PHYSICS

BOOKS - BITSAT GUIDE

ALTERNATING CURRENT AND EM WAVE

Practice Exercise

1. An Ac source of volatage V=100 sin $100\pi t$ is connected to a resistor of ressistance 20ΩThe

rsm value of current through resistor is

A. $10A$

B. $\frac{10}{\sqrt{2}}A$

C. $\frac{5}{\sqrt{2}}A$

D. non of these

Answer:

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2. An Ac source of volatage V=100 sin $100\pi t$ is connected to a resistor of ressistance 20ΩThe rsm value of current through resistor is average value of current for half cycle is

A. zero

B. $\frac{5}{\sqrt{2}}A$

C. $10A$

D. non of these

Answer:

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3. An Ac source of volatage V=100 sin $100\pi t$ is connected to a resistor of ressistance 20ΩThe rsm value of current through resistor is the averge value for half cycle is

A. $\frac{10}{\pi}A$

B. $\frac{5}{\pi}A$

C. zero

D. non of these

Answer:

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4. An Ac source of volatage V=100 sin $100\pi t$ is connected to a resistor of ressistance 20ΩThe rsm value of current through resistor is total charge transferred through resistor in long time is

A. zero

B. $\frac{2l_0}{\pi}$

C. $\frac{l_0}{25\pi}$

D. non of these

Answer:

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5. An Ac source of volatage V=100 sin $100\pi t$ is connected to a resistor of ressistance 20ΩThe rsm value of current through resistor is ,total charge transferred in 1/100 second is

A. $\frac{1}{10\pi}C$

B. $\frac{1}{5\pi}C$

C. zero

D. non of these

Answer:

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6. An Ac source of volatage V=100 sin $100\pi t$ is connected to a resistor of ressistance 20ΩThe

rsm value of current through resistor is ,total heat generated in one cycle is

A. $\sqrt{2}J$

B. 5 J

C. $4\sqrt{2}J$

D. zero

Answer:

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7. An Ac source of volatage V=100 sin $100\pi t$ is connected to a resistor of ressistance 20ΩThe rsm value of current through resistor is , power factor is

A. 1

B. 0

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

D. non of these

Answer:

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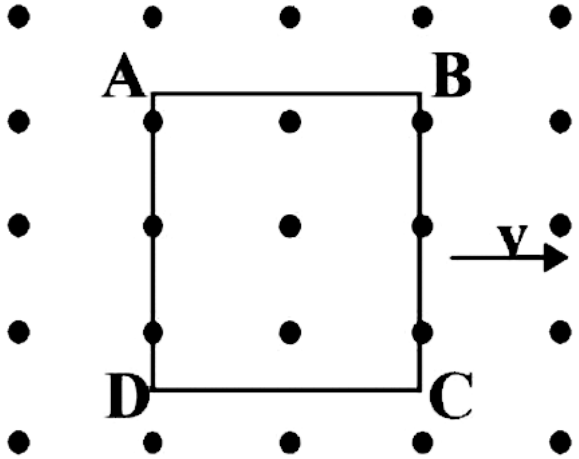
8. A metallic square loop ABCD is moving in its own plane with velocity v in a uniform magnetic field perpendicular to its plane as shown in the figure. An electric field is induced



A. in AD,but not in BC

B. in BC,but not in AD

C. neither in AD nor in BC

D. in both AD and BC

Answer:

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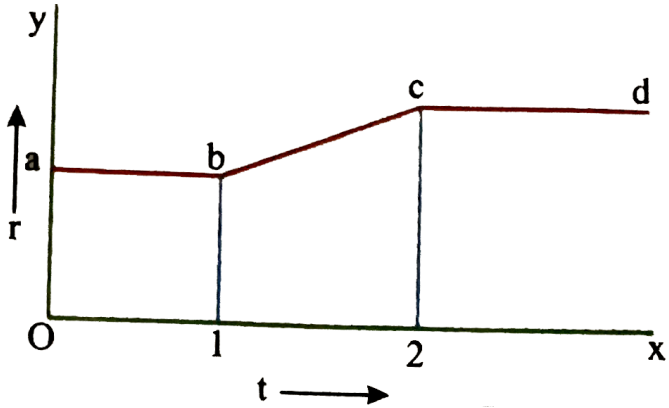
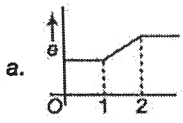
9. A flexible wire bent in the form of a circle is place in a uniform magnetic field perpendicularly to the plane of the coil. The radius of the coil changes as shown in Figure.

The graph of magnetude of induced emf in the coil is represented by



A.



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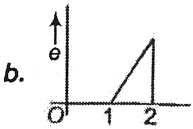

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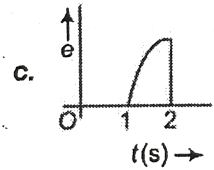
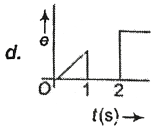


D. 

Answer:

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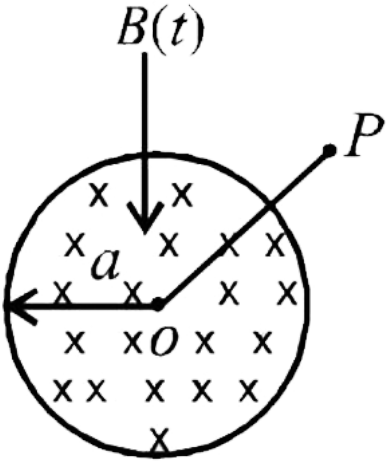
10. A uniform but time-varying magnetic field B(t) exists in a circular region of radius a and is directed into the plane of the paper, as shown. The magnitude of the induced electric field at point P at a distance r from the centre

of the circular region



A. is zero

B. decreases as 1/r

C. increases as r

D. decreases as $\frac{1}{r^2}$

Answer:

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11. Caluculate the peak and rms value of current in AC circuit. The current is represented by the eqution `i=5"sin"(300t-(pi)/4),where t is in second and I in ampere.

A. 5 A,3.535 A

B. 5 A,5.53 A

C. 3 A,3.53 A

D. 6.25 A, 5.33 A

Answer:

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12. The average value for half cycle in a 200 V AC source is

A. 180 V

B. 200 V

C. 220 V

D. none

Answer:

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13. Two alternating current are given by

$l_1 = l_0 \sin \omega t$and l `l_(2)=l_(0) cos (omega +phi)

The ratio of rms value is

A. 0.042361111111111

B. $1 : \phi$

C. 0.043055555555556

D. non of these

Answer:

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14. A current I=3+8 sin 100t is passing through a resistor of resistance 10 Ω.The effective value of current is

A. $5A$

B. $10A$

C. $4\sqrt{2}A$

D. 3sqrt2 A

Answer:

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15. An alternative voltage

V=30 sin 50t+40cos 50t is applied to a resitor of resistance 10Ω. Time rms value of current through resistor is

A. $\frac{5}{\sqrt{2}}$

B. $\frac{10}{\sqrt{2}}$

C. $\frac{7}{\sqrt{2}}$

D. $7A$

Answer:

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16. An alternating voltage V=140 sin 50 t is applied to a resistor of resistance 10 Ω. This voltage produces $\triangle H$ heat in the resistor in

time $\triangle t$. To produce the same heat in the same time, rquired DC current is

A. 14 A

B. about 20 A

C. about 10 A

D. None of these

Answer:

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17. An Ac voltage is represented by e=220 sin (100π) t volt and is applied over a resistance of 110 ohm. Calculate the heat produced in 7 min.

A. 11×10^3 cal

B. 22×10^3 cal

C. 33×10^3 cal

D. 25×10^3 cal

Answer:

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18. What is the reactance of a capacitor connected to a constant DC source?

