

PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

ALTERNATING CURRENT

Physics

1. In a series resonant LCR circuit the voltage across R is 100 volts and $R = 1k(\Omega)$ with $C = 2(\mu)F$. The resonant

frequency (ω) is 200rad/s . At resonance the voltage across L is

A. $2.5 \times 10^{-2}V$

B. $40V$

C. $250V$

D. $4 \times 10^{-3}V$

Answer:



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2. An alternating voltage $V = V_0 \sin \omega t$ is applied across a circuit. As a result, a current $I = I_0 \sin\left(\omega t - \frac{\pi}{2}\right)$ flows in it. The power consumed per cycle is

A. zero

B. $0.5V_0I_0$

C. $0.707V_0I_0$

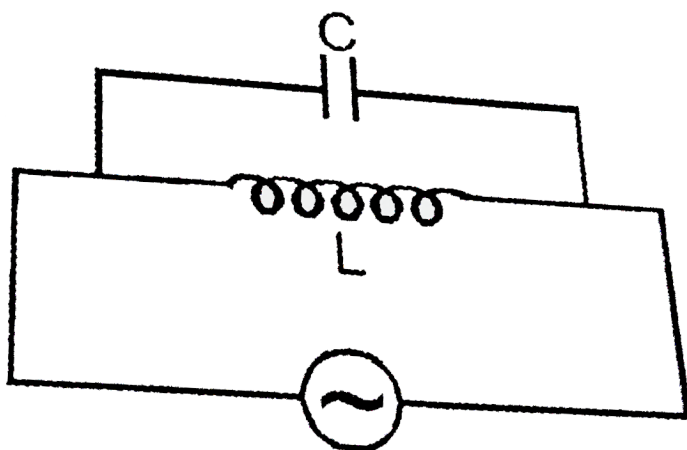
D. $1.414V_0I_0$

Answer:



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3. For the circuit shown in the fig., the current through the inductor is 0.9 A while the current through the condenser is 0.4 A. Then



$$V = V_0 \sin \omega t$$

A. current drawn from generator

$$I = 1.13A$$

B. $\omega = 1 / (1.5LC)$

C. $I = 0.5A$

D. $I = 0.6A$

Answer:



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4. A capacitor has capacity C and reactance X .
If capacitance and frequency become double,
then reactance will be

A. $4X$

B. $X/2$

C. $X/4$

D. $2X$

Answer:



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5. A coil of inductance $300mh$ and resistance 2Ω is connected to a source of voltage $2V$.

The current reaches half of its steady state value in

A. 0.1s

B. 0.05 s

C. 0.3 a

D. 0.15 s

Answer:



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6. In an AC circuit, a resistance of R ohm is connected in series with an inductance L . If phase angle between voltage and current be 45° , the value of inductive reactance will be

A. $R/4$

B. $R/2$

C. R

D. $R/5$

Answer:



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7. A bulb is rated at $100V$, $100W$. 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 at its rated power with the help of an ac source of $200V$ and $50Hz$.

A. $\frac{\pi}{\sqrt{3}}H$

B. $100H$

C. $\frac{\sqrt{2}}{\pi}H$

D. $\frac{\sqrt{3}}{\pi}H$

Answer:



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8. 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. Calculate the

ratio of the reactance to resistance at the original frequency ω .

A. $\sqrt{\frac{3}{5}}$

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

C. $\sqrt{\frac{1}{5}}$

D. $\sqrt{\frac{4}{5}}$

Answer:



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9. Large transformers, when used for some time, become hot and are cooled by circulating oil. The heating of transformer is due to

