



## PHYSICS

### BOOKS - NEET PREVIOUS YEAR (YEARWISE + CHAPTERWISE)

### ALTERNATING CURRENT AND ELECTROMAGNETIC WAVES

#### Physics

1. if  $\lambda_v$ ,  $\lambda_x$  and  $\lambda_m$  represent the wavelengths of visible light X-rays and microwaves respectively then:

A.  $\lambda_m > \lambda_X > \lambda_v$

B.  $\lambda_v > \lambda_m > \lambda_x$

C.  $\lambda_m > \lambda_v > \lambda_x$

D.  $\lambda_v > \lambda_x > \lambda_m$

**Answer: C**



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2. In a circuit  $L$ ,  $C$  and  $R$  are connected in series with an alternating voltage source of frequency  $f$ . The current lead the voltages by  $45^\circ$ . The value of  $C$  is :

A.  $\frac{1}{2\pi f(2\pi fL + R)}$

B.  $\frac{1}{\pi f(2\pi fL + R)}$

C.  $\frac{1}{2\pi(2\pi fL - R)}$

D.  $\frac{1}{\pi f(2\pi fL - R)}$

**Answer: C**



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**3. Which of the following are not electromagnetic waves ?**

A.  $\beta$  – rays

B. Heat rays

C.  $X$  – rays

D.  $\gamma$  – rays

**Answer: A**



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4. For a series L C R circuit, the power loss at resonance is

A.  $\frac{V_2}{\omega L - \frac{1}{\omega C}}$

B.  $i^2 C \omega$

C.  $i^2 R$

D.  $\frac{V^2}{\omega C}$

**Answer: C**



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5. Which of the following has minimum wavelength?

A.  $X$  – rays

B. ultraviolet rays

C.  $\gamma$  – rays

D. Cosmic rays

**Answer: D**



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6. The velocity of electromagnetic wave is along the direction of

A.  $B \times E$

B.  $E \times B$

C.  $E$

D.  $B$

**Answer: B**



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7. What is the cause of "Green house effect"?

A. Infrared rays

B. Ultraviolet rays

C. X-rays

D. Radio-waves

**Answer: A**



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8. In a certain region of space electric field  $E$  and magnetic field  $B$  are perpendicular to each other and an electron enters region perpendicular to the direction of  $B$  and  $E$  both and moves undeflected, then velocity of electron is

A.  $\frac{|E|}{|B|}$

B.  $E \times B$

C.  $\frac{|B|}{|E|}$

D.  $E \cdot B$

**Answer: A**



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9. The reactance of a capacitor of capacitance  $C$  is  $X$ . If both the frequency and capacitance be doubled, then new reactance will be

A.  $X$



B.  $2X$

C.  $4X$

D.  $\frac{X}{4}$

**Answer: D**



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**10.** A wire of resistance  $R$  is connected in series with an inductor of reactance  $\omega L$ . Then quality factor of  $RL$  circuit is

