PHYSICS

FOR IIT JEE ASPIRANTS OF CLASS 12 FOR PHYSICS

ALTERNATING CURRENT

Example

1. You have two copper cables of equal length for carrying current. One of them has a single wire of area of across section A, the other has ten wires each of cross section area $A/10$. Judge their suitability for transporting ac and dc.

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2. If the voltage in an ac circuit is represented by the equation.

$V = 220\sqrt{2}\sin(314t - \phi)$ volt calculate (a) peak and rms value of the voltage, (b) average voltage, (c) frequency of ac.

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3. A current is made of two components a dc component $i_1 = 3A$ and an ac component $i_2 = 4\sqrt{2}\sin\omega t$. Find the reading of hot wire ammeter?

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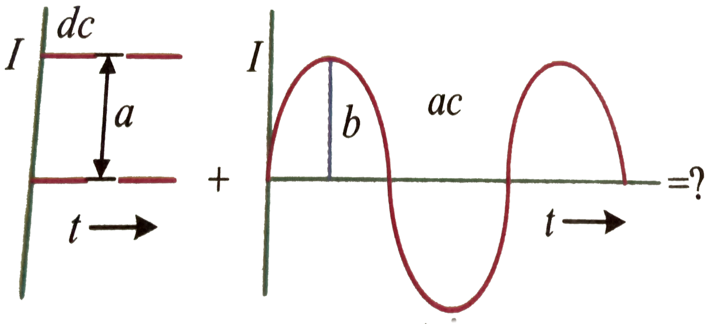
4. If a direct current of value a ampere is superimposed on an alternating current $1 = b\sin\omega t$ flowing through a wire, what is the

effective value of the resulting current in the circuit?



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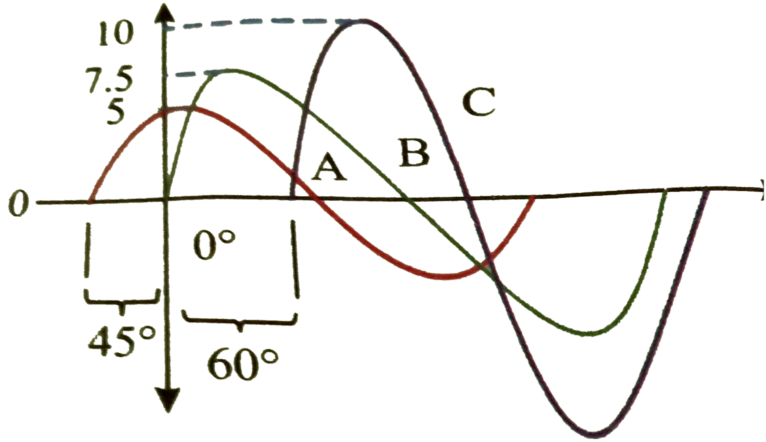
5. Use a phasor diagram to represent the sine waves in the following Figure.



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6. An alternating voltage $E = 200\sqrt{2}\sin(100t)V$ is connected to a $1\mu F$ capacitor through an ac ammeter (it reads rms value). What will be the reading of he ammeter?

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7. Find the maximum value of current when inductance of two henry is connected to 150 volt, 50 cycle supply.

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8. An inductor of 1 henry is connected across a $220v, 50Hz$ supply. The peak value of the current is approximately.

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9. A capacitor of capacitance $2\mu F$ is connected in the tank circuit of an oscillator oscillating with a frequency of 1 kHz. If the current flowing in the circuit is $2mA$, the voltage across the capacitor will be

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10. A $0.21H$ inductor and a $12ohm$ resistance are connected in series to a $220V$. $50Hz$ ac source. Calculate the current in the circuit and the phase angle between the current and the source voltage.

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11. When $100 \text{ volt} dc$ is applied across a coil, a current of $1 amp$ flows through it, when $100V$ ac of $50Hz$ is applied to the same coil, only 0.5 amp flows. Calculate the resistance and inductance of the coil.

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12. A $10\mu g$ capacitor is in series with a 50Ω resistance and the combination is connected to a $220V$, $50Hz$ line. Calculate (i) the capactive reactance, (ii) the impedance of the circuit and (iii) the current in the circuit.

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13. A coil has an inductance of 0.7 H and is joined in series with a resistance of 220 ohm. Find the wattless component of current in the circuit, when an alternating e.m.f. of 220 V at a frequency of 50 Hz is supplied to it.

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14. 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°. The value of C is :

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15. In a series LCR circuit, the voltage across the resistance, capacitance and inductance is 10 V each. If the capacitance is short circuited, the voltage across the inductance will be

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16. An inductance of $\frac{200}{\pi} mH$ a capacitance of $\frac{10^{-3}}{\pi}$ and a resistance of 10Ω are connected in series with an AC source of $220V, 50Hz$. The phase angle of the circuit is

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17. In a series LCR circuit $R = 200(\Omega)$ and the voltage and the frequency of the main supply is 220V and 50 Hz respectively. On taking out the capacitance from the circuit the current lags behind the voltage by $30(\circ)$. On taking out the inductor from the circuit the current leads the voltage by $30(\circ)$. The power dissipated in the LCR circuit is

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18. An LCR circuit has $L = 10mH$. $R = 3$ ohm and $C = 1\mu F$ connected in series to a source is $15\cos\omega t$ volt. What is average power dissipated per cycle at a frequency that is 10% lower than the resonant requency?

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19. A $750Hz, 20V$ source is connected to as resistance of 100Ω an inductance of $0.1803H$ and a capacitance of $10\mu F$ all in sereis.Calculate the time in which the resistance (thermalcapacity $2J/.^{\circ}C$) wil get heated by $10^{\circ}C$.

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20. An ideal choke coil takes a current fo 8 ampere when connected to an AC supply of 100 volt and $50Hz$. A pure resistor under the same conditions takes a current of 10 ampere. If the two are connected to an AC supply of 150 volts and $40Hz$ then the current in a series combination of the above resistor and inductor is

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21. An electric bulb has a rated power of $50W$ at $100V$. If it is used on AC source of $200V, 50Hz$, a choke has to be used in series with it. This choke should have an inductance of

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22. A transformer having efficiency 90% is working on $100V$ and at $2.0kW$ power. If the current in the seconary coil is $5A$, calculate (i)

the current in the primary coil and (ii) voltage across the secondary coil.

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23. 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?

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C.U.Q

1. In an ac circuit the current

A. is in phase with the voltage

B. leads the voltage

C. lags the voltage

D. any of the above depending on the circumstances

Answer: D

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2. The average emf during the positive half cycle of an ac supply of peak value E_0 is .

A. E_0/π

B. $E_0/\sqrt{2}$

C. $E_0/2\pi$

D. $2E_0/\pi$

Answer: 4

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3. Alternating current is transmitted to distant places at

A. high voltage and low current

B. high voltage and high current

C. low voltage and low current

D. low voltage and high current

Answer: 1

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4. In case of $a.c$ circuit, Ohm's law holds good for

a) Peak values of voltage and current

b) Effective values of voltage and current

c) Instantaneous values of voltage and current

A. only a is true

B. only a and b are true

C. only c is true

D. a,b and c are true

Answer: 2

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5. In case of AC circuits the relation $V = iZ$, where Z is impedance, can directly applied to

A. peak value of voltage and current only

B. rms values of voltage and current only

C. instantaneous value of voltage and current only

D. both 1 and 2 are true

Answer: 4

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6. Alternating current can not be measured by D.C. Ammeter because

A. alternating current can not pass through an ammeter

B. the average value of current for complete cycle is zero

C. some amount of alternating current is destroyed in the ammeter

D. peak value of current is zero

Answer: 2

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7. The r.m.s value of Potential due to superposition of given two alternating potentials $E_1 = E_0 \sin \omega t$ and $E_2 = E_0 \cos \omega t$ will be

A. E_0

B. $2E_0$

C. $E_0\sqrt{2}$

D. Zero

Answer: 1

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8. If the instantaneous current in a circuit is given by $i = 2\cos(\omega t - \phi)$ampere, the r.m.s. value of the current is

A. 2

B. $\sqrt{2}$

C. $2\sqrt{2}$

D. zero

Answer: 2

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9. If a capacitor is connected to two different $A.C$ generators, then the value of capactive reactance is

A. directly protortional frequency

B. inversely proportional to frequency

C. independent of frequency

D. inversely protortional to the square of frequency

Answer: 2

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10. In general in an alternating current circuit

A. the average value of current is zero

B. the average value of square of the current is zero

C. average power dissipation is zero

D. the phase difference between voltage and current is zero

Answer: 1

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11. The magnitude inducted e.m.f. in an LR circuit at brea of circuit as compared to its value at make of circuit will be

A. less

B. more

C. some times less and some times more

D. nothing can be said

Answer: 2

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12. The emf and current in a circuit are such that $E = E_0 \sin\omega t$ and $I - I_0 \sin(\omega t - \theta)$. This AC circuit contains

A. R and L

B. R and C

C. only R

D. only C

Answer: 1

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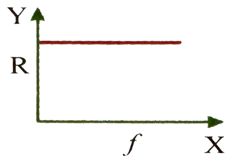
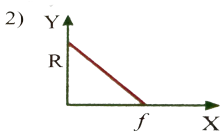
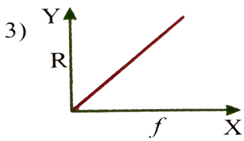
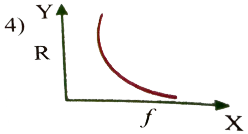
13. The correct variation of resistance R with frequency f is given by

A. 

B. 

C. 

D. 

Answer: 1

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14. Same current is flowing in two alternating circuits. The first circuit contains only inductances and the other contains only a capacitor, if the frequency of the e.m.f of AC is increased, the effect on the value of the current will be

A. increases in first circuit and decrease in the other

B. increase in both circuits

C. decrease in both circuits

D. decrease in first circuit and increase in the other

Answer: 4

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15. When an a.c source is connected across a resistor

A. The current leads the voltage in phase

B. The current lags behind the voltage in phase

C. The current and voltage are in same phase

D. The current and voltage are out of phase

Answer: 3

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16. The phase angle between current and voltage in a purely inductive circuit is

A. zero

B. π

C. $\pi/4$

D. $\pi/2$

Answer: 4

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17. Ratio of impedence to capactive reactance has

A. no units

B. ohm

C. ampere

D. tesla

Answer: 1

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18. An inductor-coil having some resistance is connected to an AC source. Which of the following quantities have zero average value over a cycle?

A. induced emf in the inductor only

B. current only

C. both 1 and 2

D. neither 1 nor 2

Answer: 3

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19. Why the current does not rise immediately in a circuit containing inductance

A. because of induced emf

B. because of high voltage drop

C. both 1 and 2

D. because of joule heating

Answer: 3

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20. In an AC circuit containing only capacitance the current

A. leads the voltage by 180°

B. lags the voltage by 90°

C. leads the voltage by 90°

D. remains in phase with the voltage

Answer: 3

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21. A bulb is connected first with DC and the then AC of same voltage then it will shine brightly with

A. AC

B. DC

C. Equally with both

D. Brightness will be in ratio $1/4$

Answer: 3

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

A. $I = \frac{V_0}{L\omega} \sin \omega t$

B. $I = \frac{V_0}{\omega C} \sin\left(\omega t + \frac{\pi}{2}\right)$

C. $I = V_0 C \omega \sin \omega t$

D. $t = V_0 C \omega \sin\left(\omega t + \frac{\pi}{2}\right)$

Answer: 4

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23. At low frequency a condenser offers

A. high impedance

B. low impedance

C. zero impedance

D. impedance of condenser is independent of frequency

Answer: 1

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24. Statement (A) : The reactance offered by an inductance in $A.C.$ Circuit decreases with increase of AC frequency

Statement (B) : The reactance offered by capacitor in AC circuit increases with increase of AC frequency.

A. A is ture but B is false

B. Both A and B are true

C. A is false but B is true

D. Both A and B are false

Answer: 4

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25. Statement (A) : With increase in frequency of AC supply inductive reactance increases.

Statement (B) : With increase in frequency of AC supply capacitive reactance increase

A. A is ture but B is false

B. Both A and B are true

C. A is false but B is true

D. Both A and B are false

Answer: 1

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26. In an $A.C$ circuit having resistance and capacitance

A. emf leads the current

B. current lags behind the emf

C. both the current and emf are in phase

D. current leads the emf.

Answer: 4

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27. Select the correct options among the following In an R - C circuit

(a) instantaneous $A.C$ is given by $I = I_0 \sin(wt + \phi)$

(b) the alternating current in the circuit leads the emf by a phase angle ϕ.

(c) Its impedance is $\sqrt{R^2 + (\omega C)^2}$

(d) It capacitive reactance is ωc

A. a, b are true

B. b, c, d are true

C. c, d are true

D. a, c are ture

Answer: 1

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28. If the frequency of alternating e.m.f. is in L - C - R circuit, then the value of impedance Z will change with log (frequency) as

A. increase

B. increases and then becomes equal to resistance, then it will start decreasing

C. decreases and when it becomes minimum equal to the resistance then it will start increasing

D. go on decreasing

Answer: 3

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29. An inductor and a resistor are connected in series with an ac source. In this circuit.

A. the current and $P.d$ across the resistance lead $P.d$ across the inductance by $\pi/2$

B. the current and $P.d$ acorss the resistance lags behind the $P.d$ across the inductance by angle $\pi/2$

C. The currentd across resistance leads and the $P.d$ across resistance lags behind the $P.d$ across the inductance by $\pi/2$

D. the current across resistance lags behind and the $P.d$ across the resistance leads the $P.d$ across the inductance by $\pi/2$

Answer: 2

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30. 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. $\pi/4$

B. zero

C. π

D. $\pi/2$

Answer: 2

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31. The incorrect statement for L - R - C series circuit is

A. The potential difference across the resistance and the applied current are always in same phase.

B. The phase difference across inductive coil is $90\ ^\circ$

C. The phase difference between the potential difference acorss capacitor and potential difference across inductance is 90°

D. The phase difference between potential difference acorss capacitor and potential difference across resistance is 90°

Answer: 3

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32. In series L - C - R resonant circuit, to increase the resonant frequency

A. L will have to be increased

B. C will have to be increased

C. LC will have to be decreased

D. LC will have to be increased

Answer: 3

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33. In an LCR series ac circuit the voltage across L, C and R are V_1, V_2 and V_3 respectively The voltage of the source is .

A. $V_1 + V_2 + V_3$

B. $\sqrt{V_1^2 + (V_2 + V_3)^2}$

C. $V_1 - V_2 - V_3$

D. $\sqrt{V_1^2 - (V_2 - V_3)^2}$

Answer: 4

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34. In the non-resonant circuit, what will be the nature of the circuit for frequencies heigher than the resonant frequency?

A. resistive

B. capacitive

C. inductive

D. both 1 and 2

Answer: 3

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35. The phase difference between voltage and current in an LCR series circuit is

A. zero always

B. $\pi/4$ always

C. π

D. between 0 and $\pi/2$

Answer: 4

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36. In an LCR a.c. circuit at resonance, the current

A. Is always in phase with the voltage

B. Always leads the voltage

C. Always lags behind the voltage

D. May lead or lag behind the voltage

Answer: 1

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37. An inductance L and capacitance C and resistance R are connected in series across an

AC source of angular frequency ω. If $\omega^2 > \frac{1}{LC}$ then

A. emf leads the current

B. both the emf and the current are in phase

C. current lead the emf

D. emf lags behind the current

Answer: 1

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38. Consider the following two statements A and B and identify the correct answer.

A) At resonance of L - C series circuit, the reactance of circuit is minimum.