A. heating effect of current alone

B. hysteresis loss alone

C. both the hysteresis loss and heating effect of current

D. none of the above

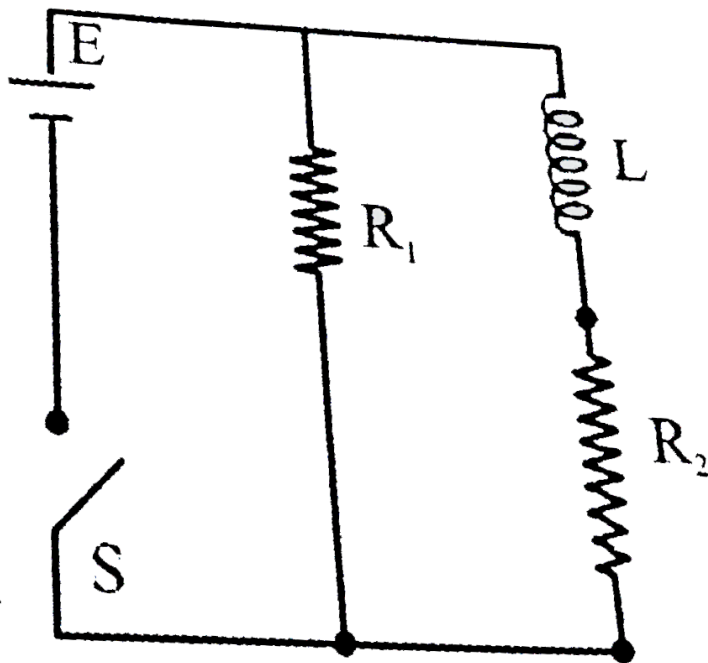
Answer:



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10. An inductor of inductance $L = 400 \text{ mH}$ 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. $6e^{-5t}V$

Answer:



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11. An ideal coil of 10H is connected in series with a resistance of $5(\Omega)$ and a battery of 5V . 2 second after the connections is made, the current flowing in ampere in the circuit is

A. $(1 - e^{-1})$

B. $(1 - e)$

C. e

D. e^{-1}

Answer:



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12. In an A.C. circuit, the current flowing in inductance is $I = 5 \sin(100t - \pi/2)$ amperes and the potential difference is $V = 200 \sin(100t)$ volts. The power consumption is equal to

A. 1000 watt

B. 40 watt

C. 20 watt

D. Zero

Answer:



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13. In an oscillating LC circuit the maximum charge on the capacitor is Q . The charges 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

Answer:



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14. 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. $\pi\sqrt{LC}$

Answer:



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15. For an LCR series circuit with an aac source of angular frequency ω .

A. circuit will be capacitive if $\omega > \frac{1}{\sqrt{LC}}$

B. circuit will be inductive if $\omega = \frac{1}{\sqrt{LC}}$

C. power factor of circuit will be unity if

capacitive reactance equals inductive

reactance

D. current will be leading voltage if

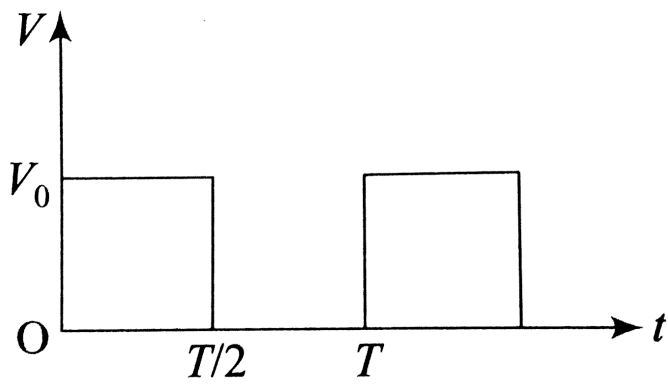
$$\omega > \frac{1}{\sqrt{LC}}$$

Answer:



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16. The rms value of potential difference V shown in the figure is



A. V_0

B. $V_0 / \sqrt{2}$

C. $V_0 / 2$

D. $V_0 / \sqrt{3}$

Answer:



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17. Which of the following statements is/are incorrect?

A. If the resonance is less sharp, not only is the maximum current less, the circuit is close to resonance for a larger range $\Delta\omega$ of frequencies and the tuning of the circuit will not be good.

B. Less sharp the resonance less is the selectivity of the circuit or vice-versa.

C. If quality factor is large, i.e., R is low or L

is large, the circuit is more selective.

D. Below resonance, voltage leads the

current while above it, current leads the

voltage

Answer:



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18. A lamp consumes only 50 % of peak power in an *a. c.* circuit. What is the phase difference between the applied voltage and the circuit current

A. $\frac{\pi}{6}$

B. $\frac{\pi}{3}$

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

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

Answer:



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19. A step down transformer reduces 220 V to 110 V. The primary draws 5 ampere of current and secondary supplies 9 ampere. The efficiency of transformer is