A.  $\frac{R}{\omega L}$

B.  $\frac{\omega L}{R}$

C.  $\frac{R}{\sqrt{R^2 + \omega^2 L^2}}$

D.  $\frac{\omega L}{\sqrt{R^2 + \omega^2 L^2}}$

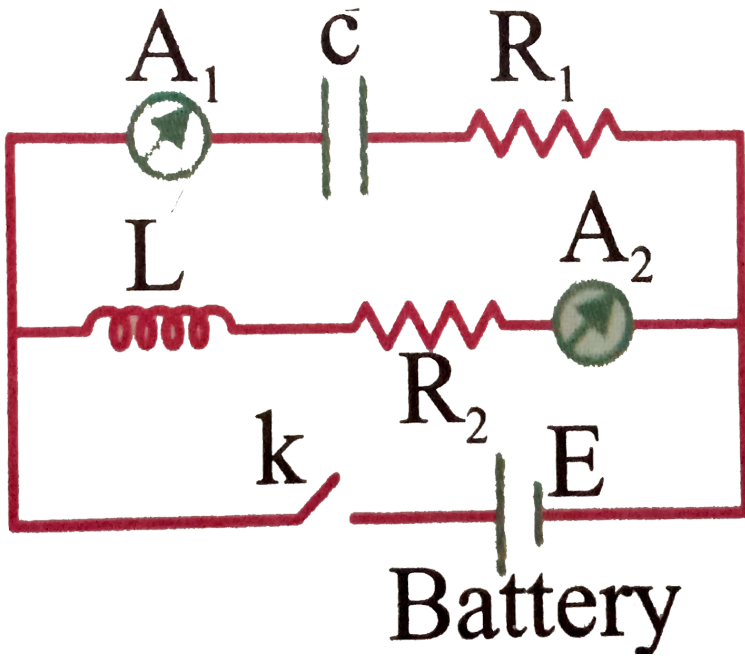
**Answer: B**



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**11.** In a circuit inductance  $L$  and capacitance  $C$  are connected as shown in figure and  $A_1$  and  $A_2$  are ammeters. When key  $k$  is pressed to complete the circuit, then just after closing key  $k$ , the reading of  $A_1$

and  $A_2$  will be:



- 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 both  $A_1$  and zero in  $A_2$

**Answer: D**



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12. The electromagnetic radiations are caused by

- A. A stationary charge
- B. uniformly moving charges
- C. accelerated charges
- D. All of the above

**Answer: C**



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**13.** Ozone layer blocks the radiations of wave length

- A. less than  $3 \times 10^{-7}m$
- B. equal to  $3 \times 10^{-7}m$
- C. more than  $3 \times 10^{-7}m$
- D. All of the above

**Answer: A**



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**14.** A step up transformer operates on a  $230V$  line and a load current of 2 ampere. The ratio of the primary

and secondary windings is  $1:25$ . What is the current in the primary?

A.  $15A$

B.  $50A$

C.  $25A$

D.  $12.5A$

**Answer: B**



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**15.** If  $\epsilon_0$  and  $\mu_0$  are respectively the electric permittivity and the magnetic permeability of free space and  $\epsilon$  and

$\mu$  the corresponding quantities in a medium, the refractive index of the medium is

A.  $\sqrt{\frac{\epsilon_0 \mu_0}{\epsilon \mu}}$

B.  $\sqrt{\frac{\epsilon \mu}{\epsilon_0 \mu_0}}$

C.  $\sqrt{\frac{\epsilon_0 \mu}{\epsilon \mu_0}}$

D.  $\sqrt{\frac{\epsilon}{\epsilon_0}}$

**Answer: B**



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**16.** The primary winding of transformer has 500 turns whereas its secondary has 5000 turns. The primary is

connected to an ac supply of  $20V, 50Hz$ . The secondary will have an output of

- A.  $2V, 5Hz$
- B.  $200V, 500Hz$
- C.  $2V, 50Hz$
- D.  $200V, 50Hz$

**Answer: D**



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**17.** In an  $AC$  circuit with voltage  $V$  and current  $I$ , the power dissipated is



A. Depends on the phase between  $V$  and  $I$

B.  $\frac{1}{\sqrt{2}} V_i$

C.  $\frac{1}{2} V_i$

D.  $v_i$

**Answer: A**



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**18.** In an experiment, 200V AC is applied at the end of an LCR circuit. The circuit consists of an inductive reactance

$(X_L) = 50\Omega$ , capacitive reactance

( $X_c L = 50\Omega$ , and capacitive resistance

( $R = 10\Omega$ ), The impedance of the circuit is

A.  $10\Omega$

B.  $20\Omega$

C.  $30\Omega$

D.  $40\Omega$

**Answer: A**



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**19.** The oscillating electric and magnetic vectors of an electromagnetic wave are oriented along

A. the same direction and in phase

B. the same direction but have a phase difference of  $90^\circ$

C. mutually perpendicular direction and are in phase

D. mutually perpendicular direction but has a phase difference of  $90^\circ$

**Answer: C**



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20. An  $LCR$  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.  $\pi$

B.  $\frac{\pi}{2}$

C.  $\frac{\pi}{4}$

D. zero

**Answer: D**



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21. In an  $AC$  circuit, the mass value of the current  $I_{\text{rms}}$  is related to the peak current  $I_0$  as

A.  $i_{rms} = \sqrt{2}i_0$

B.  $i_{rms} = \pi i_0$

C.  $i_{rms} = \frac{i_0}{\pi}$

D.  $i_{rms} = \frac{1}{\sqrt{2}}i_0$

**Answer: D**



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22. A signal emitted by an antenna from a certain point can be received at another point of the surface in the

form of

- A. sky wave
- B. ground wave
- C. sea wave
- D. Both A And C

**Answer: D**



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**23.** The time constant of C-R circuit is

A.  $\frac{1}{CR}$

B.  $\frac{C}{R}$

C.  $CR$

D.  $\frac{R}{C}$

**Answer: C**



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**24.** The structure of solids is investigated by using

A. cosmic rays

B. X-rays

C.  $\gamma$  – rays

D. infrared waves

**Answer: C**



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**25.** The frequency of *e. m* wave which is best suit to observe a particle of radius  $3 \times 10^{-4}$  is of order of:

A.  $10^{15}$

B.  $10^{14}$

C.  $10^{13}$

D.  $10^{12}$

**Answer: B**



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26. Which of the following is the longest wave?