B) The reactance of a capacitor is an $A.C$ circuit is similar to the reactance of a capacitor in a $D.C$ circuit

A. A is true but B is false

B. Both A and B are ture

C. A is false but B is true

D. Both A and B are false

Answer: 1

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39. Choose the wrong statement of the following

A. The peak voltage acorss the indcutor can be less than the peak voltage of the source in an LCR circuit

B. In a circuit containing a capacitor and an ac soruce the currentsd is zero at the instant source voltage is maximum

C. When an AC source is connected to a capacitor, then the rms current in the circuit gets increased if a dielectic slab is inserted into the capacitor

D. In a pure inductive circuitd emf will be in phase with the current.

Answer: 4

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40. The essential difference between a $d.c$ dynamo and an $a.c$ dynamo is that

A. a.c. has an electromagent but d.c. has a permanent magnet

B. a.c. will generate a higher voltage

C. a.c. has slip rings but the d.c has a commutator

D. a.c. dynamo has a coil wound on soft iron, but the d.c. dynamo has a coil wound on copper

Answer: 3

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41. The unit of impedence is

A. ohm

B. mho

C. ampere

D. volt

Answer: 1

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42. The power factor of an AC circuit having resistance (R) and inductance (L) connected in series and an angular velocity ω is

A. $\dfrac{\sqrt{R^2 + \omega^2 L^2}}{R}$

B. $\dfrac{R}{\sqrt{R^2 + \omega^2 L^2}}$

C. $\dfrac{\omega L}{R}$

D. $\dfrac{R}{\omega L}$

Answer: 2

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43. The capacitor offers zero resistance to

A. $D.C$ only

B. $A.C$ & $D.C$

C. $A.C$ only

D. neither $A.C$ nor $D.C$

Answer: 4

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44. Power factor is defined as

A. apparent power/ ture power

B. true power / apparent power

C. true power $(\text{apparent power})^2$

D. true power x apparent power

Answer: 2

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45. The core of any transformaer is laminated so as to

A. energy loss due to eddy currents may be reduced

B. rusting of the core may be prevented

C. change in flux may be increased

D. ratio of voltage in the primary to that in the secondary may be increased

Answer: 1

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46. A step up transformer is used to

A. increase the current and increase the voltage

B. decrease the currentd and increase the voltage

C. increase the current and decrease the voltage

D. decrease the current and decrease the voltage

Answer: 2

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47. A transformer changes the voltage

A. without changing the current and frequency

B. without changing the current but changes the frequency

C. without changing the frequency but changesf the current

D. without changing the frequency as well as the current

Answer: 3

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48. A step up transformer is connected on the primary side to a rechargable battery which can deliver a large current. If a bulb is connected in the secondary, then

A. the bulb will glow very bright

B. the bulb will get fused

C. the bulb will glow, but with less brightness

D. the bulb will not glow

Answer: 4

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49. The ratio of primary voltage to secondary voltage in a transformer is $'n'$. The ratio of the primary current to secondary current in the transformer is

A. n

B. $1/n$

C. n^2

D. $1/n^2$

Answer: 2

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50. In a step down transformer, the number of turns in the primary is always

A. greater than the number of turns in the secondary

B. less than the number of turns in the secondary

C. equal to the number of turns in the secondary

D. either greater than or less than the number of turns in the secondary

Answer: 1

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51. The transformer ratio of a step up transformer is

A. greater than one

B. less than one

C. less than one and some times greater than one

D. greater than one and some times less than one

Answer: 1

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52. A setup transformer develops $440V$ in secondary coil for an input of $200VA$. C Then the type of transformer is

A. Steped down

B. steped up

C. Same

D. Same but with reversed direction

Answer: 2

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53. Assertion (A) : If changing current is flowing through a machine with iron parts, results in loss of energy.

Reason (R) : Changing magnetic flux through an area of the iron parts causes eddy currents.

A. Both A and R are individually true and R is the correct explanation of A

B. Both A and R are individually true but R is not the correct explanation of A

C. A is true but R is false

D. Both A and R are false

Answer: 1

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54. Transformers are used

A. d.c circuit only

B. a.c. circuit only

C. Both a.c and d.c circuits

D. Integrated circuits

Answer: 2

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55. The magnitude of the e.m.f. across the secondary of a transformer does not depend on

A. The number of thef turns in the primary

B. The number of the turns in the secondary

C. The magnitude of the e.m.f applied across the primary

D. The resistance of the primary and the secondary

Answer: 4

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56. For an ideal transformer ratio of output ot the input power is always

A. greater than one

B. equal ot one

C. less than one

D. zero

Answer: 2

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57. Consider the following two statements A and B and identify the correct answer.

(A) In a transformer a large alternating current at low voltage can be transformed into a small alternating current at high voltage

(B) Energy in current carrying coil is stored in the form of magnetic field.

A. A is true but B is false

B. Both A and B is true

C. A is false but Bd is true

D. Both A and B are false

Answer: 2

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58. Statement (A) : Flux leakage in a transformer can be minimized by winding the primary and secondary coils one over the other.

Statement (B) : Core of the transformer is made of soft iron

A. A is true but B is false

B. Both A and B is true

C. A is false but Bd is true

D. Both A and B are false

Answer: 4

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59. Statement (A) : In high current low voltage windings of a transformer thick wire is used to minimize energy loss due to heat produced

Statement (B) : The core of any transformer is laminated so as to reduce the erergy loss due to eddy currents.

A. A is true but B is false

B. Both A and B is true

C. A is false but Bd is true

D. Both A and B are false

Answer: 2

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60. Statement (A) : Step up transformer converts low voltage, high current to high voltage, low current

Statement (B) : Transformer works on both ac and dc.

A. A is true but B is false

B. Both A and B is true

C. A is false but Bd is true

D. Both A and B are false

Answer: 1

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61. To reduce the iron losses in a transformer, the core must be made of a material having

A. low permeability and high resistivity

B. high permeability and high resistivity

C. low permeability and low resisttivity

D. high permeability and low resistivity

Answer: 2

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62. Maximum efficiency of a transformer depends on

A. the working condtitions of technicians.

B. weather copper loss $= 1/2x$ irons loss

C. weather copper loss = iron loss

D. weather copper loss $= 2x$ iron loss

Answer: 3

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

A. circuit will be capactive 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 of capacitive reactance equal inductive reactance

D. current will be leading voltage if $\omega > \frac{1}{\sqrt{LC}}$

Answer: 3

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64. The value of current in tow series LCR circuits at resonance is same, then

A. both circuits must be having same value of capacitance and inductance

B. in both circuits ratio of L and C will be same

C. for both the circuit X_L/X_C must be same at the frequency

D. both circuits must have same impedance at all frequencies

Answer: 3

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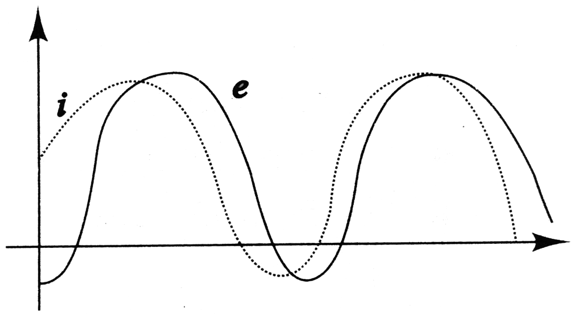
65. When an ac source of emf$e = E_0 \sin(100t)$ is connected across a circuit, the phase difference between emf e and currnet I in the circuit is observed to be $(\pi)/(4)$ as shown in fig. If the circuit consists possibly only of R-C or R-C of L-R series, find the relationship find the relationship between the two elements.



A. $R = 1k\Omega, C = 10\mu F$

B. $R = 1k\Omega, C = 1\mu F$

C. $R = 1k\Omega, L = 10H$

D. $R = k\Omega, L = 1H$

Answer: 1

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66. An AC voltage source of variable angular frequency (ω) and fixed amplitude V_0 is connected in series with a capacitance C and an electric bulb of resistance R (inductance zero). When (ω) is increased

A. the bulb glows dimmer

B. the bulb glows brighter

C. total impendance of the circuits is unchanged

D. total impendance of the circuit increases

Answer: 2

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80. When an a.c source is connected across a resistor

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81. The phase angle between current and voltage in a purely inductive circuit is

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82. Ratio of impedence to capactive reactance has

Watch Video Solution

83. An inductor-coil having some resistance is connected to an AC source. Which of the following quantities have zero average value over a cycle?

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84. Why the current does not rise immediately in a circuit containing inductance

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85. In an AC circuit containing only capacitance the current

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86. A bulb is connected first with DC and the then AC of same voltage then it will shine brightly with

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

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88. At low frequency a condenser offers

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91. In an $A.C$ circuit having resistance and capacitance

Watch Video Solution

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(a) instantaneous $A.C$ is given by $I = I_0 \sin(wt + \phi)$

(b) the alternating current in the circuit leads the emf by a phase angle ϕ.

(c) Its impedance is $\sqrt{R^2 + (\omega C)^2}$

(d) It capacitive reactance is ωc

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93. If the frequency of alternating e.m.f. is in L - C - R circuit, then the value of impedance Z will change with log (frequency) as

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98. In an LCR series ac circuit the voltage across L, C and R are V_1, V_2 and V_3 respectively The voltage of the source is .

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99. In the non-resonant circuit, what will be the nature of the circuit for frequencies heigher than the resonant frequency?

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101. In an LCR a.c. circuit at resonance, the current

Watch Video Solution

102. An inductance L and capacitance C and resistance R are connected in series across an AC source of angular frequency ω. If $\omega^2 > \frac{1}{LC}$ then

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103. Consider the following two statements A and B and identify the correct answer.

A) At resonance of L - C series circuit, the reactance of circuit is minimum.

B) The reactance of a capacitor is an $A.C$

circuit is similar to the reactance of a capacitor in a $D.C$ circuit

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104. Choose the wrong statement of the following

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107. The power factor of an AC circuit having resistance (R) and inductance (L) connected in series and an angular velocity ω is

Watch Video Solution

108. The capacitor offers zero resistance to

Watch Video Solution

109. Power factor is defined as

Watch Video Solution

110. The core of transformer is laminated so that

Watch Video Solution

111. A step up transformer is used to

Watch Video Solution

112. A transformer changes the voltage

Watch Video Solution

113. A step up transformer is connected on the primary side to a rechargeable battery which can deliver a large current. If a bulb is connected in the secondary, then

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114. The ratio of primary voltage to secondary voltage in a transformer is $'n'$. The ratio of the primary current to secondary current in the transformer is

Watch Video Solution

115. In a step down transformer, the number of turns in the primary is always

Watch Video Solution

116. The transformer ratio of a step up transformer is

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117. A setup transformer develops $440V$ in secondary coil for an input of $200VA. C$ Then the type of transformer is

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118. Assertion (A) : If changing current is flowing through a machine with iron parts, results in loss of energy.

Reason (R) : Changing magnetic flux through an area of the iron parts causes eddy currents.

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Watch Video Solution

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Watch Video Solution

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(B) Energy in current carrying coil is stored in the form of magnetic field.

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124. Statement (A) : In high current low voltage windings of a transformer thick wire is used to minimize energy loss due to heat produced

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125. Statement (A) : Step up transformer converts low voltage, high current to high voltage, low current

Statement (B) : Transformer works on both ac and dc.

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126. To reduce the iron losses in a transformer, the core must be made of a material having

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Watch Video Solution

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

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129. The value of current in two series LCR circuits at resonance is same when connected across a sinusodial voltage source. Then:

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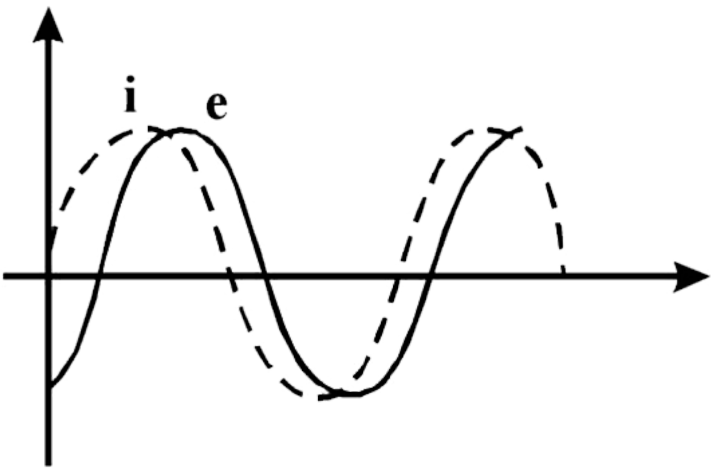
130. When an AC source of $emfe = E_0 \sin(100t)$ is connected across a circuit i in the circuit, the phase difference between the emf e and the current i in the circuit is observed to be $(\pi/4)$, as shown in the diagram. If the circuit consists possibly only of R-C or R-L or L-C in series, find the relationship between the two elements



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131. An AC voltage source of variable angular frequency (ω) and fixed amplitude V_0 is connected in series with a capacitance C and an electric bulb of resistance R (inductance zero). When (ω) is increased

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132. In an ac circuit the current

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133. The average emf during the positive half cycle of an ac supply of peak value E_0 is .

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134. Alternating current is transmitted to distant places at

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135. In case of $a.c$ circuit, Ohm's law holds good for

a) Peak values of voltage and current

b) Effective values of voltage and current

c) Instantaneous values of voltage and current

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136. In case of AC circuits the relation $V = iZ$, where Z is impedance, can directly applied to

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137. Alternating current can not be measured by D.C. Ammeter because

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138. The r.m.s value of Potential due to superposition of given two alternating potentials $E_1 = E_0 \sin\omega t$ and $E_2 = E_0 \cos\omega t$ will be

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139. If the instantaneous current in a circuit is given by $i = 2\cos(\omega t - \phi)$ampere, the r.m.s. value of the current is

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140. If a capacitor is connected to two different $A.C$ generators, then the value of capactive reactance is

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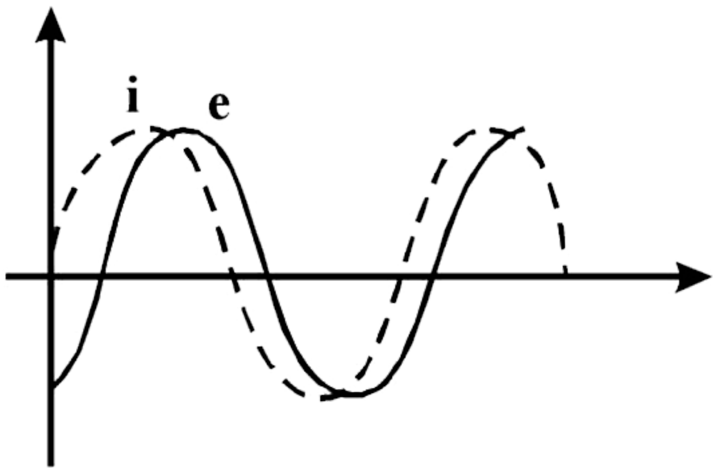

197. An AC voltage source of variable angular frequency (ω) and fixed amplitude V_0 is connected in series with a capacitance C and an electric bulb of resistance R (inductance zero). When (ω) is increased

Assertion & Reason

1. Assertion (A) : The average value of $< \sin^2\omega t >$ is zero.

Reason (R) : The average value of function $F(t)$ over a period T is $< F(t) > = \frac{1}{T}\int_0^T F(t)dt$

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 4

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2. Assertion (A) : If current varies sinusoidally the average power consumed in a cycle is zero.

Reason (R) : If current sinusoidally the average power consumed is zero

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 4

Watch Video Solution

3. Assertion (A) : The power consumed in an electric circuit is never negative

Reason (R) : The aveage power consumed in an electric circuit is $P = \frac{V^2}{R} = I^2R$

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of

Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 1

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4. Assertion (A) : The inductive reactance limits the currents in a purely inductive circuit in the same way as the resistancefsd circuit.

Reason (R) : The inductive reactance is directly propontional to the inductance and to the frequency of tha varying current.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 2

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5. Assertion (A) : An ac emf which oscillates symmetrically about zero, the current it sustains also oscillates symmetrically about zero.

Reason (R) : In any circuit element, current is always in the phase with voltage

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 4

Watch Video Solution

6. Assertion (A) : A lamp is connected in series with a capacitor and ac source connected across their terminal consequently current flow in the circuit and the lamp will shine.

Reason (R) : Capacitor block dc current and allow ac current

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 1

Watch Video Solution

7. Assertion (A) : An electric lamp is connected in series with a long solenoid of copper with air core and then connected to AC source. If an iron rod is inserted in solenoid the lamp will become dim.

Reason (R) : If iron rod is inserted in solenoid, the induction of solenoid increases.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 1

Watch Video Solution

8. An inductor, a capacitor, and a resistor are connected in series. The combination is connected across an ac source.

Statement 1: Peak current through each remains same.

Statement 2: Average power dielivered by source is equal to average power developed across resistance.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 2

Watch Video Solution

9. Assertion: When frequency is greater than resonace frequency is a series LCR circuit, it will the an inductive circuit.

Reason : Resultant voltage will lead the current.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 1

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10. Assertion (A) : Maximum power is dessipated in a circuit (through R) in resonace

Reason (R) : At resonance in a series LCR circuit, the voltage across inductor and capacitor are out phase.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 1

Watch Video Solution

11. Statement 1: Both dc and ac can be measured by a hot wire instrument.

Statement 2: the hot wire instrument is based on the principle of magnetic effect of current.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 3

Watch Video Solution

12. Assertion (A) : The electrostatic energy stored in capacitor plus magnetic energy stored in inductor will always be zero in series LCR circuit driven by ac voltage source under condition of resonance.

Reason (R) : The complete voltage of ac source appears across the resistor in a series LCR circuit driven by ac voltage source under condition of resonance.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 4

Watch Video Solution

13. Assertion (A) : The r.m.s value of alternating current is defined as the square root of the average of I^2 during a complete cycle.

