R = X_L = 2X_C$. The impedance of the circuit and phase difference between V and i will be
 - (1) $\frac{\sqrt{5}R}{2}, \tan^{-1}(2)$
 - (2) $\frac{\sqrt{5}R}{2}, \tan^{-1}\left(\frac{1}{2}\right)$
 - (3) $\sqrt{5} X_C, \tan^{-1}(2)$
 - (4) $\sqrt{5} R, \tan^{-1}\left(\frac{1}{2}\right)$

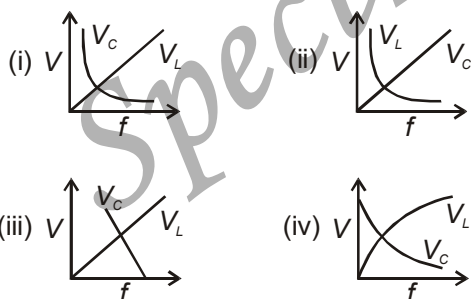
12. Which of the following plots may represent the variation of reactance of a series LC combination?



- (1) I (2) II
(3) III (4) IV
13. An electric bulb of 100 W–300 V is connected with an AC supply of 500 V and $\left(\frac{150}{\pi}\right)$ Hz. The required inductance to save the electric bulb is
- (1) 2H (2) $\frac{1}{2}$ H
(3) 4H (4) $\frac{1}{4}$ H
14. In the circuit given below, the AC source has voltage $20 \cos \omega t$ with $\omega = 2000$ rad/s. The amplitude of the current will be nearest to



- (1) 2 A (2) 3.3 A
(3) $\frac{2}{\sqrt{5}}$ A (4) $\sqrt{5}$ A
15. In a series LCR circuit, the source frequency f is varied, but the current is kept unchanged. Which of the following curves shows changes of V_C and V_L with frequency?



- (1) (i) (2) (ii)
(3) (iii) (4) (iv)

16. With increase in frequency of an AC supply, the impedance of an L–C–R series circuit

- (1) Remains constant
(2) Increases
(3) Decreases
(4) Decreases at first, becomes minimum and then increases

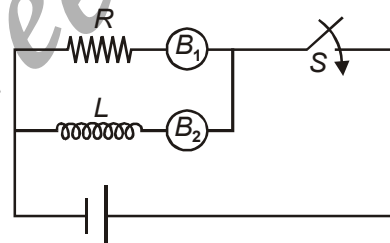
17. If an alternating voltage is given by $e = e_1 + e_2 \sin \omega t$, then the root mean square value of the voltage is given by

- (1) $\sqrt{e_1^2 + \frac{e_2^2}{2}}$ (2) $\sqrt{\frac{e_1^2 + e_2^2}{2}}$
(3) $\sqrt{e_1^2 + e_2^2}$ (4) $\sqrt{\frac{e_1 e_2}{2}}$

18. A direct current of 4A and an alternating current having a maximum value of 4A flow through two identical resistance. The ratio of heat produced in the two resistance will be

- (1) 1 : 1 (2) 2 : 1
(3) 1 : 2 (4) 4 : 1

19. Figure shows two bulbs B_1 and B_2 resistor R and inductor L , when the switch S is turned off

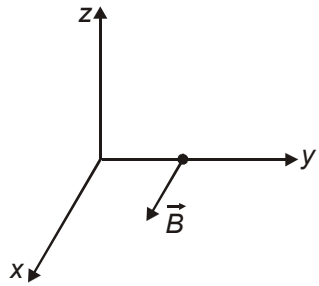


- (1) Both B_1 and B_2 die out promptly
(2) Both B_1 and B_2 die out with some delay
(3) B_2 dies out promptly, but B_1 with some delay
(4) B_1 dies out promptly, but B_2 with some delay
20. If L and R denote inductance and resistance respectively, then the dimension of $\frac{R}{L}$ is

- (1) $[M^0 L^0 T^{-1}]$ (2) $[M^0 L^1 T^{-1}]$
(3) $[M^1 L^0 T^{-1}]$ (4) $[M^0 L^0 T^{-1}]$

Answer Keys at Page No: 148

Choose the correct answer :