A. zero

B. ∞

C. 1Ω

D. None of these

Answer:

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19. The reactance of an inductor connected with DC voltage is

A. zero

B. ∞

C. 1Ω

D. None of these

Answer:

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20. An AC voltage $e = e_0 \sin 50t - e_0 \cos 100\pi t$ is connected in series with a resistor and capacitor. The steady state current through circuit is found to be $I = I_0 \sin g(50\pi t + \phi) + I_0{}' \cos(100\pi t + \phi_2)$ Then, the ratio of $\frac{I_0}{I_0{}'}$ is

A. greater than 1

B. equal to 1

C. less than 1

D. None of these

Answer:

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21. An alternating voltage $V = V_0 \sin \omega t$ is connected to a capacitor of capacity C_0 through an AC ammeter of zero resistance. The reading of ammeter is

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

B. $\frac{V_0}{\omega C\left(\sqrt{2}\right)}$

C. $\frac{V_0 \omega C}{\sqrt{2}}$

D. None of these

Answer:

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22. Calculate the maximum current in the circuit, if a capacitor of capacitance $1\mu F$ is charged to a potential of 2 V and is connceted in parallel to an inductor of inductance $10^{-3}H$.

A. $\sqrt{4000}\quad mA$

B. $\sqrt{2000} \quad mA$

C. $\sqrt{1000} \quad mA$

D. $\sqrt{5000} \quad mA$

Answer:

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23. In a circuit consisting of inductor (L), capacitor (C) and resistor (R) are in series, if $\omega L < \frac{1}{\omega C}$, then the emf

A. leads the current

B. lags behind the current

C. is in phase with current

D. is zero

Answer:

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24. Find the resonant frequency of a series circuit consist of an inductance 200 μH, a

capacitance of $0.0005\mu F$ and a resistance of 10 Ω.

A. 480 kHz

B. 503 kHz

C. 406 kHz

D. 607 kHz

Answer:

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25. Find the frequency of voltage for an AC circuit. The equation of alternating voltage is $V = 200 \sin 314t$.

A. 50 Hz

B. 60 Hz

C. 55 Hz

D. 65 Hz

Answer:

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26. An Ac circuit with f=1000 Hz consists of a cail of 200 mH and negligible resistance. Calculate the voltage across the coil, if the effective current of 5 mA is flowing.

A. 7.64 V (rms)

B. 7.452 V (rms)

C. 6.28 V (rms)

D. 74.62 V (rms)

Answer:

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27. Find the average power per unit area at distance of 2 m from a small bulb, if the bulb emits 20 W of electromagnetic radiation uniformly in all directions.

A. $0.69 \quad W/m^2$

B. $0.56 \quad W/m^2$

C. $0.78 \quad W/m^2$

D. $0.39 \quad W/m^2$

Answer:

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28. If a circuit made up of a resistance 1 Ω and inductance 0.01 H, an alternating emf of 200 voit at 50 Hz is connected, then find the phase difference between the current and the emf in the circuit.

A. $\tan^{-1}(\pi)$

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

C. $\tan^{-1}\left(\frac{\pi}{4}\right)$

D. $\tan^{-1}\left(\frac{\pi}{3}\right)$

Answer:

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29. choose the correct option. If speed of gamma rays, X-rays and microwaves are V_g, V_x and V_m.

A. $V_g < V_x < V_m$

B. $V_g > V_x > V_m$

C. $V_g > V_x < V_m$

D. $V_g = V_x = V_m$

Answer:

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30. A condenser of capacitance of $2.4\mu F$, is used in a transmitter to transmit a λ wavelength. If the inductor of $10^{-8}H$ is used for resonant circuit, then value of λ is

A. 292 m

B. 400 m

C. 334 m

D. 446 m

Answer:

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31. If a dry cell of emf=1.5 V is connected across the primary of a step-up transformer of turn

ratio 3:5, then calculate the voltage developed across the secondary.