Reason (R) : For sinusoidal a.c.

$$\left(I = I_0 \sin wt\right) I_{\text{rms}} = \frac{I_0}{\sqrt{2}}$$

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 2

Watch Video Solution

14. Assertion: In series LCR circuit resonance can take place.

Reason: Resonance takes place if inductance and capacitive reactance are equal and opposite.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

C. Assertion is true but Reason is false

D. Assertion is false but Reason is true

Answer: 1

Watch Video Solution

LEVEL - I (C.W)

1. The r.m.s value of an a.c of $59Hz$ is $10A$. The time taken by the alternating current in reaching from zero to maximum valuef and the peak value of current will be

A. 2×10^{-2}sec and $14.14A$

B. 1×10^{-2}sec and $7.07A$

C. 5×10^{-3}sec and $7.07A$

D. 5×10^{-3}sec and $14.14A$

Answer: 4

Watch Video Solution

2. An inductor has a resistance R inductance L. It is connected to an $A.C$ source of e.m.f. E_V and angular frequency ω then the current I_v in the circuit is

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

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

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

D. $\sqrt{\left(\dfrac{E_V}{R}\right)^2 + \left(\dfrac{E_V}{\omega L}\right)^2}$

Answer: 3

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3. The peak value of AC mains (in volt) is

A. 155.6

B. 220.0

C. 311

D. 440.0

Answer: 3

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4. The peak value $A.C$ is $2\sqrt{2}A$. It's apparent value will be

A. $1A$

B. $2A$

C. $4A$

D. zero

Answer: 2

Watch Video Solution

5. Alternating current in circuit is given by $I = I_0 \sin 2\pi nt$. Then the time by the current to rise from zero to r.m.s value is equal to

A. $1/2n$

B. $1/n$

C. $1/4n$

D. $1/8n$

Answer: 4

Watch Video Solution

6. Using an ac voltmeter, the potential difference in the electrical line in a house is read to be 234 V. If the line freqency 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: 2

Watch Video Solution

7. A mixer of 100Ω resistance is connected to an $A.C$ source of $200V$ and $50\text{cycles}/\text{sec}$. The value of average potentail difference across the mixer will be

A. $308V$

B. $264V$

C. $220V$

D. zero

Answer: 4

Watch Video Solution

8. The equation of an alternating voltage is $E = 220\sin(\omega t + \pi/6)$ and the equation of the current in the circuit is $I = 10\sin(\omega t - \pi/6)$. Then the impedance of the circuit is

A. 10 ohm

B. 22 ohm

C. 11 ohm

D. 17 ohm

Answer: 2

Watch Video Solution

9. A steady $P.D$ of $10V$ produces heat at a rate $'x'$ in resistor. The peak value of $A.C$ voltage which will produce heat at rate of $x/2$ is same resistor is

A. $5V$

B. $5\sqrt{2}$

C. $10V$

D. $10\sqrt{2}V$

Answer: 3

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10. An alternating voltage $E = 200\sqrt{2}\sin(100t)V$ is connected to a $1\mu F$ capacitor through an ac ammeter (it reads rms value). What will be the reading of he ammeter?

A. $10mA$

B. $40mA$

C. $80mA$

D. $20mA$

Answer: 4

Watch Video Solution

11. A 120 volt AC source is connected across a pure inductor of inductance 0.70 henry. If the frequency of the source is $60Hz$, the current passing through the inductor is

A. $4.55A$

B. $0.355A$

C. $0.455A$

D. $3.55A$

Answer: 3

Watch Video Solution

12. A transformer steps an $A.C$ voltage from $230V$ ot $2300V$. If the number of turns in the secondary coil is 1000, the number of turns in the primary coil will be

A. 100

B. $10, 000$

C. 500

D. 1000

Answer: 1

Watch Video Solution

13. The transformer ratio of a transformer is 5. If the primary voltage of the transformer is $400V, 50Hz$ the secondary voltage will be

A. $2000V$, $250Hz$

B. $80V$, $50Hz$

C. $80V$, $10Hz$

D. $2000V$, $50Hz$

Answer: 4

Watch Video Solution

14. A step-up transformer works on $220V$ and gives $2A$ to an external resistor. The turn ratio between the primary and secondary coils is 2 :

25. Assuming 100% efficiency, find the secondary voltage, primary current and power delivered respectively

A. $2750V, 25A, 5500W$

B. $2750V, 20A, 5000W$

C. $2570V, 25A, 550W$

D. $2750V, 20A, 55W$

Answer: 1

Watch Video Solution

15. A coil of self-inductance $\left(\frac{1}{\pi}\right)H$ is connected is series with a 300Ω resistance. A voltage of $200V$ at frequency $200Hz$ is applied to this combination. The phase difference between the voltage and the current will be

A. $\tan^{-1}\left(\frac{4}{3}\right)$

B. $\tan^{-1}\left(\frac{3}{4}\right)$

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

D. $\tan^{-1}\left(\frac{5}{4}\right)$

Answer: 1

Watch Video Solution

16. A condenser of $10\mu F$ and an inductor of $1H$ are connected in series with an $A.C$ source of frequency $50Hz$. The impedance of the combination will be (take $\pi^2 = 10$)

A. zero

B. Inifinity

C. 44.7Ω

D. 5.67Ω

Answer: 1

Watch Video Solution

17. A $100km$ telegraph wire hasd capacity of $0.02\mu F/km$, if it carries an alternating current of frequency $5kHZ$. The value of an inductrance required to be connected in series so that the impedance is minimum.

A. $50.7mH$

B. $5.07mH$

C. $0.507mH$

D. $507mH$

Answer: 3

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18. In an LCR series circuit the rms voltages across R, L and C are foundd to be $10V, 10V$ and $20V$ respectively. The rms voltage across the entire combination is

A. $30V$

B. $1V$

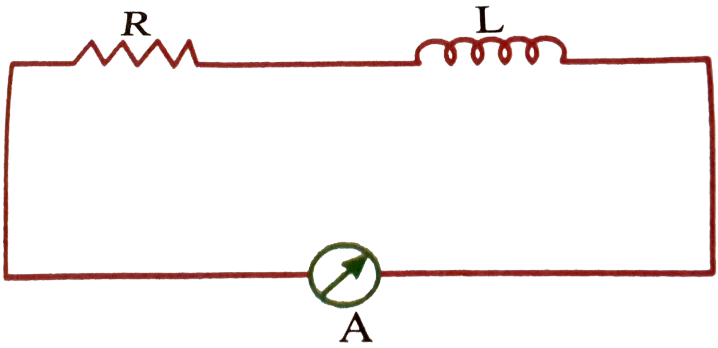
C. $20V$

D. $10\sqrt{2}V$

Answer: 4

Watch Video Solution

19. In the circuit shown, a $30V$ d.c. source gives a current $2.0A$ as recorded in the ammeter A and $30V$ a.c. source of frequency $100Hz$ gives a currentd $1.2A$. The inductive reactance is



A. 10 ohm

B. 20 ohm

C. $5\sqrt{34}$ ohm

D. 40 ohm

Answer: 2

Watch Video Solution

20. A choke coil has negligible resistance. The alternating potential drop across it is 220 volt and the current is $5mA$. The power consumed is

A. $220 \times \frac{5}{1000} W$

B. $\frac{220}{5} W$

C. zero

D. $2.20 \times 5W$

Answer: 3

Watch Video Solution

21. In an AC circuit, the instantaneous values of e.m.f and current are $e = 200\sin 314t$ volt and $i = \sin\left(314t + \frac{\pi}{3}\right)$ ampere. The average power consumed in watt is

A. 200

B. 100

C. 0

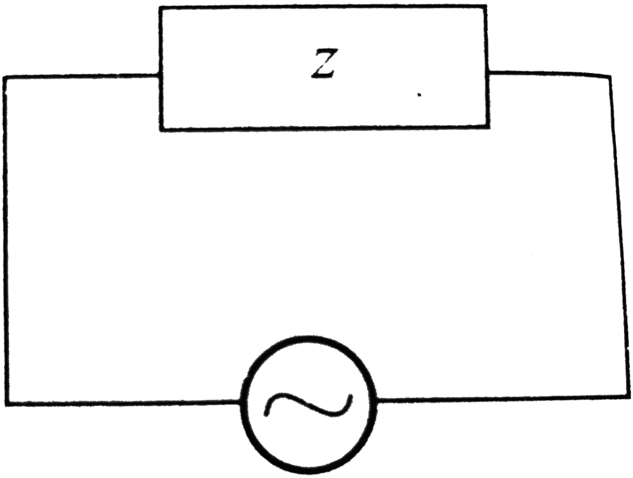
D. 50

Answer: 4

Watch Video Solution

22. In a black box of unknown elements (L or R or any other combination), an ac voltage $E = E_0 \sin(\omega t) + \phi)$ is applied and current in the circuit was found to be $I = \left(I_0\right)\sin[\omega t + \phi + (\pi/4)]$. Then the unknown

elements in the box may be



A. only capacitor

B. both inductor and resistor

C. either capacitor, resistor and inductor or

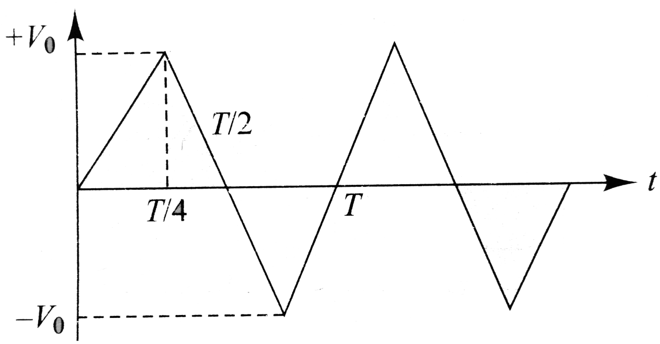
only capacitor and resistor

D. only resistor

Answer: 3

Watch Video Solution

23. The voltage time (V-t) graoh for triangular wave having peak value $\left(V_0\right)$ is as shown in fig.



A. $\frac{V_0}{\sqrt{3}}$

B. $\frac{V_0}{2}$

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

D. $2V_0$

Answer: 1

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LEVEL - II (C.W)

1. The average current of a sinusoidally varrying alternating current of peak value $5A$ with initial phase zero, between the instants $t = T/8$ to $t = T/4$ is (where $'T'$ is time period)

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

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

C. $\frac{20\sqrt{2}}{\pi}$

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

Answer: 1

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2. A 100Ω resistance is connected in series with a $4H$ inductor. The voltage across the resistor is $V_R = 2\sin(1000t)V$. The voltage across the inductors is

A. $80\sin\left(1000t + \frac{\pi}{2}\right)$

B. $40\sin\left(1000t + \frac{\pi}{2}\right)$

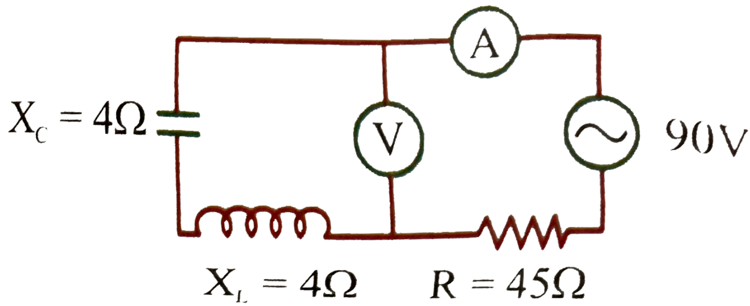
C. $80\sin\left(1000t - \frac{\pi}{2}\right)$

D. $40\sin\left(1000\pi - \frac{\pi}{2}\right)$

Answer: 1

Watch Video Solution

3. The reading of voltemeter and ammeter in the following figure will respectively be



A. 0 and $2A$

B. $2A$ and $0V$

C. $2V$ and $2A$

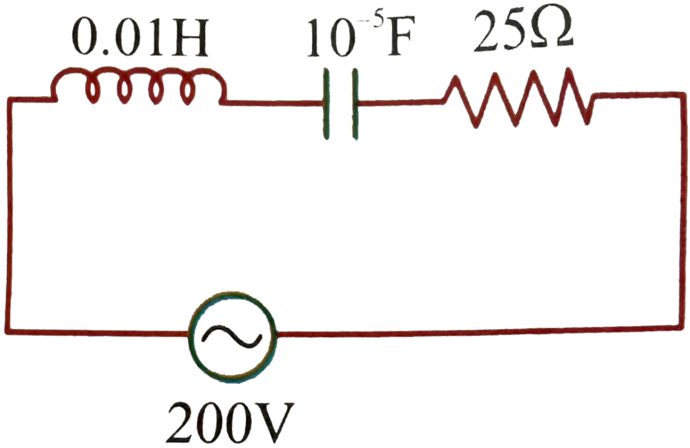
D. $0V$ and $0A$

Answer: 1

Watch Video Solution

4. In the following circuit, the value of current flowing in the circuit at $f = 0$ and $f = \infty$ will

respectively be



A. $8A$ and $0A$

B. $0A$ and $0A$

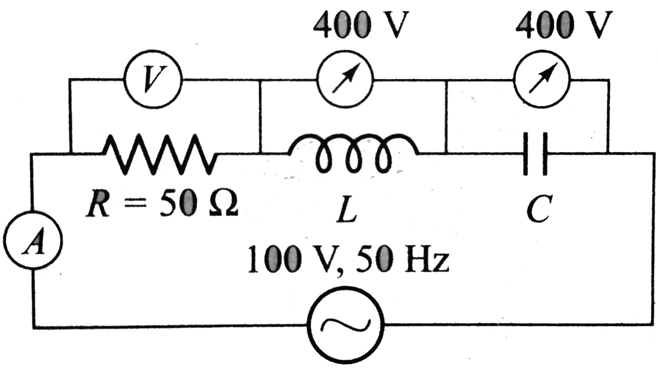
C. $8A$ and $8A$

D. $0A$ and $8A$

Answer: 2

Watch Video Solution

5. In the series LCR circuit , the voltmeter and ammeter reading are:



A. $V = 100$ volt, $I = 2A$

B. $V = 100$ volt, $I = 5A$

C. $V = 1000$ volt, $I = 2A$

D. $V = 300$ volt, $I = 1A$

Answer: 1

Watch Video Solution

6. The potential difference between the ends of a resistance R is V_R, between the ends of capacitor is $V_C = 2V_R$ and between the ends of inductance is $V_L = 3V_R$. Then the alternating potential of the source in terms of V_R will be

A. $\sqrt{2}V_R$

B. V_R

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

D. $5V_R$

Answer: 1

Watch Video Solution

7. A 220-V, 50 Hz, ac generator is connected to an inductor and a 50Ω resistance in series. The current in the circuit is $1.0A$. What is the PD across inductor?

A. $102.2V$

B. $186.4V$

C. $213.6V$

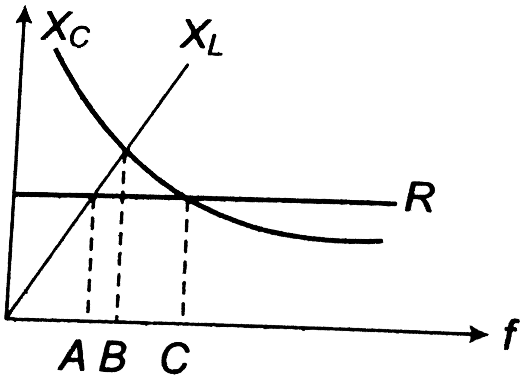
D. $302V$

Answer: 3

Watch Video Solution

8. The figure shows variation of R, X_L and X_C with frequency f in a series L, C, R circuit. Then for what frequency point, the circuit is

inductive ?



A. A

B. B

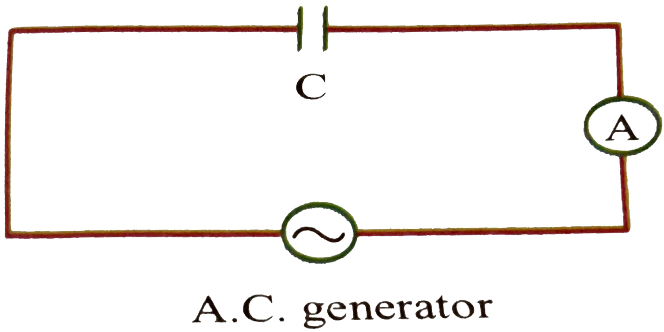
C. C

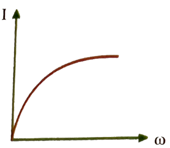
D. All points

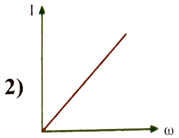
Answer: 3

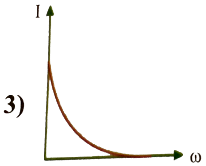
Watch Video Solution

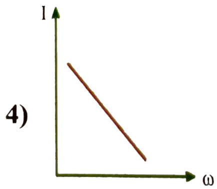
9. A constant voltage at different frequencies is applied across a capacitance C as shown in the figure. Which of the following graphs correctly depicts the variation of current with frequency



A. 1) 

B. 

C. 

D. 

Answer: 2

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10. In a series LCR circuit $R = 200(\Omega)$ and the voltage and the frequency of the main supply is 220V and 50 Hz respectively. On taking out the capacitance from the circuit the current lags behind the voltage by $30(\circ)$. On taking out the inductor from the circuit the current leads the voltage by $30(\circ)$. The power dissipated in the LCR circuit is

A. $305W$

B. $210W$

C. zero

D. $242W$

Answer: 4

Watch Video Solution

11. 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 $200 rad/s$. 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: 2

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LEVEL - III (C.W)

1. An AC voltage source of variable angular frequency (ω) and fixed amplitude V_0 is connected in series with a capacitance C and an electric bulb of resistance R (inductance zero).

When (ω) is increased

A. The bulb glows dimmer

B. The bulb glows brighter

C. Total impendance of the circuits is unchanged

D. Total impendance of the circuit increases

Answer: 2

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2. In an $A.C$ circuit the instantaneous values of current and voltage are $I = 120\sin\omega t$ ampare and $E = 300\sin(\omega t + \pi/3)$ volt respectively. What will be the inductive reactance of series LCR circuit if the resistance and capacitve reactrance are 2 ohm and 1 ohm respectively?