A.  $X$  – rays

B.  $\gamma$  – rays

C. Microwaves

D. Radiowaves

**Answer: D**



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27. The frequencies of  $X$ -rays,  $\gamma$ -rays and ultraviolet rays are respectively  $a$ ,  $b$  and  $c$ . Then

A.  $a > b > c$

B.  $a < b < c$

C.  $a = b = c$

D.  $a > c > b$

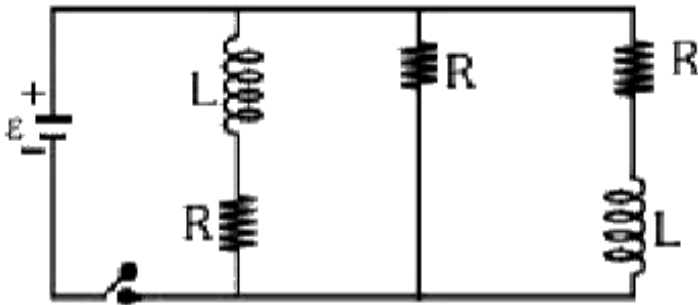
**Answer: A**



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**Others**

1. A circuit that contains three identical resistors with resistance  $R = 9.0\Omega$  each, two identical inductors with inductance  $L = 2.0 \text{ mH}$  each, and an ideal battery with emf  $\varepsilon = 18V$ . The current 'i' through the battery just after the switch closed



A.  $2Ma$

B.  $0.2A$

C.  $2A$

D.  $0. A$

**Answer: C**



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2. In an electromagnetic wave in free space the root mean square value of the electric field is  $E_{rms} = 6V/m$ . The peak value of the magnetic field is

A.  $1.41 \times 10^{-8}T$

B.  $2.83 \times 10^{-8}T$

C.  $0.70 \times 10^{-8}T$

D.  $4.23 \times 10^{-8}T$

**Answer: B**



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3. Out of the following options which one can be used produce a propagating electromagnetic wave?

- A. A stationary charge
- B. A chargeless particle
- C. An accelerating charge
- D. A charge moving at constant velocity

**Answer: C**



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4. An inductor  $20\text{mH}$ , a capacitor  $100\mu\text{F}$  and a resistor  $50\Omega$  are connected in series across a source of emf,  $V = 10\sin 314t$ . The power loss in the circuit is

A.  $0.67\text{W}$

B.  $0.76\text{W}$

C.  $0.89\text{W}$

D.  $0.51\text{W}$

**Answer: D**



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5. Which of the following combinations should be selected for better turning of an LCR circuit used for communication ?

A.  $R = 20\Omega, L = 1.5H, C = 35, \mu F$

B.  $R = 25\Omega, L = 2.5H, C = 45, \mu F$

C.  $R = 15\Omega, L = 3.5H, C = 30, \mu F$

D.  $R = 25\Omega, L = 1.5H, C = 45, \mu F$

**Answer: C**



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6. The potential differences across the resistance, capacitance and inductance are  $80V$ ,  $40V$  and  $100V$  respectively in an  $L - C - R$  circuit. The power factor of this circuit is

A. 0.4

B. 0.5

C. 0.8

D. 1.0

**Answer: C**



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7. A  $100\Omega$  resistance and a capacitor of  $100\Omega$  reactance are connected in series across a 220 V source. When the capacitor is 50 % charged, the peak value of the displacement current is

A.  $2.2A$

B.  $11A$

C.  $4.4A$

D.  $11\sqrt{2}A$

**Answer: A**



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8. A resistance  $R$  draws power  $P$  when connected to an  $AC$  source. If an inductance is now placed in series with the resistance, such that the impedance of the circuit becomes  $Z$ , the power drawn will be

A.  $P \left( \frac{R}{Z} \right)^2$

B.  $P \sqrt{\frac{R}{Z}}$

C.  $P \left( \frac{R}{Z} \right)$

D.  $P$

**Answer: A**



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9. 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.  $V_a > V_b$

C.  $i_a > i_b$

D.  $V_a = V_b$

**Answer: B**



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10. The energy of the electromagnetic wave is of the order of 15 keV. To which part of the spectrum dose it belong?