A. 20 %

B. 44 %

C. 90 %

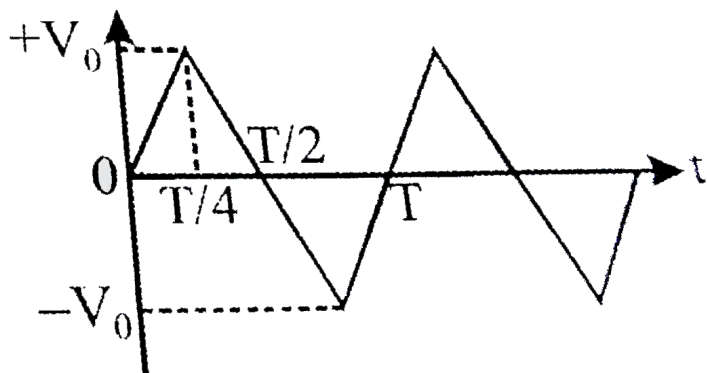
D. 100 %

Answer:



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20. 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



A. 5

B. 4

C. 7

D. 3

Answer:



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21. The tuning circuit of a radio receiver has a resistance of 50Ω , an inductor of 10 mH and a variable capacitor. A 1 MHz radio wave

produces a potential difference of 0.1 mV. The values of the capacitor to produce resonance is (Take $\pi_2 = 10$)

A. 2.5 pF

B. 5.0 pF

C. 25 pF

D. 50 pF

Answer:



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22. 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 henry and the value of capacitance is $8\mu\text{F}$. The angular frequency of applied alternating voltage will be

- A. 5000 rad/sec
- B. 4000 rad/sec
- C. 2×10^5 rad/sec
- D. 500 rad/sec

Answer:



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23. A coil has resistance 30ohm and inductive reactance 20ohm at 50Hz frequency. If an ac source of 200 volts. 100Hz , is connected across the coil, the current in the coil will be

A. 4.0 A

B. 8.0 A

C. $\frac{20}{\sqrt{13}}\text{A}$

D. 2.0 A

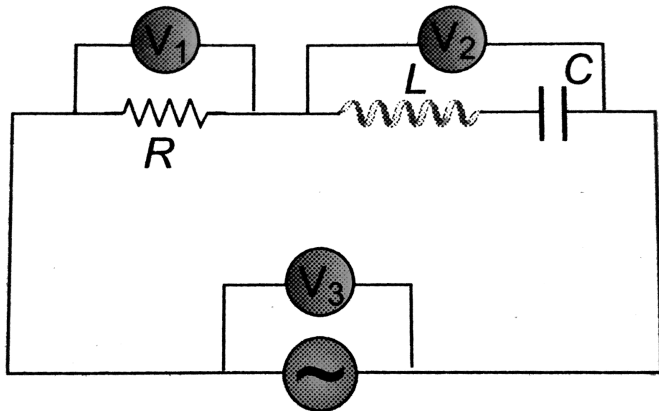
Answer:



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24. In the figure shown, three AC voltmeters have been connected. At resonance, the

reading of



A. $V_2 = 0$

B. $V_1 = 0$

C. $V_3 = 0$

D. $V_1 = V_2 \neq 0$

Answer:



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25. A.C. power is transmitted from a power house at a high voltage as

A. the rate of transmission is faster at high voltages

B. it is more economical due to less power loss

C. power cannot be transmitted at low voltages

D. a precaution against theft of transmission lines

Answer: B



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26. A transformer has an efficiency of 80%. It works at 4 kW and 100 V. If secondary voltage is 240 V, the current in primary coil is

A. 0.4A

B. $4A$

C. $10A$

D. $40A$

Answer:



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27. A 12Ω resistor and a 0.21 henry inductor are connected in series to an AC source operating at 20 volts, 50 cycle/second. The

phase angle between the current and the source voltage is

A. 30°

B. 40°

C. 80°

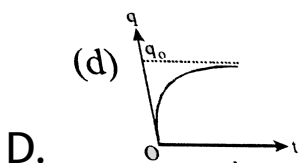
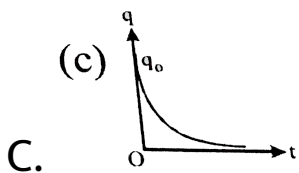
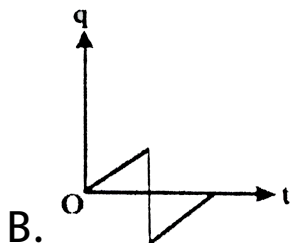
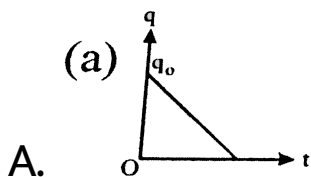
D. 90°

Answer:



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28. In LCR series circuit fed by a DC source, how does the amplitude of charge oscillations vary with time during discharge ?