A. 4.5 ohms

B. 2 ohms

C. 2.5 ohms

D. 3 ohms

Answer: 1

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3. A pure resistive circuit element $'x'$ when connected to an $A.C$ supply of peak voltage $100V$ gives a peak current of $4A$ which is in phase with the voltage. A second circuit element $'y'$ when connected to the same AC supply also gives the same value of peak current but the current lags behind by 90°. If the series combination to of $'x'$ and $'y'$ is connected to the same supply. $R.M.S$ value of current is

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

B. $2A$

C. $1/2A$

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

Answer: 2

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4. An ideal inductor takes a current of $10A$ when connected to a $125V, 50HzAC$ supply, A pure resistor across the same source takes $12.5A$. If the two are connected in series across a $100\sqrt{2}V, 40Hz$ supply, the current through the circuit will be

A. $10A$

B. $12.5A$

C. $20A$

D. $25A$

Answer: 1

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5. A circuit containing resistance R_1, Inductance L_1 and capacitance C_1 connected in series resonates at the same frequency' n' as a second combination of R_2, L_2 and C_2 . If the two are connected in series. Then the circuit will resonates at

A. n

B. $2n$

C. $\sqrt{\frac{L_2C_2}{L_1C_1}}$

D. $\sqrt{\frac{L_1C_1}{L_2C_2}}$

Answer: 1

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6. An AC source of variable frequency is applied across a series L - C - R circuit. At a requency double the resonace frequency. The impedance is $\sqrt{10}$ times the minimum impedance. . The inductive reactance is

A. R

B. $2R$

C. $3R$

D. $4R$

Answer: 4

Watch Video Solution

7. A $750Hz, 20V$ source is connected to as resistance of 100Ω an inductance of $0.1803H$ and a capacitance of $10\mu F$ all in sereis.Calculate the time in which the resistance (thermalcapacity $2J/.^{\circ}C$) wil get heated by $10^{\circ}C$.

A. 328 sec

B. 348 sec

C. 3.48 sec

D. 4.32 sec

Answer: 2

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

C. $\frac{3}{5}$

D. $\frac{5}{3}$

Answer: 1

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9. An LCR circuit has $L = 10mL, R = 3\Omega$, and $C = 1\mu F$ connected in series to a source of

$15\cos\omega t$ volt. The current amplitude at a frequency that is 10% lower then the resonant frequency is

A. $0.5A$

B. $0.7A$

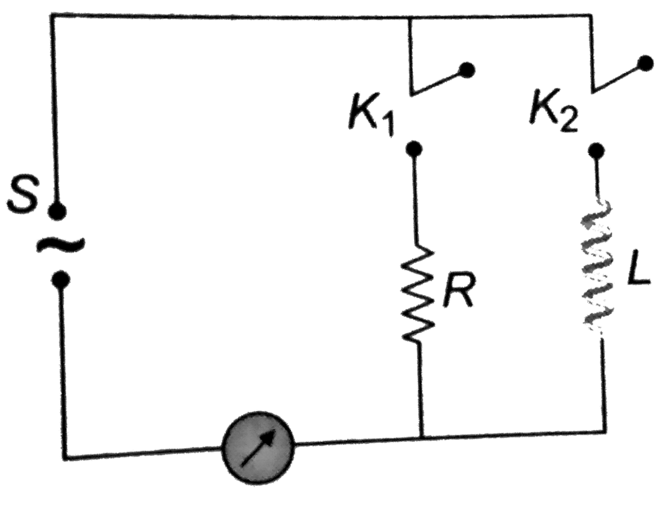
C. $0.9A$

D. $1.1A$

Answer: 2

Watch Video Solution

10. In the circuit shown, R is a pure resistor, L is an inductor of negligible resistance (as compared to R) and S is a$100V, 50HzAC$ source of negligible resistance. With eigther key k_1 alone or k_2 alone closed, the current is I_0. if the source is changed to $100V, 100Hz$, the current with k_1 alone closed and with k_2 alone closed will be respectively



A. $I, I/2$

B. $I, 2I$

C. $2I, I$

D. $2I, I/2$

Answer: 1

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11. A capacitor has a resistance of $1200 M\Omega$ and capacitance of $22 \mu F$. When connected to an a.c. supply of frequency 80 hertz, then the alternating voltage supply requried to drive a current of 10 virtual ampere is

A. $904\sqrt{2}V$

B. $904V$

C. $904\sqrt{2}V$

D. $452V$

Answer: 2

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12. A $120V, 60Hz$ a.c. power is connected 800Ω non-inductive resistance and unknown capacitance in series. The voltage drop across the resistance is found to be $102V$, then voltage drop across capacitor is

A. $8V$

B. $102V$

C. $63V$

D. $55V$

Answer: 3

Watch Video Solution

13. A $100V$ a.c. source of frequency $50Hz$ is connected to a LCR circuit with $L = 8.1$ millihenry, $C = 12.5\mu F$ and $R = 10$ ohm, all connected in series. What is the potential difference across the resistance?

A. $100V$

B. $200V$

C. $300V$

D. $450V$

Answer: 1

Watch Video Solution

14. A coil has an inductance of $0.7H$ and is joined in series with a resistance of 220Ω. When an alternating e.m.f of $220V$ at 50 c.p.s. is applied to it, then the wattless component of the current in the circuit is

A. 5 ampere

B. 0.5 ampere

C. 0.7 ampere

D. 7 ampere

Answer: 2

Watch Video Solution

15. Two alternating voltage generators produce emfs of the same amplitude$\left(E_0\right)$ but with a phase difference of $(\pi)/3$. The resultant emf is

A. $E_0 \sin\left(\omega t + \frac{\pi}{3}\right)$

B. $E_0 \sin\left(\omega t + \frac{\pi}{6}\right)$

C. $\sqrt{3}E_0 \sin\left(\omega t + \frac{\pi}{6}\right)$

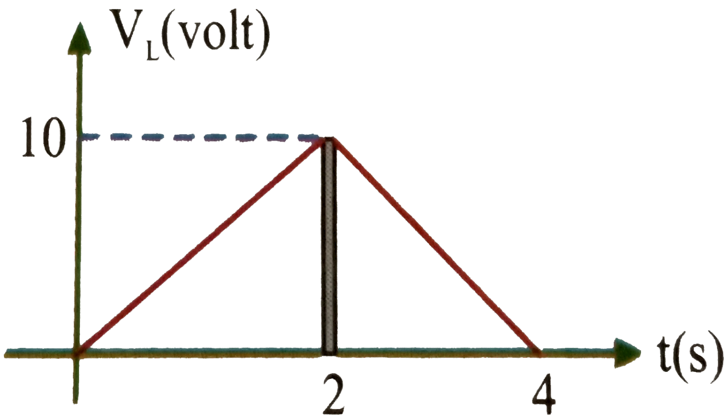
D. $\sqrt{3}E_0 \sin\left(\omega + \frac{\pi}{2}\right)$

Answer: 3

Watch Video Solution

16. The potential difference across a $2H$ inductor as a function of time is shown in figure. At time $t = 0$, current is zero

Current $t = 2$ second is



A. $1A$

B. $3A$

C. $4A$

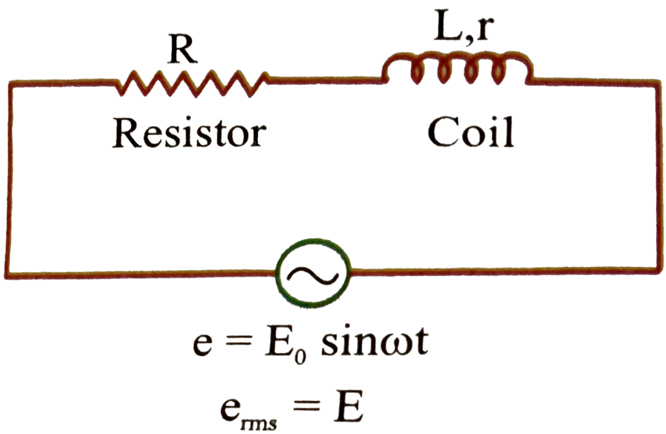
D. $5A$

Answer: 4

Watch Video Solution

17. For the circuit shown in the figure the rms value of voltage across R and coil are E_1 and E_2 respectively.

The power (thermal) developed across the coil is



A. $\frac{E - E_1^2}{2R}$

B. $\frac{E - E_1^2 - E_2^2}{2R}$

C. $\frac{E^2}{2R}$

D. $\frac{\left(E - E_1\right)^2}{2R}$

Answer: 2

Watch Video Solution

18. 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: 4

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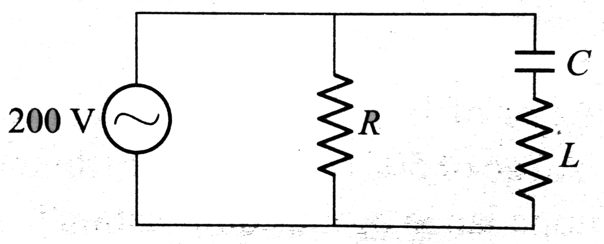
19. In the circuit shown in fig. $X_C = 100\Omega$, $\left(X_L\right) = 200\Omega$ and $R = 100\Omega$. The effective current through the source is



A. $2A$

B. $2\sqrt{2}A$

C. $0.5A$

D. $\sqrt{0.4}A$

Answer: 2

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20. When the rms voltages V_L, V_C and V_R are measured respectively across the inductor L, the capacitor C and the resistor R in a series LCR circuit connected to an AC source, it is found that the ratio $V_L : V_C : V_R = 1 : 2 : 3$. If the rms voltage of the AC sources is $100V$, the V_R is close to:

A. $50V$

B. $70V$

C. $90V$

D. $100V$

Answer: 3

Watch Video Solution

21. A sinusoidal voltage $V(t) = 100\sin(500t)$ is applied across a pure inductance of $L = 0.02H$. The current through the coil is :

A. $10\cos(500t)$

B. $-10\cos(500t)$

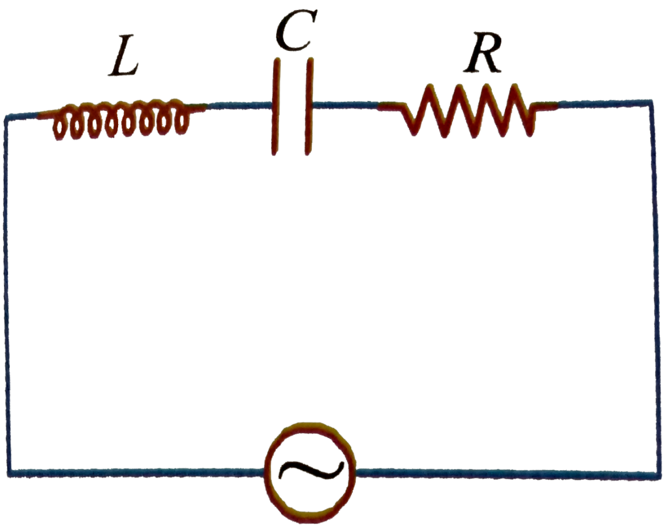
C. $10\sin(500t)$

D. $-10\sin(500t)$

Answer: 2

Watch Video Solution

22. For the LCR circuit, shown here, the current is observed to lead the applied voltage. An additional capacitor C', when joined with the capacitor C present in the circuit, makes the power factor of the circuit unity. The capacitor C' must have been connected in:



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

A. series with C and has magnitude $\dfrac{C}{\left(\omega^2 LC - 1\right)}$

B. series with C and has a magnitde

$$\frac{1 - \omega^2 LC}{\omega^2 L}$$

C. parallel with C and has a magnitude

$$\frac{1 - \omega^2 LC}{\omega^2 L}$$

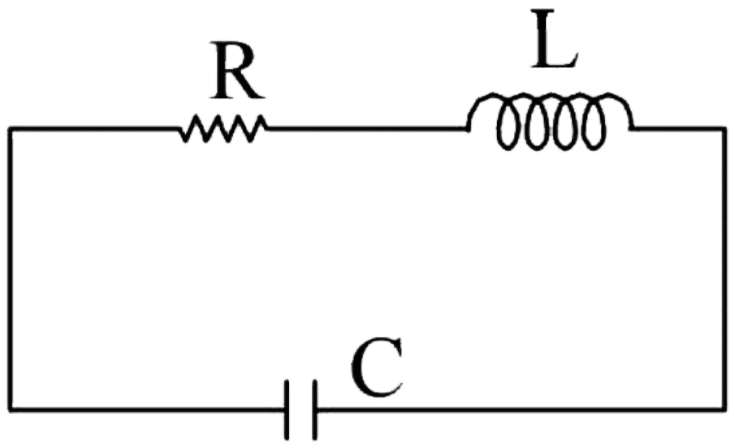
D. parallel with C and has a magnitude

$$\frac{C}{\left(\omega^2 LC - 1\right)}$$

Answer: 3

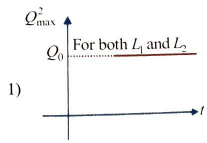
Watch Video Solution

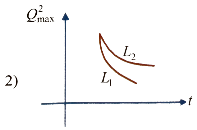
23. An LCR curcuit is equivalent to a damped pendulum. In an LCR circuit the capacitor is charged to $\left(Q_0\right)$ and then connected to the L ans R as shown below.

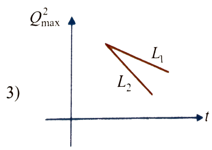


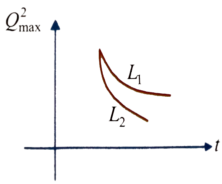
If a student plaots graphs of the square of maximum charge $\left(Q_{\max}^2\right)$ on the capacitor with time (t) for two different values

L_1 and $L_2 \left(L_1 > L_2\right)$ of L then which of the following represents this graph correclty? (plots are schematic and not drawn to scale).

A. 

B. 

C. 

D. 

Answer: 4

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24. An are lamp requires a direct current of 10A at 80V to function. If it is connected to a 220V(rms), 50 Hz AC supply, the series inductor needed for it to work is close to:

A. $80H$

B. $0.08H$

C. $0.044H$

D. $0.065H$

Answer: 4

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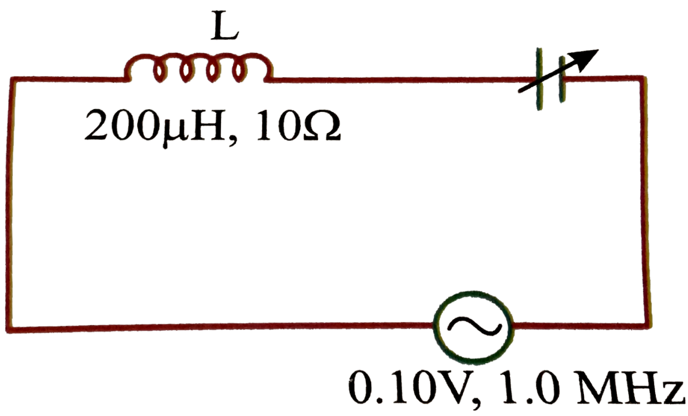
NCERT Based Question

1. At resonance, V_L and V_C both very much greater than the applied potential, V itself. The quantity factor for an LCR circuit in resonance is given by $Q = \frac{X_L}{R}$. In pratice, $Q = 200$ has been achieved.



At resonance, the capacitor has been adjusted for

(1). $200 \times 10^{-6} \mu F$

(2) $0.00013 \mu F$

(3). $0.0012 \mu F$

(4). $0.0013 F$

At resonance, the potential difference across the inductance is

(1) $1.3 V$

(2) $13V$

(3). $0.3V$

(d) none of these

The potential across the capacitor at resosnance is

(1) $1.3V$

(2) $13V$

(3) $< 13V$

(4) none of these

The Q factor is

(1) $\frac{V_L}{V_C}$

(2) $\frac{V_C}{V_L}$

(3) $\frac{V_C}{V}$

(d) $\frac{V_L}{V}$

(e) choose the right statement.

(1) $V_L + V_C$ can be greater than V_{applied}

(2) $V_L + V_C = V_{\text{applied}}$

(3) $V_L + V_C < V_{\text{applied}}$

(4) none of these

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LEVEL - IV NCERT Based Questions

1. If the rms current in a 50 Hz ac circuit is 5 A, the value of the current $1/300$ second after its value becomes zero is

A. $5\sqrt{2}A$

B. $5\sqrt{\frac{3}{2}}A$

C. $\frac{5}{6}A$

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

Answer: 2

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2. An alternating current generator has an internal resistance R_g and an internal reactance X_g. It is used to supply power to a passive load consisting of a resistance R_g and a rectance X_L. For maximum power to be delivered from the generator to the load, the value of X_L is equal to

A. zero

B. X_g

C. -X_g

D. R_g

Answer: 3

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3. When a voltage measuring device is connected to a.c. mains the meter shows the steady input voltage of $220V$. This means

A. input voltage cannot be a.c. voltage, but a.d.c voltage.

B. maximum input voltage is $220V$

C. the meter reads not v but $< v^2 >$ and is calibrated to read $\sqrt{< v^2 >}$.

D. the pointer of the meter is stuck by some mechanical defect

Answer: 3

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4. To reduce the resonant frequency in an LCR series circuit with a generator

A. the generator frequency should be reduced

B. another capacitor should be added in parallel to the first

C. the iron core of the inductor should be removed

D. dielectric in the capacitor should be removed.

Answer: 2

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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: 3

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6. A inductor of reactance 1Ω and a resistor of 2Ω are connected in series to the terminals of a 6 V (rms) a.c. source. The power dissipated in the circuit is

A. $8W$

B. $12W$

C. $14.4W$

D. $18W$

Answer: 3

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7. The output of a step-down transformer is measured to be $24V$ when connected to a 12 watt light bulb. The value of the peak current is

A. $\frac{1}{\sqrt{2}}$

B. $\sqrt{2}A$

C. $2A$

D. $2\sqrt{2}A$

Answer: 1

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8. As the frequency of an ac circuit increases, the current first increases and then decreases. What combination of circuit elements is most likely to comprise the circuit ?