A.  $X - rays$

B. Infrared rays

C. Ultraviolet rays

D.  $\gamma - rays$

**Answer: A**



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

A.  $300V$ ,  $15A$

B.  $450V$ ,  $15A$

C.  $450V$ ,  $13.5A$

D.  $600V$ ,  $15A$

**Answer: B**



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

- A. Frequency of the AC source is decreased
- B. number of turns in the coil is reduced
- C. a capacitance of reactance  $X_C = X_L$  is included in the same circuit
- D. an iron rod is inserted in the cell

**Answer: D**



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**13.** The condition under which a microwave oven heats up a food item containing water molecules most efficiently is

A. the frequency of the microwave must match the resonant frequency of the water molecules

B. the frequency of the microwave has no relation with natural frequency of water molecules

C. microwaves are heat waves, so always produce heating

D. infra-red waves produce heating in a microwave oven

**Answer: A**



**View Text Solution**

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

A.  $1/2$

B.  $1/\sqrt{2}$



C. 1

D.  $\sqrt{3}/2$

**Answer: C**



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**15.** The electric field associated with an electromagnetic wave in vacuum is given by

$\vec{E} = \hat{i}40 \cos(kz = 6 \times 10^8 t)$ , when  $E$ ,  $z$  and  $t$  are in volt/m metre and second respectively

find the wave vector.

A.  $2m^{-1}$

B.  $0.5m^{-1}$

C.  $6m^{-1}$

D.  $3m^{-1}$

**Answer: A**



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**16.** The electric and the magnetic field, associated with a electromagnetic, wave, propagating along the  $+z$  - axis, can be represented by

A.  $\left[ E = E_0 \hat{k}, B = B_0 \hat{i} \right]$

B.  $\left[ E = E_0 \hat{j}, B = B_0 \hat{j} \right]$

C.  $\left[ E = E_{\circ} \hat{j}, B = B_{\circ} \hat{k} \right]$

D.  $\left[ E = E_{\circ} \hat{i}, B = B_{\circ} \hat{j} \right]$

**Answer: D**



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17. In an ac circuit , an alternating voltage  $e = 200\sqrt{2} \sin 100t$  volts is connected to a capacitor of capacitance  $1\mu F$ . The rms value of the current in the circuit is :

A.  $100mA$

B.  $200mA$

C.  $20mA$

D.  $10mA$

**Answer: C**



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**18.** An  $AC$  voltage is applied to a resistance  $R$  and an inductance  $L$  in series. If  $R$  and the inductive reactance are both equal to  $3\Omega$ , the phase difference between the applied voltage and the current in the circuit is

A.  $\pi / 4$

B.  $\pi / 2$

C. zero

D.  $\pi / 6$

**Answer: A**



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**19.** The decreasing order of wavelength of infrared, microwave, ultraviolet and gamma rays is

A. gamma rays ,ultraviolet , infrared microwaves

B. microwaves,gamma rays, infrared, violet

C. infrared, microwave,ultraviolet,gamma rays

D. microwave, infrared, ultraviolet, gamma rays

**Answer: D**



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**20.** Which of the following statement is false for the properties of electromagnetic waves?

A. both electric and magnetic field vectors attain the the maxima and minima at the same place and same time

B. The energy in electromagnetic wave is divided equally between electric and magnetic vector

- C. Both electric and magnetic field vector are parallel to each other and perpendicular to the direction of propagation of wave
- D. These waves do not require any material medium for propagation

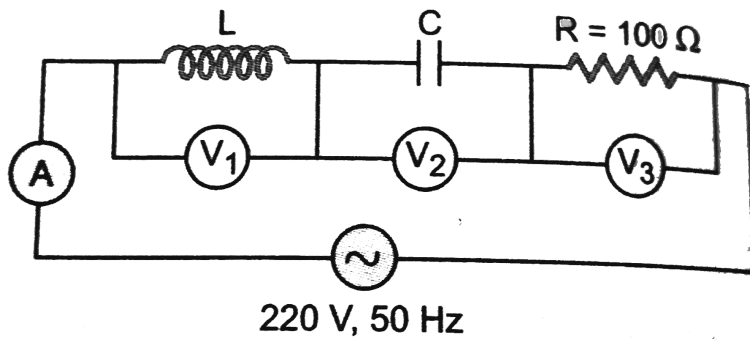
**Answer: C**



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21. In the given circuit, Fig., the reading of voltmeter  $V_1$  and  $V_2$  300 volts each. The reading of the voltmeter