Answer:



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29. The primary and secondary coils 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 weber, t is time in second and ϕ_0 is a constant, the output voltage across the secondary coil is

A. 120 volts

B. 220 volts

C. 30 volts

D. 90 volts

Answer:



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30. The primary winding of a transformer has 100 turns and its secondary winding has 200 turns. The primary is connected to an ac

supply of $120V$ and the current flowing in it is $10A$. The voltage and the current in the secondary are

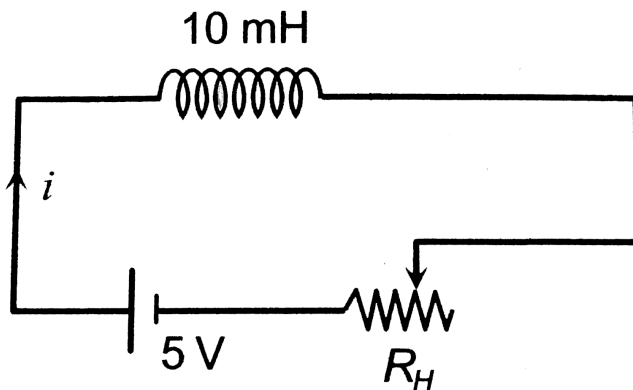
- A. $240 V, 5 A$
- B. $240 V, 10 A$
- C. $60 V, 20 A$
- D. $120 V, 20 A$

Answer:



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31. The resistance in the following circuit is increase at a particle instant. At this instant the value of resistanc eis 10Ω . The current in the circuit will be now



- A. $i = 0.5A$
- B. $I > 0.5A$
- C. $I < 0.5A$

D. $i = 0$

Answer:



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32. The current in a LR circuit builds up to $\frac{3}{4}$ th of its steady state value in 4s. The time constant of this circuit is

A. $\frac{1}{\ln 2} s$

B. $\frac{2}{\ln 2} s$

C. $\frac{3}{\ln 2} s$

D. $\frac{4}{\ln 2} s$

Answer:



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33. 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. π

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

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

D. 0

Answer:



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34. 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. 1 mH

B. cannot be calculated unless R is known

C. 10 mH

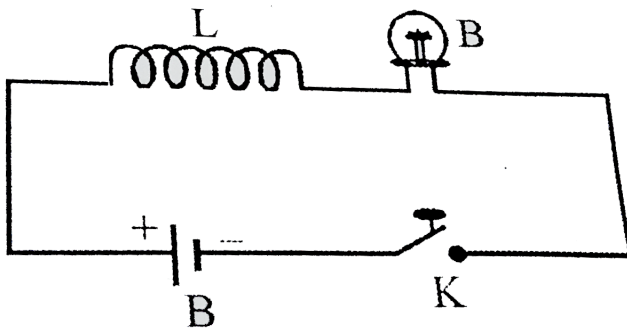
D. 100 mH

Answer:



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35. In the circuit of Fig, the bulb will become suddenly bright if



- A. contact is made or broken
- B. contact is made
- C. contact is broken
- D. won't become bright at all

Answer:



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36. The voltage of an ac source varies with time according to the equation $V = 100 \sin 100\pi t \cos 100\pi t$ where t is in seconds and V is in volt. Then

A. the peak voltage of the source is 100 volt

B. the peak voltage of the source is 50 volt

C. the peak voltage of the source is

$$100 / \sqrt{2} \text{ volt}$$

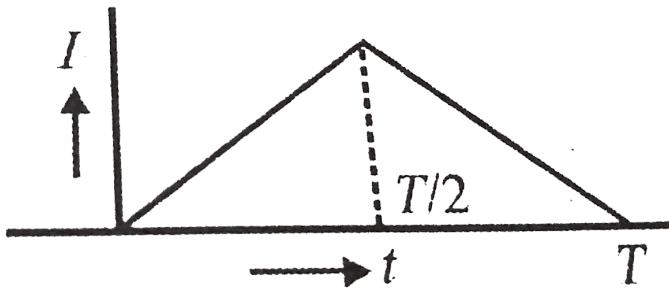
D. the frequency of the source is 50 Hz

Answer:

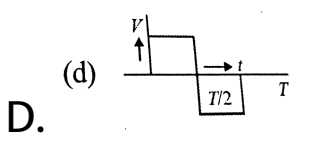
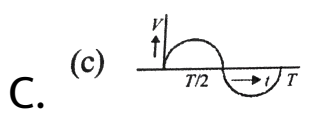
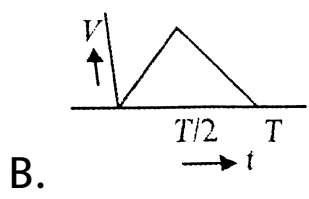
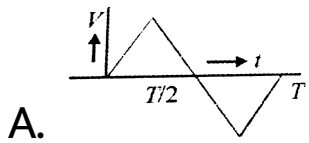


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37. The current (I) in the inductance is varying with time according to the plot shown in figure.