A. Inductor and capacitor

B. Resistor and inductor

C. Resistor and capacitor

D. Resistor, inductor and capacitor

Answer: 1,4

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9. In an alternating current circuit consisting of elements in series, the current increases on increasing the frequency of supply. Which of the following elements are likely to consitute the circuit ?

A. Only resistor

B. Resistor and an inductor

C. Resistor and a capacitor

D. Only a capacitor

Answer: 3,4

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10. Electrical energy is transmitted over large distances at high alternating voltages. Which of the following statements is (are) correct?

A. For a given power level, there is a lower current.

B. Lower current implies less power less.

C. Transmission lines can be made thinner.

D. It is easy reduce the voltage at the receving end using step-down transformers

Answer: 1,2,4

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11. For an LCR circuit, the power transferred from the driving source to the driven oscillator is $P = I^2 Z \cos\phi$.

A. Here, the power factor $\cos\phi \geq 0$, $P \geq 0$.

B. The driving force can give no energy to the oscillator ($P = 0$) in some cases.

C. The driving force cannot syphone out ($P > 0$) the energy out of osillator.

D. The driving force take away energy out of the oscillator.

Answer: 1,2,3

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12. When an $A.C$ voltage of $220V$ is applied to the capacitor C

A. The maximum voltage between plates is $220V$

B. the current is in phase with the applied voltage

C. the change on the plates is in phase with the applied voltage.

D. power delivered to the capacitor is zero.

Answer: 3,4

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13. The line the draws power supply to your house from street has

A. zero average current.

B. $220V$ average voltage

C. voltage and current out of phase by 90°

D. voltage and current possibly differing in phase ϕ such that $|\phi| \leq \frac{\pi}{2}$

Answer: 1,4

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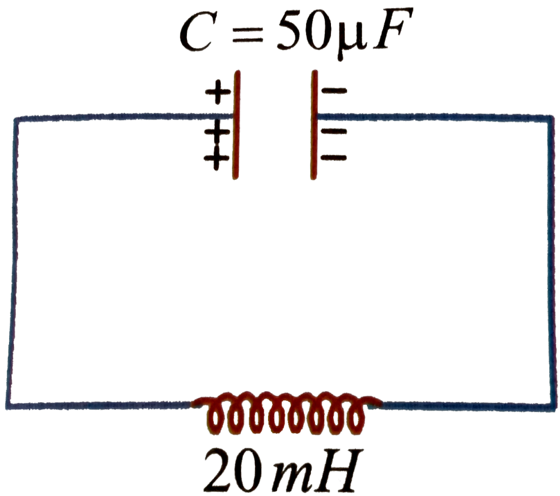
14. An LC circuit contains a $20mH$ inductor asn a $50\mu F$ capacitor with initial change of $10mC$. The resistance of the circuit is negligible. Let the instant the circuit is closed be $t = 0$.



A. Energy stored in the circuit in completely electrical at $t = \dfrac{n\pi}{2000}$

B. Energy stored in the circuitin completely magnetic at $t = \dfrac{(2n+1)\pi}{2000}$

C. Energy stored in the circuit in shared equally between the inductor and capacitor at $t = \frac{(2n+1)\pi}{4000}$

D. Energy stored in the circuit is shared euqally between the inductor and capacitor at $t = \frac{n\pi}{2000}$

Answer: 1,2,3

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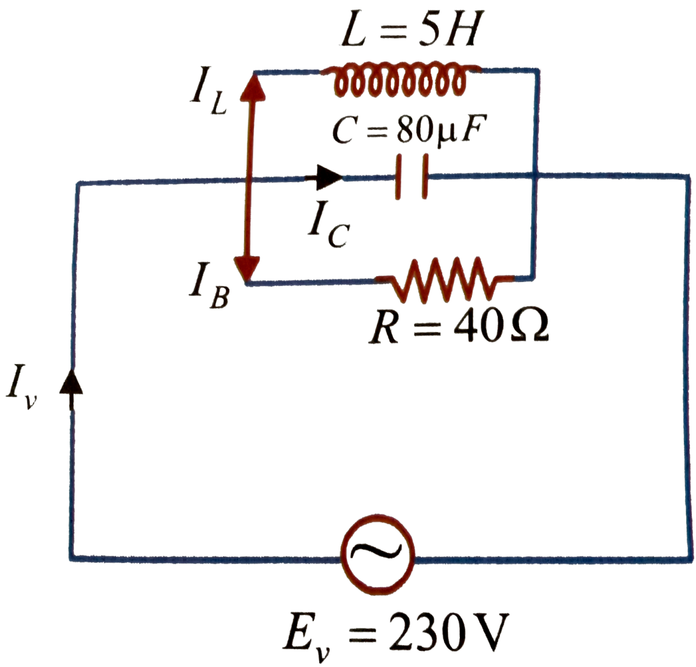
15. If the three elements, L, C and R are arranged in parallel. Source has emf $230V$ and $L = 5.0H, C = 80\mu F$ and $R = 40\Omega$



A. The minimum impedance in the circuit is

40Ω

B. The maximum impedance in the circuit is 40Ω

C. The impedance is minimum at $\omega = 50 \text{rads}^{-1}$ of the source.

D. The impedance is maximum at $\omega = 50 \text{rads}^{-1}$ of the source

Answer: 2,3

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LEVEL - V

1. The value of current in two series LCR circuits at resonance is same when connected across a sinusodial voltage source. Then:

A. both circuits must be having same value of capacitance and inductor

B. in both circuits ratio of L and C will be same

C. for both the circuits X_L / X_C must be same at that frequency

D. both circuits must have same impedance at all frequencies

Answer: C

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2. The series RLC circuit in resonance is called:

A. Selector circuit

B. rejector circuit

C. amplifier circuit

D. oscillator circuit

Answer: A

Watch Video Solution

3. 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

A. capacitive

B. inductive

C. purely resistive

D. selective

Answer: A

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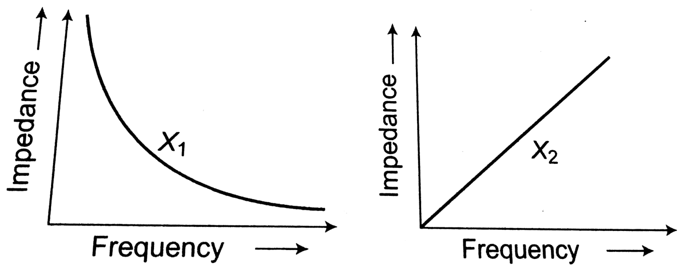
4. The graphs given below depict the dependence of two reactive impedences X_1 and X_2 on the frequency of the alternating e.m.f. applied individually to them. We can then say that



A. X_1 is an inductor and X_2 is a capacitor

B. X_L is a resistor and X_2 is a capacitor

C. X_1 is a capacitor and X_2 is an inductor

D. X_1 is an inductor and X_2 is a resistor

Answer: C

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5. In which of the following electrical applianes will AC fail to function where DC is normally used?

A. electric light

B. voltmeter

C. solenoid for electromagnet

D. a cathode ray tube

Answer: C

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6. Instantaneous values of current and e.m.f in an AC circuit are $I = I/\sqrt{2}\sin 314$ tamp and $E = \sqrt{2}\sin(314t - \pi/6)V$ respectively. The phase difference between E and I will be

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

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

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

D. $\frac{\pi}{3}$ rad

Answer: A

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7. The rms value of an ac of 50Hz is 10A. The time taken by an alternating current in reaching from zero to maximum value and the peak value will be

A. 2×10^{-2} sec and 14.14 amp

B. 1×10^{-2} sec and 7.07 amp

C. 5×10^{-3} sec and 7.07 amp

D. 5×10^{-3} sec and 14.14 amp

Answer: D

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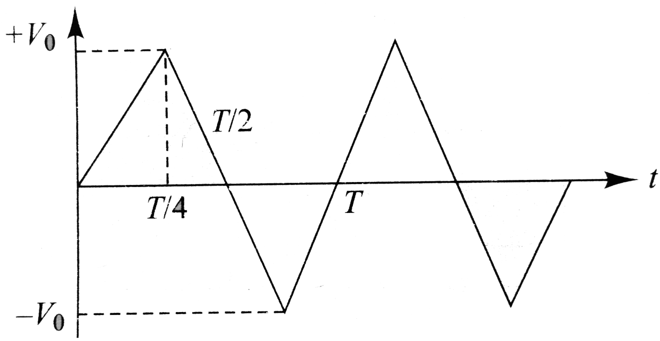
8. The voltage time (V-t) graoh for triangular wave having peak value $\left(V_0\right)$ is as shown in fig.



A. $\frac{V_0}{3}$

B. $\frac{V_0}{2}$

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

D. $\frac{V_0}{\sqrt{3}}$

Answer: D

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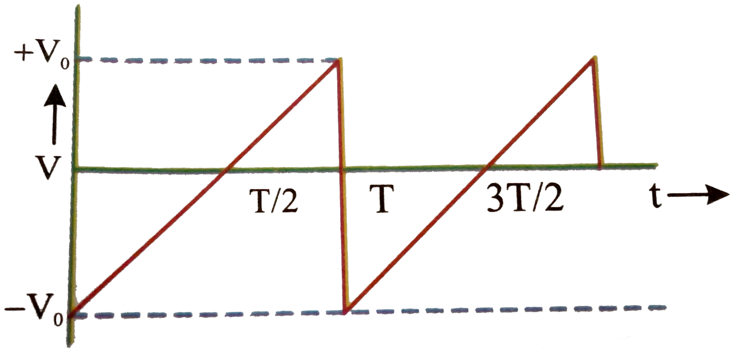
9. The average value for the saw-tooth voltage of peak value of V_0 over half the cycle as shown in figure is



A. $\frac{V_0}{\sqrt{3}}$

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

C. $\frac{2V_0}{3}$

D. $\frac{V_0}{3}$

Answer: D

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10. An alternating voltage is given by: $e = e_1 \sin\omega t + e_2 \cos\omega t$. Then the root mean square value of voltage is given by:

A. $\sqrt{e_1^2 + e_2^2}$

B. $\sqrt{e_1 e_2}$

C. $\sqrt{\frac{e_1 e_2}{2}}$

D. $\sqrt{\frac{e_1^2 e_2^2}{2}}$

Answer: D

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11. If $i = t^2, 0 < t < T$ then $r.m.s.$ value of current is

A. $\frac{T^2}{\sqrt{2}}$

B. $\frac{T^2}{2}$

C. $\frac{T^2}{\sqrt{5}}$

D. $\frac{T^2}{5}$

Answer: C

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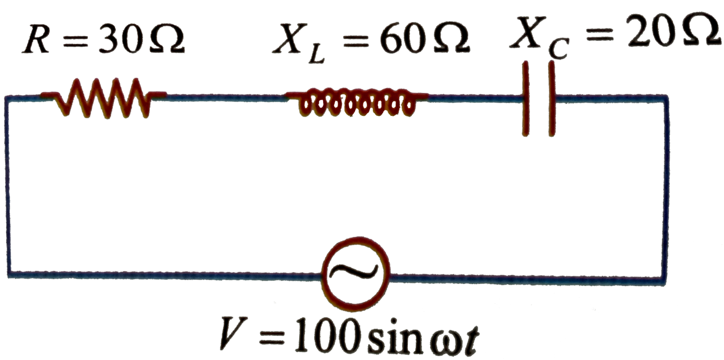
12. An alternating voltage $V = 100\sin\omega t$ is applied across an LCR circuit as shown. At the instant when voltage drop across source is $50\sqrt{3}$ volts then at that instant

$R = 30\Omega \quad X_L = 60\Omega \quad X_C = 20\Omega$



A. voltage drop across inductor is $\left(120\cos 7^\circ\right)$ volts

B. voltage drop across capacitor is $\left(40\cos 173^\circ\right)$ volts

C. voltage drop across resistor is $\left(60\cos 7^\circ\right)$ volts

D. All the above

Answer: D

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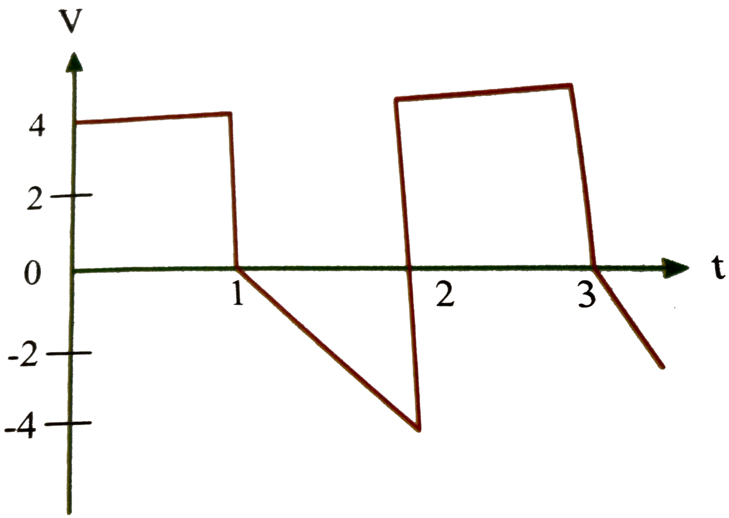
13. The rms and the average value of the voltage wave shown in figure are



A. $\sqrt{\frac{32}{3}} V, 1V$

B. $\sqrt{\frac{11}{3}} V, 1V$

C. $\sqrt{\frac{11}{3}} V, 3V$

D. $\sqrt{\frac{32}{3}} V, 3V$

Answer: A

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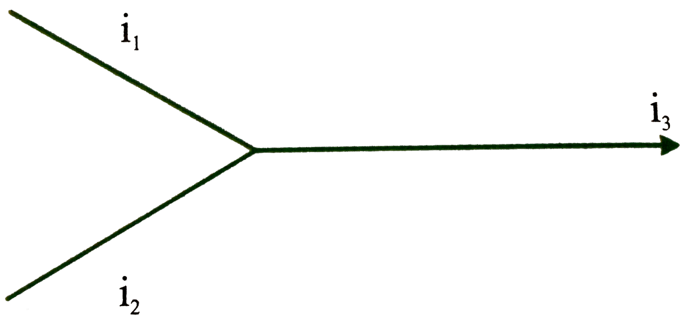
14. If $i_1 = i_0\sin(\omega t)$, $i_2 = i_{0_2}\sin(\omega t + \phi)$, then $i_3 =$



A. $\sqrt{i_{0_1}^2 + i_{0_2}^2}\sin\{\phi + \omega t\}$

B. $\left(i_{0_1} + i_{0_2}\right)\sin\left(\dfrac{\phi}{2} + \omega t\right)$

C. $\left(\sqrt{i_{0_1}^2 + i_{0_2}^2 + 2i_{0_1}i_{0_2}\cos\phi}\right)\sin[\phi + \omega t]$

D. $\left(\sqrt{i_{0_1}^2 + i_{0_2}^2 + 2i_{0_1}i_{0_2}\cos\phi}\right)\sin[\alpha + \omega t]$

where $\alpha = \tan^{-1}\left[\dfrac{i_{0_2}\sin\phi}{i_{0_1} + i_{0_2}\cos\phi}\right]$

Answer: D

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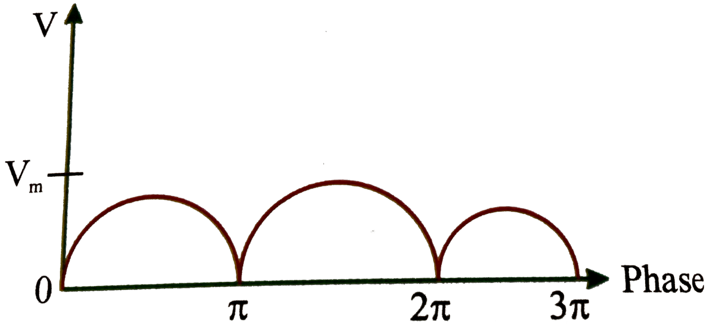
15. The average and effective values for the waveshaphe shown in figure are:



A. $\frac{2}{\pi}V_m$ and $\frac{V_m}{2}$

B. $\frac{V_m}{\pi}$ and $\frac{V_m}{\sqrt{2}}$

C. $\frac{2}{\pi}V_m$ and $\frac{V_m}{\sqrt{2}}$

D. $\frac{V_m}{\pi\sqrt{2}}$ and $\frac{V_m}{\sqrt{2}}$

Answer: C

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16. Calculate the reading which will be given by a hot-wire voltmeter if it is connected across the terminals of generator whose voltage waveform is represented by

$v = 200\sin\omega t + 100\sin 3\omega t + 50\sin\omega t$

A. $110V$

B. $162V$

C. $200V$

D. $220V$

Answer: B

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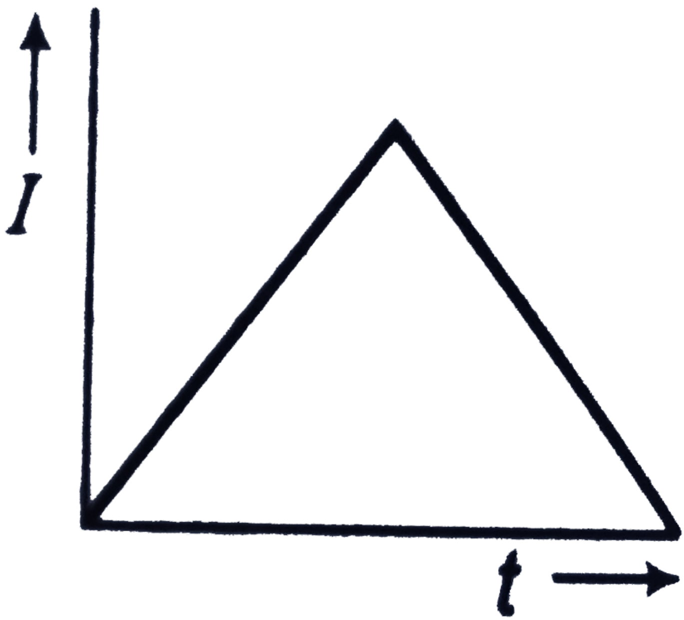
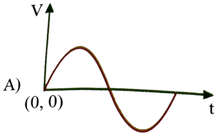
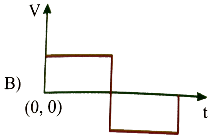
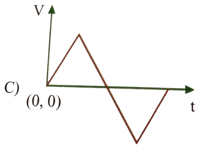
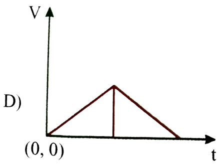
17. An alternating current I in an inductance coil varies with time t according to the graph as shown: Which one of the following graph gives the variation of voltage with time?