A. 30 V

B. 5 V

C. zero

D. None of these

Answer:

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32. If at a certain instant, the magnetic induction of the electromagnetic wave in vacuum is 6.7×10^{-12}T, then the magnitude of of electric field intensity will be

A. $2 \times 10^{-3} \quad N/C$

B. $3 \times 10^{-3} \quad N/C$

C. $4 \times 10^{-3} \quad N/C$

D. $1 \times 10^{-3} \quad N/C$

Answer:

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33. Find the energy of photon of electromagnetic radiation of wavelength 200 Å.

A. $1.76 \times 10^{-18} J$

B. $0.99 \times 10^{-18} J$

C. $0.54 \times 10^{-18} J$

D. $0.63 \times 10^{-18} J$

Answer:

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34. Find the speed of light in air, if an electromagnetic wave is travelling in air whose dielectric constant is $K = 1006$.

A. $3 \times 10^8 \quad m/s$

B. $3.88 \times 10^8 \quad m/s$

C. $2.5 \times 10^8 \quad m/s$

D. $4.6 \times 10^8 \quad m/s$

Answer:

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35. An object is placed at some distance from a radio station. If the interval between transmission and reception of pulses is 2.66×10^{-2}S, then find the distance.

A. 4000 km

B. 2000 km

C. 3000 km

D. 2500 km

Answer:

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36. Calculate the wavelength of a radio wave of frequency of 1 MHz.

A. 400 m

B. 300 m

C. 350 m

D. 200 m

Answer:

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37. The electric in an electromagetic wave is given by E=(100 N/C)$\sin\omega\left(t-\frac{X}{C}\right)$.

If the energy contained in a cylinder of coss-section $10cm^2$ and length 50 cm along the X-axis is $4.4\times10^{-8}J/m^3$, then find intensity of the wave.

A. $12.4W/m^3$

B. $13.2W/m^3$

C. $15.7W/m^3$

D. $11.9W/m^3$

Answer:

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1. A radio wave of intensity / isn reflcted by a surface. Find intersity (I), if pressure exerted

on the surface is $2 \times 10^{-8} N/m^2$.

A. $3N/m^2$

B. $4N/m^2$

C. $6N/m^2$

D. $7N/m^2$

Answer:

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2. A TvV tower has a height of 100 m. Find the area covered by the TV broadast, if radius of the earth is 6400 km.

A. $380 \times 10^7 m^2$

B. $402 \times 10^7 m^2$

C. $595 \times 10^7 m^2$

D. $440 \times 10^7 m^2$

Answer:

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3. An electromagnetic wave with pointing vector 5 W/m^2 is absorbed by a surface of same area. If the force on the surface is 10^{-7} N, then area is

A. $6m^2$

B. $3m^2$

C. $60m^2$

D. $4m^2$

Answer:

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4. Voltage V and current I in AC circuit are given by V =50sin(50 t)volt,I = 50 sin $(50t + \frac{\pi}{3}$)mA

The power dissipated in the ciruit is

A. 5.0 W

B. 2.5 W

C. 1.25 W

D. zero

Answer:

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5. The produced rays in sonography are

A. microwaves

B. infrared waves

C. sound waves

D. ultrasound

Answer:

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6. The ratio of secondary and primary turns of step-up transformer is 4 : 1.If a current of 4A is applied to the primary , the induced current in secondary will be

A. 8A

B. 2A

C. 1A

D. 0.5A

Answer:

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7. The impedance of a circuit consister of 3Ω resistance and 4Ω reactance. The power factor of the circuit is

A. 0.4

B. 0.6

C. 0.8

D. 1

Answer:

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8. The time taken by the current to rise to 0.63 of its maximum value in a DC circuit containing inductance (L) and resistance ® depends on

A. L only

B. R only

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

D. LR

Answer:

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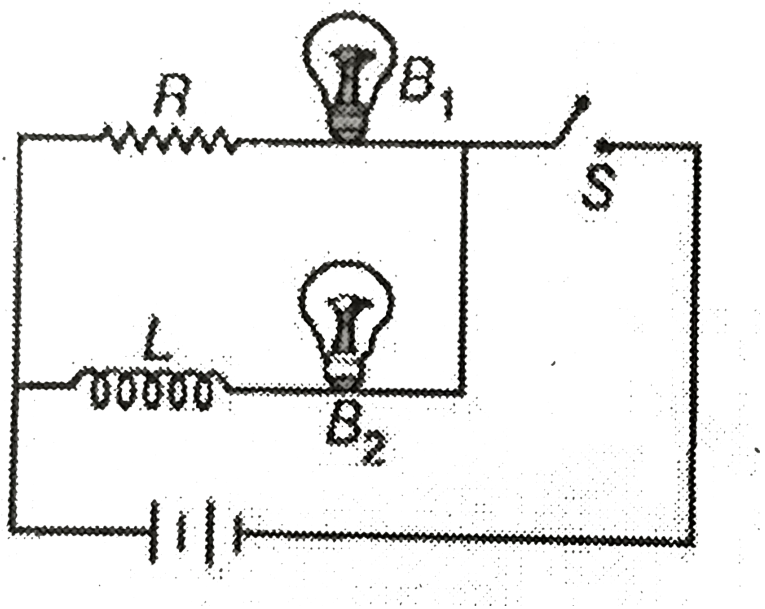
9. Figure represents two bullbs B_1 and B_2 resister R and inductor L. When the switch S in

turned off,then



A. both B_1 and B_2 die out promptly

B. both B_1 and B_2 die out with some selay

C. B_1 dies out promptly but B_2 with some selay

D. B_(2) dies out promptly but B_1 with some delay

Answer:

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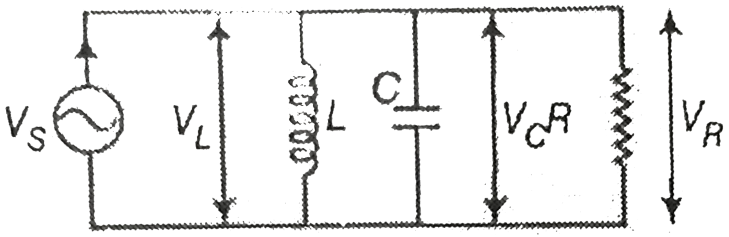
10. An AC source is connected in parallel with an L-C-R circuit as shown.Let l_s, l_L, l_C and l_R denote the currents through and V_s, V_L, V_C and $V_R$the voltage

across the corresponding componts.Then,



A. $l_S = l_L + L_C + l_R$

B. $V_S = V_L + V_C + V_R$

C. $(l_L, l_C, l_R) < l_S$

D. l_L, l_C may be greater than l_S

Answer:

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11. The number of turns in primary and secondary coils of a transformer is 50 and 200, respectively. If the current in the primary coil is 4 A, then current in the secondary coil is

A. $1A$

B. 2A

C. 4A

D. 5A

Answer:

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12. An inductor of 2 H and a resitance of 10Ω are conncts in series with a bttery of 5 V. The intial rate of change of current is

A. 0.54A/s

B. 2.0 A/s

C. 2.5 A/s

D. 0.25 A/s

Answer:

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13. The transformation ratio in the step -up transformer is

A. 1

B. greater than one

C. less than one

D. the ratio greater or less than sepenods on the other factors

Answer:

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14. In a stap-up transformer, if ratio of turns of primary to secondary is 1 : 10 and primary voltage is 230 V. If the load current is 2 A, then currect in primary is

A. 20A

B. 10A

C. 2A

D. 1A

Answer:

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15. The squre root of the prioduct of indutance and capacitance has the dimension of

A. length

B. mass

C. time

D. no dimersion

Answer:

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