1. Red light differs from blue light in its
 (1) Speed (2) Frequency
 (3) Intensity (4) Amplitude
2. Which has the largest wavelength?
 (1) Radio wave (2) X-ray
 (3) Ultraviolet ray (4) Infra-red ray
3. In an electromagnetic wave, the amplitude of electric field is 1 V/m. What is average energy density of electric field?
 (1) $2.2 \times 10^{-12} \text{ J/m}^3$ (2) $4.4 \times 10^{-12} \text{ J/m}^3$
 (3) $3 \times 10^{-9} \text{ J/m}^3$ (4) $12 \times 10^{-12} \text{ J/m}^3$
4. Electromagnetic wave is deflected by
 (1) Electric field
 (2) Magnetic field
 (3) Both of (1) & (2)
 (4) Neither electric field nor magnetic field
5. The speed of electromagnetic waves depends upon
 (1) Electric field
 (2) Magnetic field
 (3) Intensity
 (4) Medium, in which it travels
6. Refractive index of a medium is given by
 (1) $\sqrt{\mu_r \epsilon_r}$ (2) $\sqrt{\mu_0 \epsilon_0}$
 (3) $\frac{1}{\sqrt{\mu_r \epsilon_r}}$ (4) $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$
7. Displacement current is set up between the plates of the capacitor when the potential difference across the plates is
 (1) Maximum (2) Zero
 (3) Minimum (4) Varying
8. If \vec{E} and \vec{B} represent the electric and magnetic field vectors of the electromagnetic waves, then the direction of propagation of the electromagnetic waves is that of
 (1) \vec{E} (2) \vec{B}
 (3) $\vec{E} \times \vec{B}$ (4) $\vec{B} \times \vec{E}$
9. Which of the following pairs of space and time varying electric and magnetic field $\vec{E} \times \vec{B}$ would generate a plane electromagnetic wave travelling in y-direction?
 (1) E_x, B_y (2) E_z, E_x
 (3) E_y, B_x (4) E_y, B_z
10. If an electromagnetic wave propagating through vacuum is describe by
 $E_y = E_0 \sin(kx - \omega t); B_z = B_0 \sin(kx - \omega t)$, then
 (1) $E_0 k = B_0 \omega$ (2) $E_0 B_0 = \omega k$
 (3) $E_0 \omega = B_0 k$ (4) $E_0 B_0 = \frac{\omega}{k}$
11. Out of the following, choose the ray which does not travel with the velocity of light
 (1) X-ray (2) Microwave
 (3) γ -rays (4) β -rays
12. In a plane electromagnetic wave, which of the following have zero average value?
 (a) Magnetic field (b) Magnetic energy
 (c) Electric field (d) Electric energy
 (1) (a), (c) (2) (b), (c)
 (3) (a), (d) (4) All of these
13. The ratio of amplitude B_0 and E_0 of the magnetic and electric fields associated with an electromagnetic wave is
 (1) $\frac{1}{c}$ (2) c
 (3) c^2 (4) $\frac{1}{c^2}$
14. The figure gives the magnetic field of an electromagnetic wave at a certain point and at a certain instant. The wave transports energy in negative y-direction. Then the direction of electric field at this point and instant is


15. The amplitude of electric field at a distance r from a source of power P is (taking 100% efficiency)

(1) $\sqrt{\frac{P}{2\pi r^2 c \epsilon_0}}$

(2) $\sqrt{\frac{P}{4\pi r^2 c \epsilon_0}}$

(3) $\sqrt{\frac{P}{8\pi r^2 c \epsilon_0}}$

(4) $\frac{P}{2\pi r^2 c \epsilon_0}$

16. Which of the following pairs of electric and magnetic field vector represent an electromagnetic wave travelling along negative Z-axis?

(1) $E = E_0 \sin(\omega t - kz)\hat{j}$, $B = B_0 \sin(\omega t - kz)\hat{j}$

(2) $E = E_0 \sin(\omega t + kz)\hat{j}$, $B = B_0 \sin(\omega t + kz)\hat{i}$

(3) $E = E_0 \sin(\omega t + kz)\hat{i}$, $B = B_0 \sin(\omega t + kz)\hat{j}$

(4) $E = E_0 \sin(\omega t - kz)\hat{j}$, $B = B_0 \sin(\omega t - kz)\hat{i}$

17. If ϵ , ϕ and t stand for permittivity, electric flux and time respectively, then dimensions of $\epsilon \cdot \frac{d\phi}{dt}$ is same as that

- (1) Speed (2) Current
(3) Charge (4) Potential difference

18. Ozone layer blocks the radiation of wavelength

- (1) Less than 4×10^{-7} m
(2) Between 4×10^{-7} m to 8×10^{-7} m
(3) More than 8×10^{-7} m
(4) None of these

19. Choose the incorrect statement

- (1) EM waves are produced by accelerated charge
(2) Heat radiations are a type of EM waves
(3) Speed of EM waves in vacuum is the same for all intensities and frequencies
(4) Speed of EM waves is same in all media

20. A free proton is placed in path of an EM wave. The proton starts moving

- (1) In the direction of the poynting vector
(2) Along the direction of electric field
(3) Along the direction of magnetic field
(4) In a direction perpendicular to both electric and magnetic field

Answer Keys Alternating Current

- | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|
| 1. (1) | 2. (3) | 3. (2) | 4. (2) | 5. (1) | 6. (1) | 7. (2) |
| 8. (4) | 9. (2) | 10. (3) | 11. (2) | 12. (4) | 13. (3) | 14. (1) |
| 15. (1) | 16. (4) | 17. (1) | 18. (2) | 19. (2) | 20. (4) | |

Answer Keys Electromagnetic Waves

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|---------|---------|---------|---------|---------|---------|---------|
| 1. (2) | 2. (1) | 3. (1) | 4. (4) | 5. (4) | 6. (1) | 7. (4) |
| 8. (3) | 9. (2) | 10. (1) | 11. (4) | 12. (1) | 13. (1) | 14. (2) |
| 15. (1) | 16. (2) | 17. (2) | 18. (1) | 19. (4) | 20. (2) | |