A. 

B. 

C. 

D. 

Answer: B

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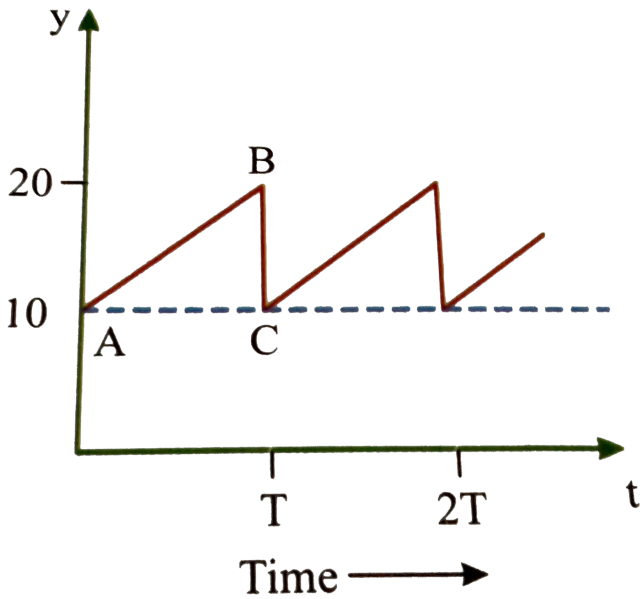
18. Find the rms and average value of the wavefrom shown in figure



A. 8.5,10

B. 10.3,20

C. 15.2,15

D. 26,5

Answer: C

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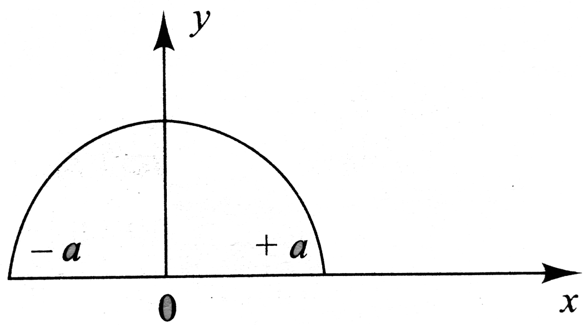
19. Determine the rms value of a semi-circular current wave which has a maximum value of a.



A. 2.515 a

B. 1.815 a

C. 0.615 a

D. 0.816 a

Answer: D

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20. An electric bulb is designed to operate at 12 volts DC. If this bulb is connected to an AC source and gives normal brightness, what would be the peak voltage of the source?

A. $37V$

B. $17V$

C. $18V$

D. $10V$

Answer: B

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21. The current in a discharging LR circuit is given by $I = i_0 e^{-\frac{t}{\tau}}$ where τ is the time constant of the circuit. Calculate the rms current for the period $t = 0$ to $t = \tau$.

A. $\frac{i_0}{e}\sqrt{\frac{\left(e^2 - 1\right)}{2}}$

B. $\frac{i_0}{e}\sqrt{\frac{\left(e^{-2} + 1\right)}{2}}$

C. $\frac{i_0}{e}\sqrt{\frac{(e + 2)}{3}}$

D. $\frac{i_0}{e}\sqrt{\frac{\left(e^2 - 1\right)}{2}}$

Answer: A

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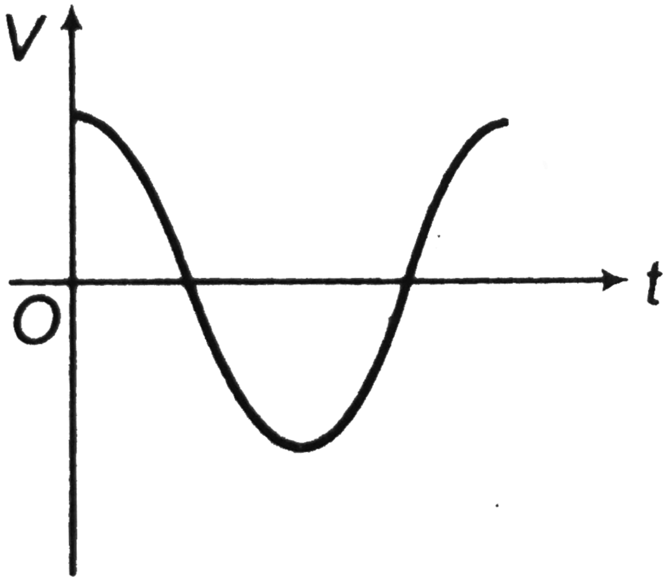
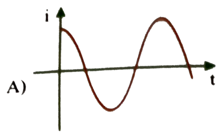
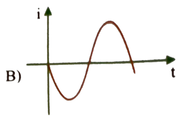
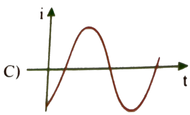
22. The figure represents the voltage applied across a pure inductor. The diagram which correctly represents the variation of curent i

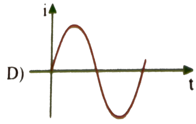
with time t is given by



A. 

B. 

C. 

D. 

Answer: D

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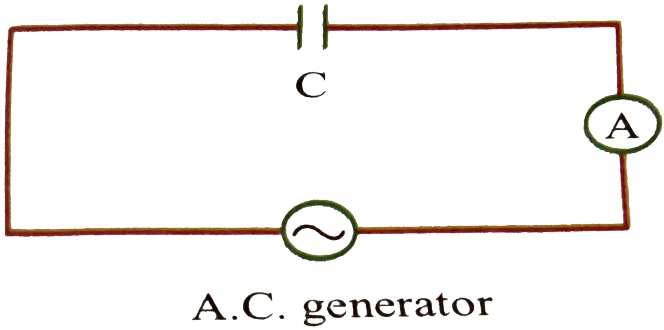
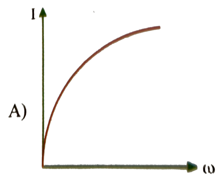
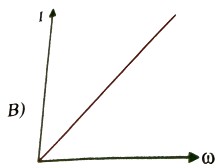
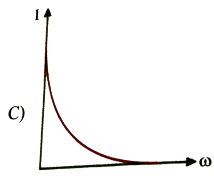
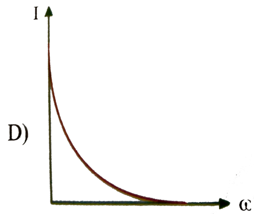
23. A constant voltage at different frequencies is applied across a capacitance C as shown in the figure. Which of the following graphs correctly depicts the variation of current with frequency



A. 

B. 

C. 



D.

Answer: B

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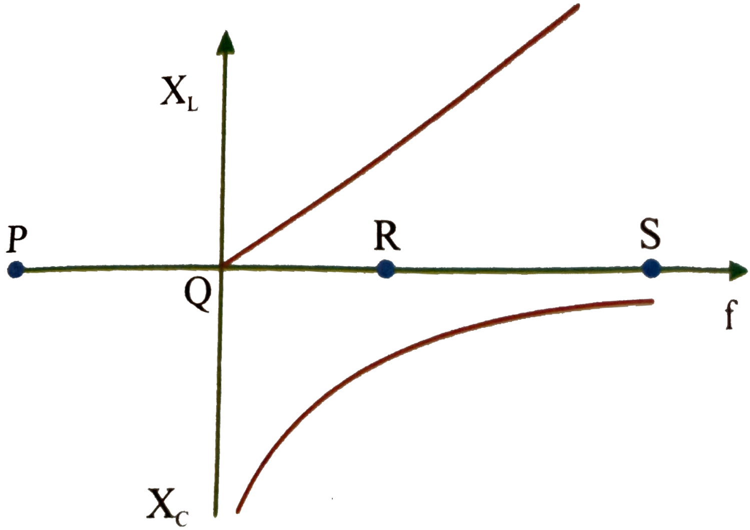
24. The resonance point in X_L - f and X_C - f curves is



A. P

B. Q

C. R

D. S

Answer: C

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25. When $100V$ DC is applied across a solenoid, a current of $1.0A$ flows in it. When $100V$ AC is applied across the same coil. The current drops to $0.5A$. If the frequency of the ac source is $50Hz$, the impedance and inductance of the solenoid are

A. 200 ohm and 0.55 henry

B. 100 ohm and 0.86 henry

C. 100 ohm and 1.0 henry

D. 100 ohm and 0.93 henry.

Answer: A

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26. A coil having an inductance of $1/\pi$ henry is connected in series with a resistance of 300Ω. If 20 volt from a 200 cycle source are impressed across the combination, the value of the phase angle between the voltage and the current is :

A. $\tan^{-1}\frac{5}{4}$

B. $\tan^{-1}\frac{4}{5}$

C. $\tan^{-1}\frac{3}{4}$

D. $\tan^{-1}\frac{4}{3}$

Answer: D

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27. In a circuit containing an inductance of zero resistance, the current leads the applied a.c. voltage by a phase angle at

A. 90°

B. -90°

C. 0°

D. 180°

Answer: B

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28. In RLC circuit, at a frequency v, the potential difference across each device are $(\Delta V_R)_{\max} = 8.8V$, $(\Delta V_L)_{\max} = 2.6V$ and

$\left(\Delta V_C\right)_{\max} = 7.4V$. The composed potential difference $\left(\Delta V_C + \Delta V_L\right)_{\max}$ across inductor and capacitor is

A. $10V$

B. $7.8V$

C. $7.4V$

D. $4.8V$

Answer: D

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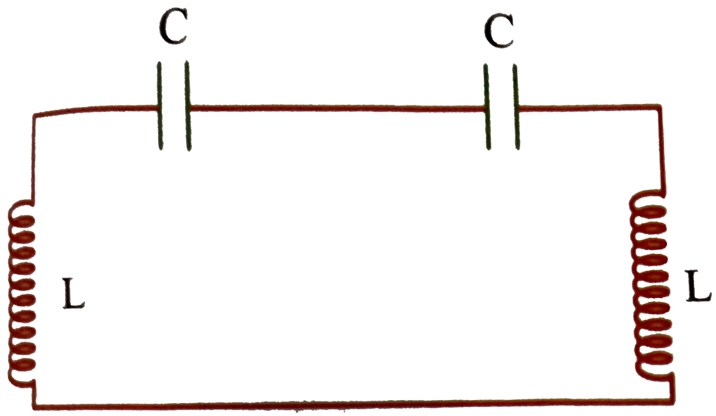
29. The natural frequency of the circuit shown in the figure is



A. $\dfrac{1}{2\pi\sqrt{LC}}$

B. $\dfrac{1}{\pi\sqrt{LC}}$

C. $\dfrac{2}{\pi\sqrt{LC}}$

D. none

Answer: A

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30. If the phase difference between voltage and current is $\pi/6$ and the resistance in the circuit is $\sqrt{300}\Omega$, then the impedance of the circuit will be

A. 40Ω

B. 20Ω

C. 50Ω

D. 13Ω

Answer: B

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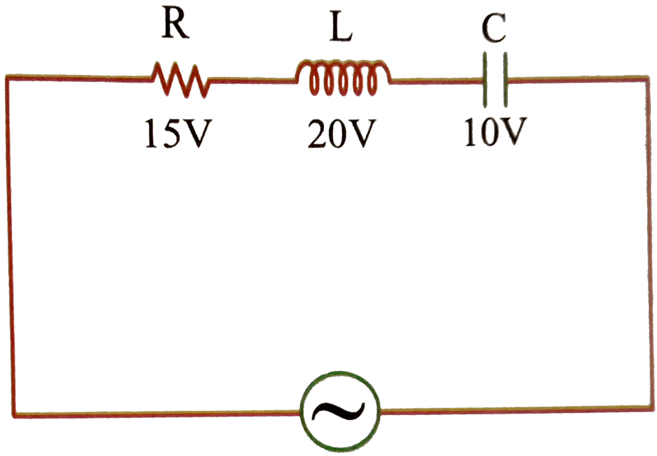
31. In the circuit as shown in the figure, if value of $R = 60\Omega$, then the current flowing through the condenser will be



A. $0.5A$

B. $0.25A$

C. $0.75A$

D. $1.0A$

Answer: B

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32. The power in ac circuit is given by $P = E_{rms}I_{rms}\cos\phi$. The vale of cos phi in series LCR circuit at resonance is:

A. zero

B. 1

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

D. $\frac{1}{\sqrt{2}}$

Answer: B

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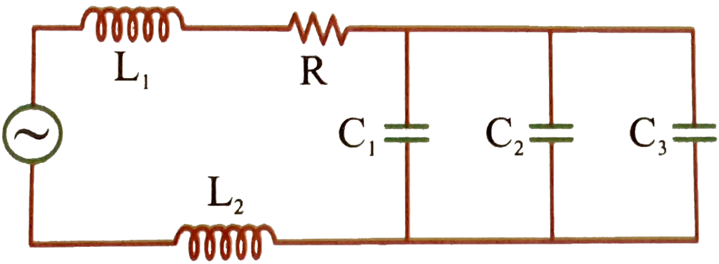
33. A generator with an adjustable frequency of oscillaton is connected to resistance, $R = 1000\Omega$, inductance, $L_1 = 1.7mH$ and $L_2 = 2.3mH$ and capacitance, $C_1 = 4\mu F$, $C_2 = 2.5\mu F$ and $C_3 = 3.5\mu F$. The resonant angular frequency of the circuit is



A. $0.5 \text{rad}/s$

B. $0.5 \times 10^4 \text{rad}/s$

C. $2 \text{rad}/s$

D. $2 \times 10^{-4} \text{rad}/s$

Answer: B

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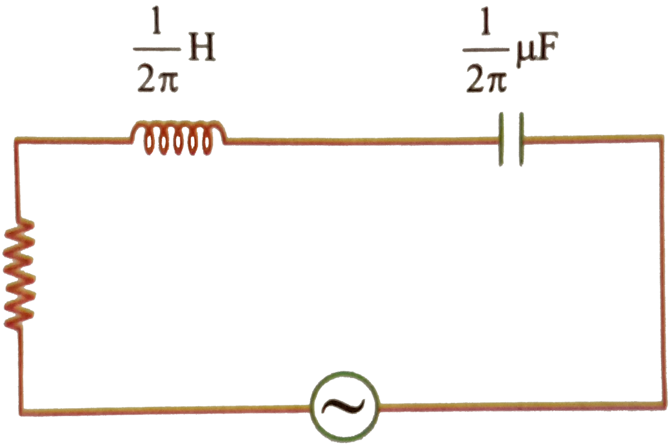
34. In the a.c circuit shown in figure, the supply voltage has a constant r.m.s value but variable frquency f. Resonance frequency is



A. $10Hz$

B. $100Hz$

C. $1000Hz$

D. $200Hz$

Answer: C

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35. in a LCR circuit capacitance is chagned from C to 2C. For the resomat frequency to remain unchaged, the inductance should be chagned from L to

A. $4L$

B. $2L$

C. $L/2$

D. $L/4$

Answer: C

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36. In an AC circuit, V and I are given by $V = 100\sin(100t)vo < s, I = 100\sin\left(100t + \frac{\pi}{3}\right)mA$. The power dissipated in circuit is

A. 10^4 watt

B. 10 watt

C. 2.5 watt

D. 5 watt

Answer: C

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37. A series combination of R, LC is connected to an a.c source. If the resistance is 3Ω and the reactance is 4Ω, the power factor of the circuit is

A. 0.4

B. 0.6

C. 0.8

D. 1.0

Answer: B

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38. In an a.c. Circuit the voltage applied is $E = E_0 \sin(\omega)t$. The resulting current in the circuit is $I = I_0 \sin\left((\omega)t - \left(\frac{\pi}{2}\right)\right)$. The power consumption in the circuit is given by

A. $E_0I_0/\sqrt{2}$

B. $E_0I_0/2$

C. $EI/\sqrt{2}$

D. zero

Answer: D

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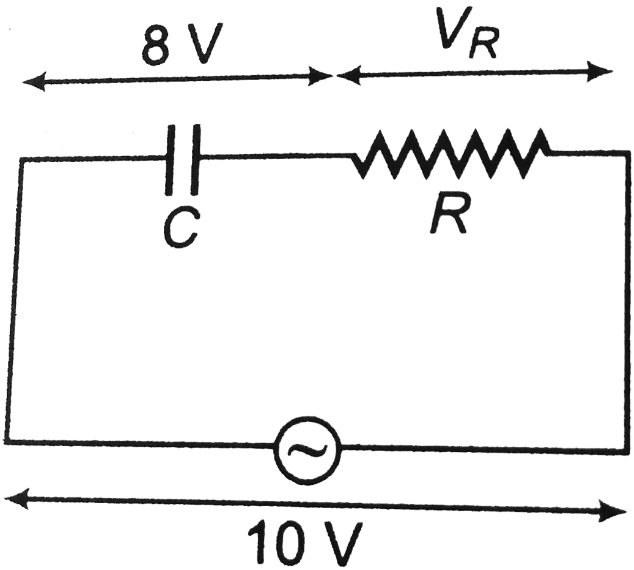
39. In a series C - R circuit shown in figureure, the applied voltage is $10V$ and the voltage across capacitor is found to$8V$. The voltage across R, and the phase difference between current and the applied voltage will respectively be



.