$V_3$  and ammeter  $A$  are respectively



A. 150V, 2.2A

B. 200V, 2.2A

C. 220V, 2.0A

D. 100V, 2.0A

**Answer: B**



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22. A  $220V$  input is supplied to a transformer. The output circuit draws a current of  $2.0A$  at  $440V$ . If the efficiency of the transformer is  $80\%$ , the current drawn by the primary winding of the transformer is

A.  $3.6A$

B.  $2.8A$

C.  $2.5A$

D.  $5.0A$

**Answer: D**



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23. Power dissipated in an  $L - C - R$  series circuit connected to an  $AC$  source of emf  $\varepsilon$  is

A. 

B. 

C. 

D. 

**Answer: A**



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24. The electric field part of an electromagnetic wave in a medium is represented by

$$E_x = 0,$$

$$E_y = 2.5 \frac{N}{C} \cos \left[ \left( 2\pi \times 10^6 \frac{rad}{m} \right) t - \left( \pi \times 10^{-2} \frac{rad}{s} \right) x \right]$$

$$E_z = 0.$$

The wave is

A. moving along y-direction with frequency

$2\pi \times 10^6$  Hz and wavelength  $200m$

B. moving along x-direction with frequency  $10^6$

Hz and wavelength  $100m$

C. moving along x-direction with frequency  $10^6$  Hz

and wavelength  $200m$

D. moving along x-direction with frequency  $10^6$  Hz

and wavelength  $200m$

**Answer: C**



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**25.** In any  $AC$  circuit the emf ( $e$ ) and the current ( $i$ ) at any instant are given respectively by  $e = E_0 \sin \omega t$

$$i = I_0 \sin(\omega t - \phi)$$

The average power in the circuit over one cycle of  $AC$  is

A.  $\frac{V_0 i_0}{2}$

B.  $\frac{V_0 i_0}{2} \sin \phi$

C.  $\frac{V_0 i_0}{2} \cos \phi$

D.  $V_0 i_0$

**Answer: C**



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**26.** The velocity of electromagnetic radiation in a medium of permittivity  $\epsilon_0$  and permeability  $\mu_0$  is given by

A.  $\sqrt{\frac{\epsilon_0}{\mu_0}}$

B.  $\sqrt{\mu_0 \epsilon_0}$

C.  $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$

D.  $\sqrt{\frac{\mu_0}{\epsilon_0}}$

**Answer: C**



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27. A transformer is used to light a  $100W$  and  $110V$  lamp from a  $220V$  mains. If the main current is  $0.5A$ , the Efficiency of the transformer is approximately:

A. 30 %

B. 50 %

C. 90 %

D. 10 %

**Answer: C**



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**28.** The primary and secondary coils of a transformer have 50 and 1500 turns respectively. If the magnetic flux  $\phi$  linked with the primary coil is given by  $\phi = \phi_0 + 4t$ , where  $\phi$  is in weber,  $t$  is time in second and  $\phi_0$  is a constant, the output voltage across the secondary coil is

A.  $90V$

B.  $120V$

C.  $220V$

D.  $30V$

**Answer: B**



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29. What is the value of inductance  $L$  for which the current is a maximum in series  $LCR$  circuit with  $C = 10\mu F$  and  $\omega = 1000\frac{rad}{s}$ ?

A.  $100mH$

B.  $1mH$

C. Cannot be calculated unless  $R$  is known

D.  $10mH$

**Answer: A**



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30. A coil of inductive reactance  $31\Omega$  has a resistance of  $80\Omega$ . It is placed in series with a condenser of capacitive reactance  $25\Omega$ . The combination is connected to an *ac* source of  $110V$ . The power factor of the circuit is

A. 0.56

B. 0.64

C. 0.80

D. 0.33

**Answer: C**



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**31.** The core of any transformer is laminated so as to

A. energy losses due to eddy currents may be minimised

B. the weight of the transformer may be reduced

C. rusting of the core may be prevented

D. ratio of voltage in primary and secondary may be increased

**Answer: A**



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