Which one of the following is the correct variation of voltage with time in the coil?



Answer:

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38. Using an ac voltmeter, the potential difference in the electrical line in a house is read to be 234 V. If the line frequency is known to be 50 cycles per second, the equation for the line voltage is

A. $V = 165 \sin(100\pi t)$

B. $V = 331 \sin(100\pi t)$

C. $V = 220 \sin(100\pi t)$

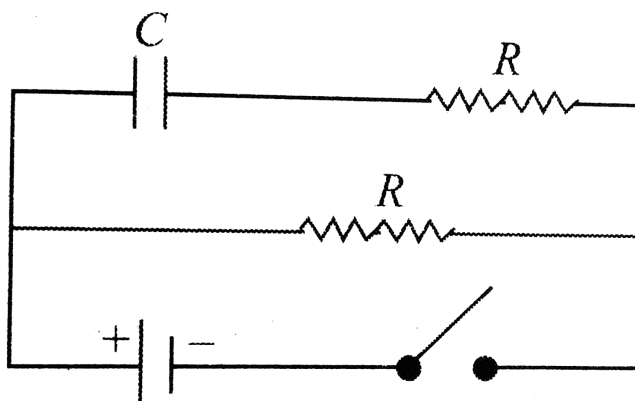
D. $V = 440 \sin(100\pi t)$

Answer:



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39. In the circuit shown in fig. when the switch is closed, the capacitor charges with a time constant



A. RC

B. $2RC$

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

D. $RC \ln 2$

Answer:



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40. A 100 mF capacitor in series with a 40Ω resistance is connected to a 110 V, 60 Hz supply. What is the maximum current in the circuit?

A. 3.24 A

B. 4.25 A

C. 2.25 A

D. 5.20 A

Answer:



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41. 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

Answer:



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

A. 484 W

B. 400 W

C. 441 W

D. 396 W

Answer:



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43. What is increase in step-down transformer?

A. Voltage

B. Current

C. Power

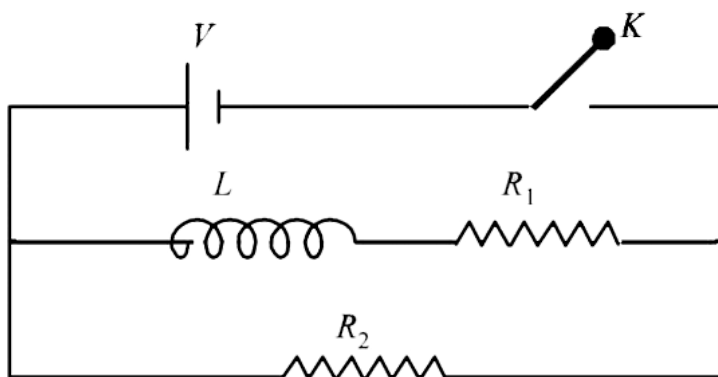
D. Current density

Answer:



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44. 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 $\frac{V(R_1 + R_2)}{R_1 R_2}$ at

$t = \infty$

C. $\frac{V}{R_2}$ at $t = 0$ and $\frac{V R_1 R_2}{\sqrt{R_1^2 + R_2^2}}$ at $t = \infty$

D. $\frac{V(R_1 + R_2)}{R_1 R_2}$ at $t = 0$ and $\frac{V}{R_2}$ at

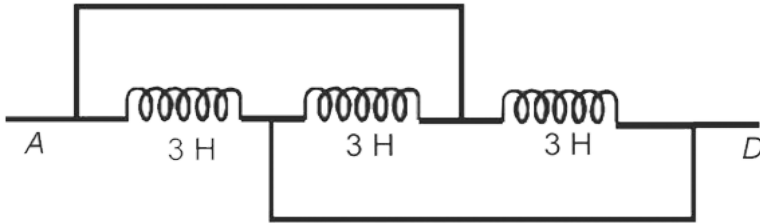
$t = \infty$

Answer:



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45. The inductance between A and D is



A. 3.66 H

B. 9 H

C. 0.66 H

D. 1 H

Answer:



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