A. $6V, \tan^{-1}\left(\frac{4}{4}\right)$

B. $3V, \tan^{-1}\left(\frac{3}{4}\right)$

C. $6V, \tan^{-1}\left(\frac{5}{3}\right)$

D. $3V, \tan^{-1}\left(\frac{4}{3}\right)$

Answer: A

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40. An inductor of inductance L and ressistor of resistance R are joined in series and connected by a source of frequency ω. Power dissipated in the circuit is

A. $\frac{\left(R^2 + \omega^2 L^2\right)}{V}$

B. $\dfrac{V^2R}{\left(R^2+\omega^2L^2\right)}$

C. $\dfrac{V}{\left(R^2+\omega^2L^2\right)}$

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

Answer: B

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41. Power loss in AC circuit will be minimum when

A. Inductance is high, resistance is high

B. Inductance is low, resistance is high

C. Inductance is low, resistance is low

D. Inductance is high, resistance is low

Answer: D

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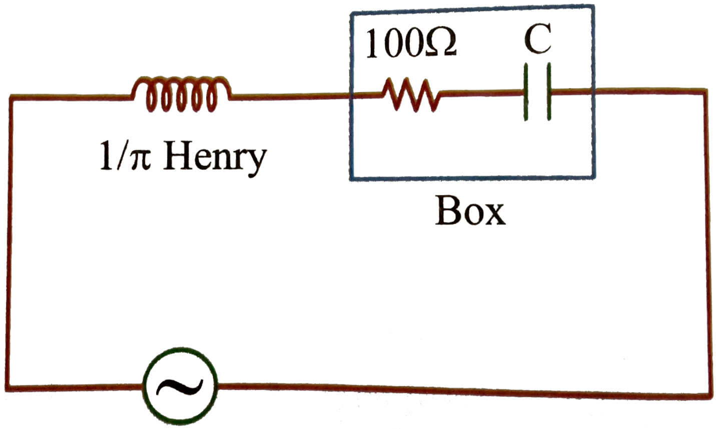
42. In the circuit, as shown in the figure, if the value of $R.M.S$ current is 2.2 ampere, the power factor of the box is $(E = 220V)$



A. $\frac{1}{\sqrt{2}}$

B. 1

C. $\frac{\sqrt{3}}{3}$

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

Answer: A

Watch Video Solution

43. The impedance of a sereis RL circuit is same as the series RC circuit when connected to the same AC source separately keeping the same resistance. The frequency of the source is

A. $\frac{1}{\sqrt{LC}}$

B. $\frac{1}{2\pi\sqrt{LC}}$

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

D. $\frac{1}{RC}$

Answer: B

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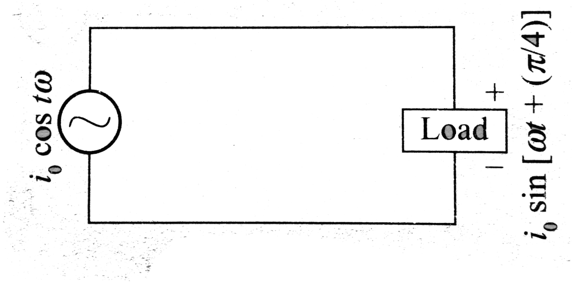
44. A current source sends a current $I = \left(i_0\right)\cos(\omega t)$, When connected across an unknown load, it gives a voltages output of $v = v_0 \sin[\omega t + (\pi/4)]$ across that load. Then the voltage across the current source may bebroaught in phase with the current through it by



A. Connectinng an inductor in series with the load

B. Connecting a capacitor in series with the load

C. Connecting a capacitor in parallel with the load

D. Connecting a capacitor in parallel with the load

Answer: B

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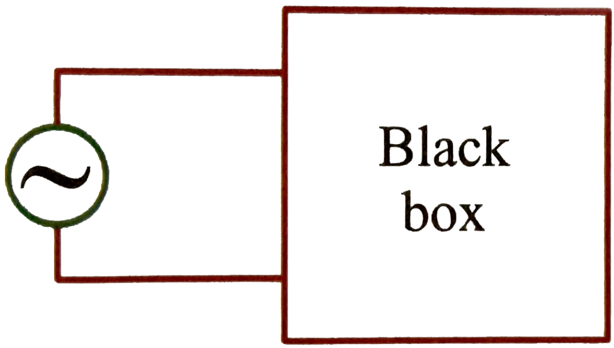
45. A combination of elements is enclosed in a black box an the voltage and currents are measured across this black box. The expression for applied voltage, and the current flowing in it is $V = V_0 \sin\omega t$,

$i = 2\sqrt{2}\sin(\omega + \pi/4)$ where $\omega = 100\pi \text{rad/sec}$

Then the wrong statement is



A. The must be a capacitor is the black box

B. Power factor of circuit = 0.707

C. There must be a resistor in the box

D. There must be an inductor in the box

Answer: D

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46. A high impedance AC voltmeter is connected in turn across the inductor, the capacitor and the resistor in a series circuit having an AC source of $100V$ (rms) and gives the same reading in volts in each case. This reading is:

A. $100V$

B. $141V$

C. $150V$

D. $200V$

Answer: A

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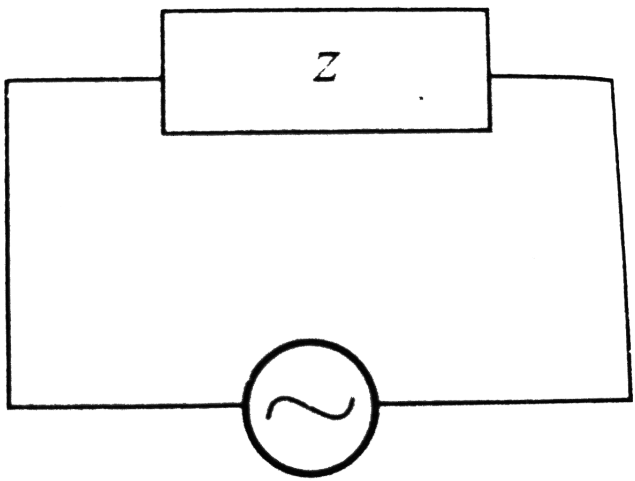
47. In a black box of unknown elements (L or R or any other combination), an ac voltage $E = E_0 \sin(\omega t) + \phi\big)$ is applied and current in the circuit was found to be $I = \left(I_0\right) \sin[\omega t + \phi + (\pi/4)]$. Then the unknown elements in the box may be



A. only capacitor

B. inductor and resistor both

C. either capacitor, resistor and inductor or

only capacitor and resistor

D. only resistor

Answer: C

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48. A given alternating current has an rms value of 5.6 ampere. If this current flows in a circuit containing 10Ω of resistance in series with 20Ω of inductive reactance, the power consumed in the circuit will be

A. $313.6W$

B. $940.8W$

C. $627.2W$

D. $168W$

Answer: A

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49. In an a.c circuit, V & I are given by

$V = 100\sin(100t)$ volt.

$$I = 100\sin\left(100t + \frac{\pi}{2}\right)mA$$

The power dissipated in the circuit is:

A. 1 watt

B. 10 watt

C. zero

D. 5 watt

Answer: C

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50. In R - L - C series circuit, we have same current at angular frequencies ω_1 and ω_2. The resonant frequency of circuit is

A. $\dfrac{\omega_1^2}{\omega_2}$

B. $\dfrac{\omega_2^2}{\omega_1}$

C. $\sqrt{\omega_1\omega_2}$

D. $\omega_1 + \omega_2$

Answer: C

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51. A choke coil of resistance R and inductance L is connected to $A. C$ sourceof frequency f and maximum voltage V_0. Then, the average power dissipated in the choke is proportional to:

A. f^2

B. f^{-2}

C. f^1

D. f^0

Answer: D

Watch Video Solution

52. When two $A.C$ generators of emfs V_1 and V_2 and same frequency connected in series, the emf across A and B is ($\phi =$ phase angle difference between the generators):

A. $\dfrac{V_1 + V_2}{2}$

B. $\sqrt{V_1 + V_2}$

C. $\sqrt{V_1^2 + V_2^2 + 2V_1V_2\cos\phi}$

D. $\sqrt{V_1^2 + V_2^2}$

Answer: C

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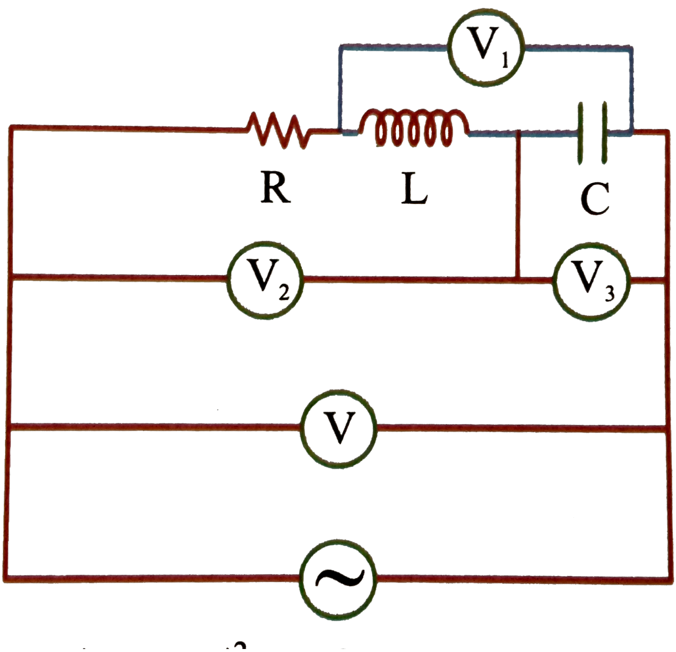
53. At resonance of the given series R - L - C circuit:



A. $V^2 = \left|V_1 - V_2\right|^2 + V_3^2$

B. $V_3 = 0$

C. $V_1 = 0$

D. $V_2 = 0$

Answer: C

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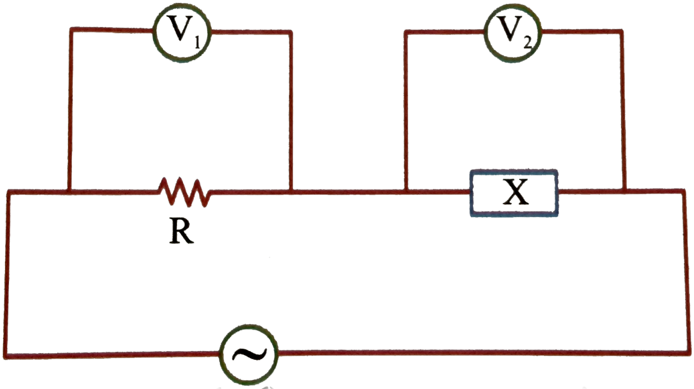
54. If the reading of the voltmeters vary with time as: $V_1 = 20\sin\omega t$ and

$V_2 = -20\cos\left(\omega t + \frac{\pi}{6}\right)$ then the unknown circuit element x is a:



A. pure (or ideal) inductor

B. practical inductor

C. pure (or ideal) capacitor

D. practical capacitor

Answer: D

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55. In a series LCR circuit, at the frequencies f_1 and f_2 of AC source, the current amplitude falls to $\frac{1}{\sqrt{2}}$ of the current amplitude at resonance. Then the value of f_2 - f_1 is

A. $\frac{R}{2\pi L}$

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

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

D. $\dfrac{R}{\pi^2 L}$

Answer: A

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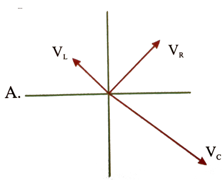
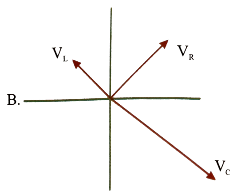
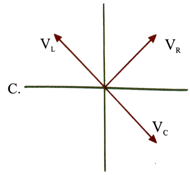
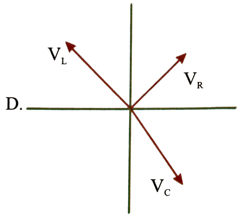
56. In the figure, which of the phasor diagrams represents RLC circuit driven at resonance?

A. 

B. 

C. 

D. 

Answer: C

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57. In LCR circuit at resonance current in the circuit is $10\sqrt{2}A$. If tnow frequency of the source is changed such that now current lags by $45°$ that applied voltage in the circuit .

Which of the following is correct.

A. Frequency must be increased and current after the change is $10A$

B. Frequency must be decreases and current after the change is $10A$

C. Frequency must be decreased and current is same as that of initial value

D. The given information is insufficient to conclude anything

Answer: A

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58. A pure resistive circuit element X when connected to an sinusoidal AC supply peak voltage $200V$ gives a peak current of $5A$ which is in phase with the voltage. A second circuit element Y, when connected to the same AC supply also gives the same value of peak currrent but the current lags behind by 90^0. If the series combination of X and Y is connected to the same supply. the rms value of current is

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

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

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

D. $5A$

Answer: C

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59. An $A.C$ circuit contains a resistor $'R'$ an inductor $'L'$ and a capacitor $'C'$ connected in series. When it is connected to an $A.C$ generator of fixed output voltage and varialbe frequency, the current in the circuit is found to be leading the applied voltage $\frac{\pi}{4}$ read, when the frequency is f_1. when the frequency of the generator increased to f_2 the current is found to be lagging behind the applied voltage by $\frac{\pi}{4}$ rad. The resonant frequency of the circuit is

A. $\frac{f_1 f_2}{f_1 + f_2}$

B. $\frac{f_1 + f_2}{2}$

C. $\frac{2f_1f_2}{f_1 + f_2}$

D. $\sqrt{f_1f_2}$

Answer: D

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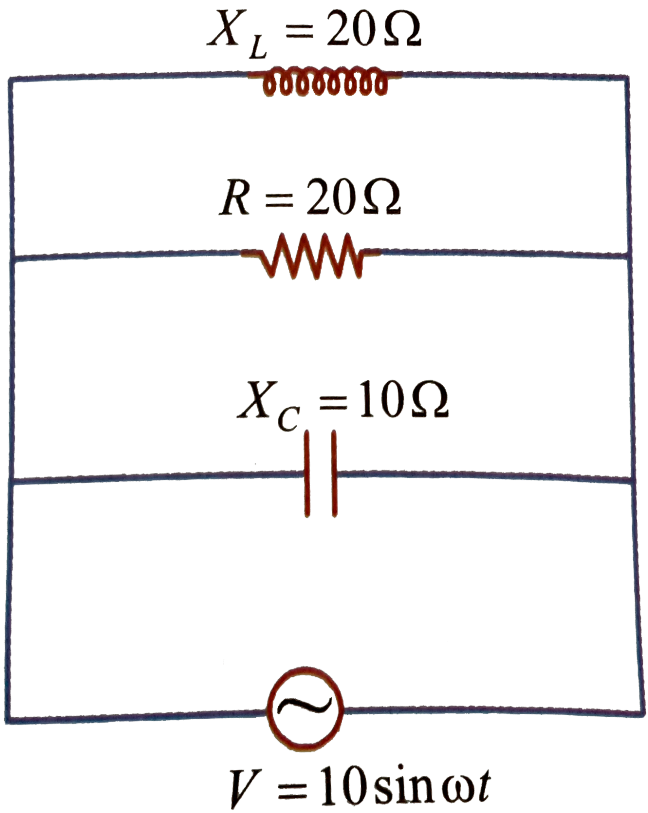
60. An alternative voltage $V = 10\sin\omega t$ (in volts) is applied across a parallel arrangement as shown current (in A) through the source is best described by



A. $i = 0.05\sin\omega t$

B. $i = 0.7\sin\left(\omega t + \frac{\pi}{6}\right)$

C. $i = 0.7\sin\left(\omega t + \frac{\pi}{4}\right)$

D. $i = 0.05\sin\left(\omega t + \frac{\pi}{2}\right)$

Answer: C

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61. A radio tuner has a frequency range from $500kHz$ to $5MHz$. If its LC circuit has an effective inductance of $200\mu H$, what is the range of it varialbe capacitors? (Take $\pi^2 = 10$).

A. 2.5 pF to 250 pF

B. 5.0 pF to 500 pF

C. 7.5 pF to 750 pF

D. 10 pF to 1000 pF

Answer: A

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62. In a series LCR circuit the frequency of a $10V$, AC voltage soure is adjusted in such a fashion that the reactance of the inductor meausers 15Ω and that of the capacitor 11Ω. If $R = 3\Omega$, the potentail difference across the series combination of L and Cwill be:

A. $8V$

B. $10V$

C. $22V$

D. $52V$

Answer: A

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63. A resistor of resistance 100Ω is connected to an AC source $\varepsilon = (12V)\sin\left(250\pi s^{-1}\right)t$. Find the energy dissipated as heat during $t = 0$ to $t = 1.0ms$.

A. $0.61 \times 10^{4}J$

B. $0.61 \times 10^{-4}J$

C. $2.61 \times 10^{-4}J$

D. $2.61 \times 10^{-6}J$

Answer: C

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64. 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: B

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65. Voltage and current for a circuit with two elements in series are expressed as

$$V(t) = 170\sin\left(6280t + \frac{\pi}{3}\right)vo <$$

$$i(t) = 8.5\sin\left(6280t + \frac{\pi}{2}\right)amp$$

(a) Plot the two waveforms.

(b) Determine the frequency in Hz.

(c) Determine the power factor starting its nature.

(d) What are the values of the elements?

A. $R = 27.32\Omega, C = 25.92mF$

B. $R = 17.32\Omega, C = 15.92mF$

C. $R = 7.32\Omega, C = 5.92mF$

D. $R = 10.32\Omega, C = 5.92mF$

Answer: B

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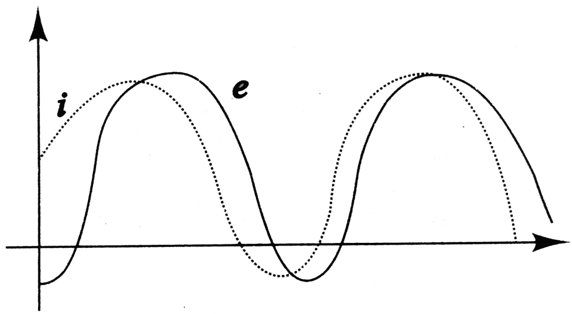
66. When an ac source of emf$e = E_0\sin(100t)$ is connected across a circuit, the phase difference between emf e and currnet I in the circuit is observed to be $(\pi)/(4)$ as shown in fig. If the circuit consists possibly only of R-C or R-C of L-R series, find the relationship find the relationship between the two elements.



A. $R = 1k\Omega, C = 10\mu F$

B. $R = 1k\Omega, C = 1\mu F$

C. $R = 1k\Omega, H = 10H$

D. $R = 1k\Omega, L = 1H$

Answer: C

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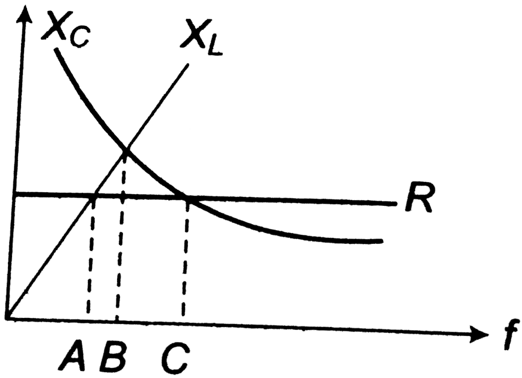
67. The figure shows variation of R, X_L and X_C with frequency f in a series L, C, R circuit. Then for what frequency point, the circuit is

inductive ?



A. A

B. B

C. C

D. All points

Answer: C

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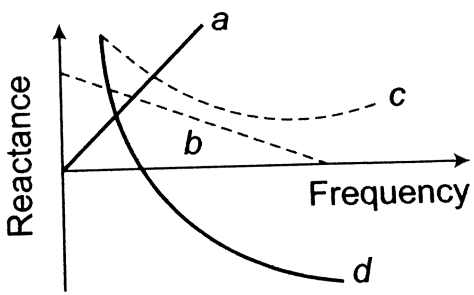
68. Which of the following plots may represent the reactance of a series LC combination?



A. a

B. b

C. c

D. d

Answer: D

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69. An inductor-coil , a capacitor and an AC source of rms voltage $24V$ are connected in series. When the frequency of the source is varied, a maximum rms current of $6.0A$ is observed. If this inductor coil is connected to a battery of $emf 12V$ and internal resistance 4.0Ω, what will be the current?

A. $2A$

B. $1.5A$

C. $0.5A$

D. $2.5A$

Answer: B

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70. A circuit consisting of a capacitor and a coil in series is connected to the mains. Varying the capacitance of the capacitor, the heat power genergated in the coil was increased $n = 1.7$

times. How much (in per cent) was the value of $\cos\varphi$ changed in the process ?

A. 80 %

B. 25 %

C. 50 %

D. 30 %

Answer: D

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71. An AC source producing *emf*

$$\varepsilon = \varepsilon_0\left[\cos\left(100\pi s^{-1}\right)t + \cos\left(500\pi s^{-1}\right)t\right]$$

is connected in series with a capacitor and a resistor. The steady-state current in the circuit is found to be

$$I = i_1\cos\left[\left(100\pi s^{-1}t + \varphi_1\right] + i_2\cos\left[\left(500\pi s^{-1}\right)t + \phi_2\right]$$

.

A. $i_1 \geq i_2$

B. $i_1 = i_2$

C. $i_1 \leq i_2$

D. the information is insufficient to find the relation between i_1 and i_2.

Answer: C

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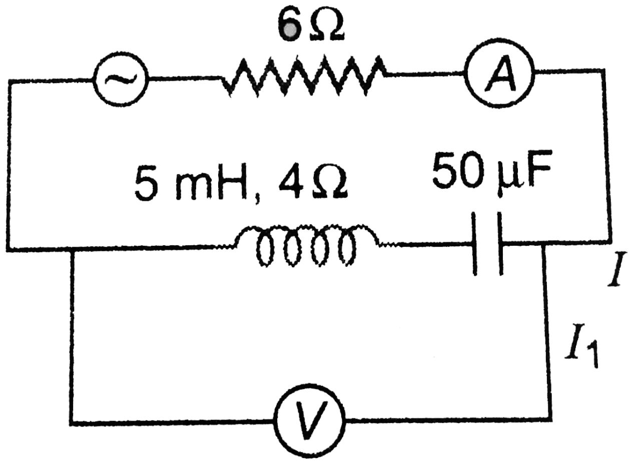
72. In the circuit shown in figureure the AC source gives a voltage $V = 20\cos(2000t)$. Neglecting source resistance, the voltmeter and and ammeter readings will be



A. $0V, 0.47A$

B. $1.68V, 0.47A$

C. $0V, 1.4A$

D. $5.6V, 1.4A$

Answer: D

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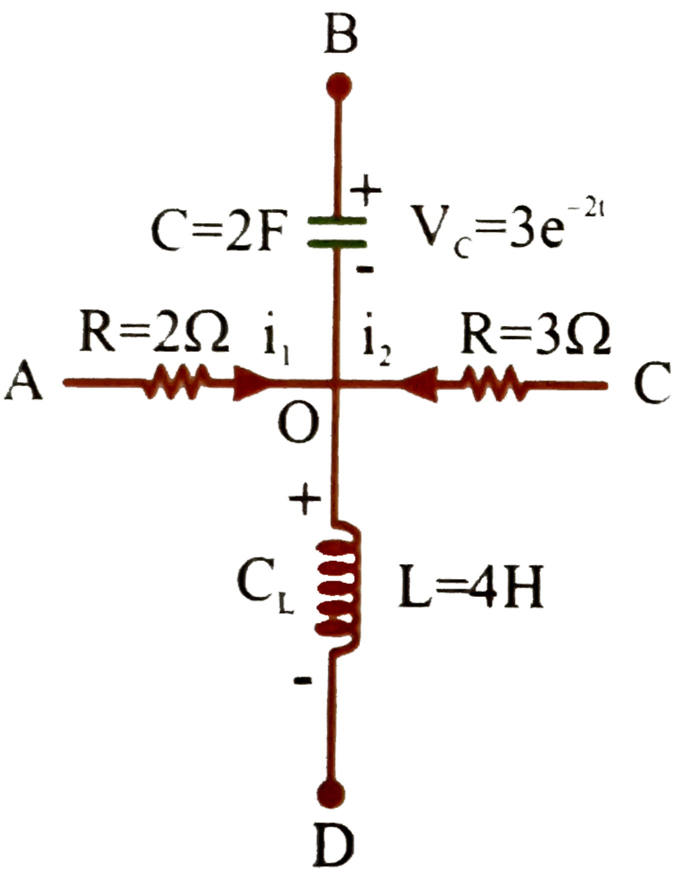
73. In figure $i_1 = 10e^{-2t}A, i_2 = 4A, v_C = 3e^{-2t}V$



The current i_L is

A. $\left[2 - 2\left(1 - e^{-2t}\right)\right]A$

B. $\left[2 + 2\left(1 - e^{-2t}\right)\right]A$

C. $\left[3 - 2\left(1 - e^{-2t}\right)\right]A$

D. $\left[2 + 3\left(1 - e^{-2t}\right)\right]A$

Answer: B

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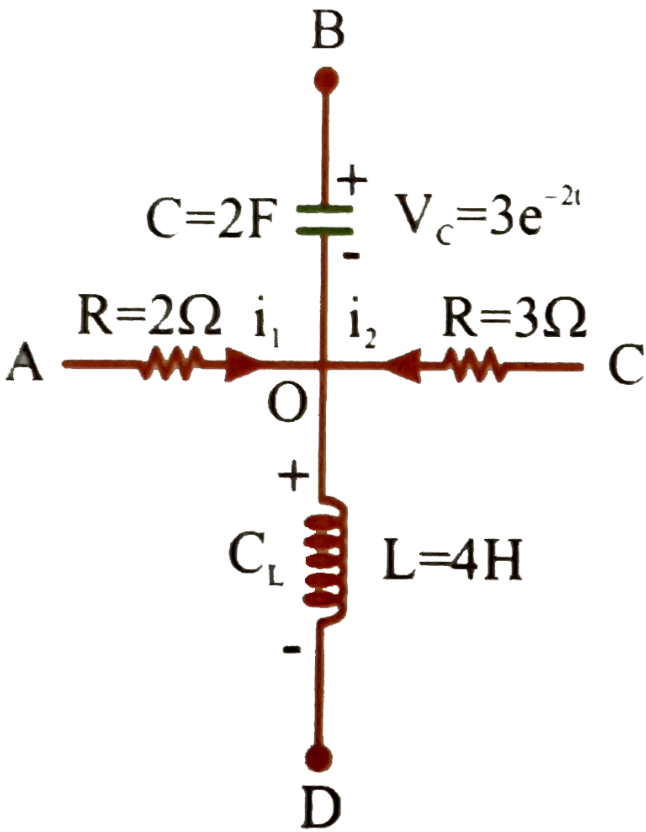
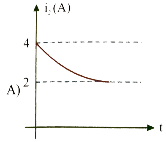
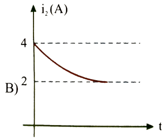
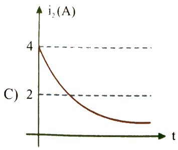
74. In figure $i_1 = 10e^{-2t}A$, $i_2 = 4A$, $v_C = 3e^{-2t}V$

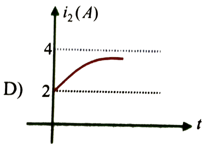


The variaton of current in the inductor with time can be repesented as :

A. 

B. 

C. 

D. 

Answer: D

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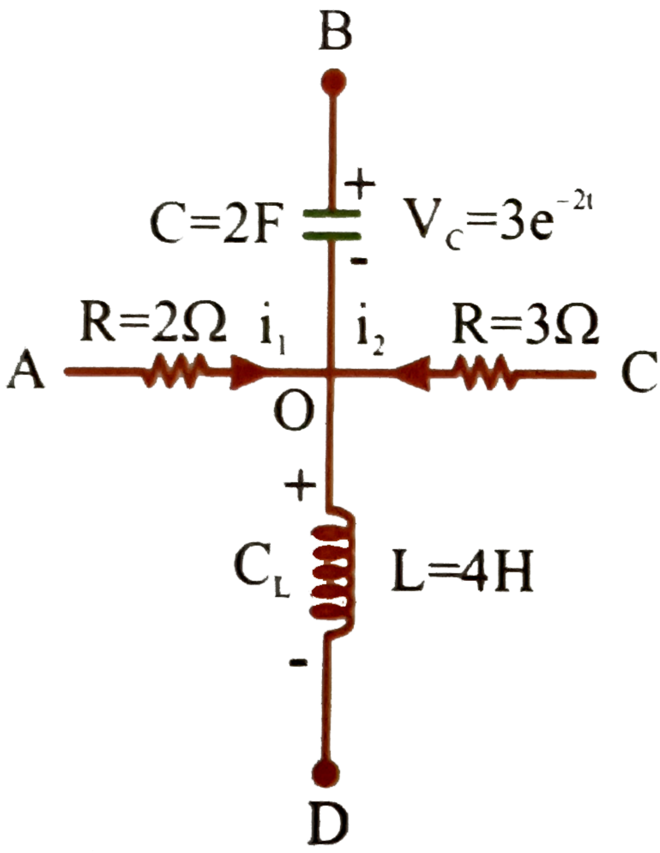
75. In figure $i_1 = 10e^{-2t}A, i_2 = 4A, v_C = 3e^{-2t}V$



The potential difference across inductor V_L is :

A. $8e^{-2t}V$

B. $9e^{-2t}V$

C. $16e^{-2t}V$

D. $18e^{-2t}V$

Answer: C

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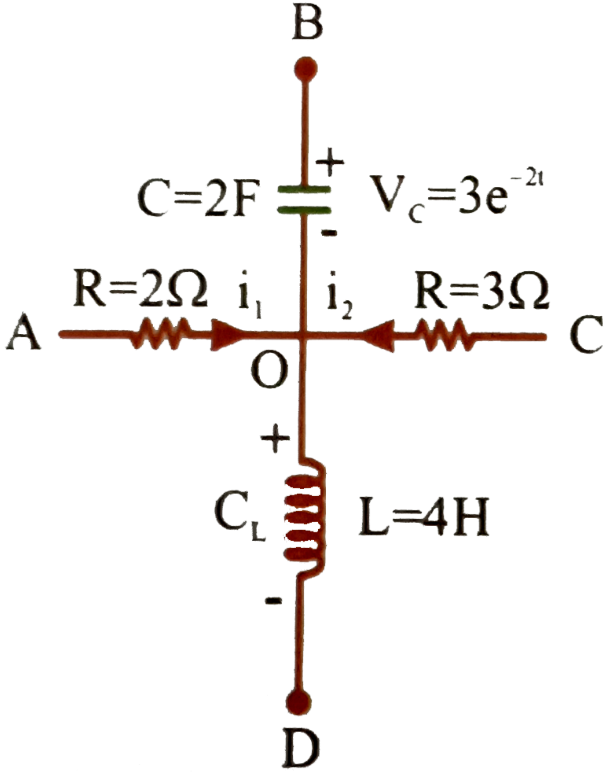
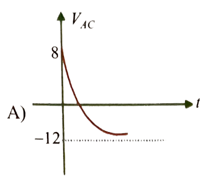
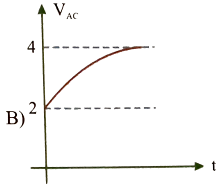
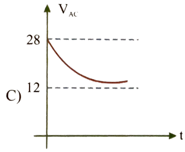
76. In figure $i_1 = 10e^{-2t}A, i_2 = 4A, v_C = 3e^{-2t}V$

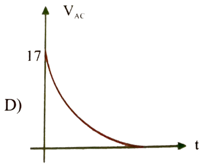


The variation of potential difference acorss A and C with time can be represented as

A. 

B. 

C. 

D. 

Answer: A

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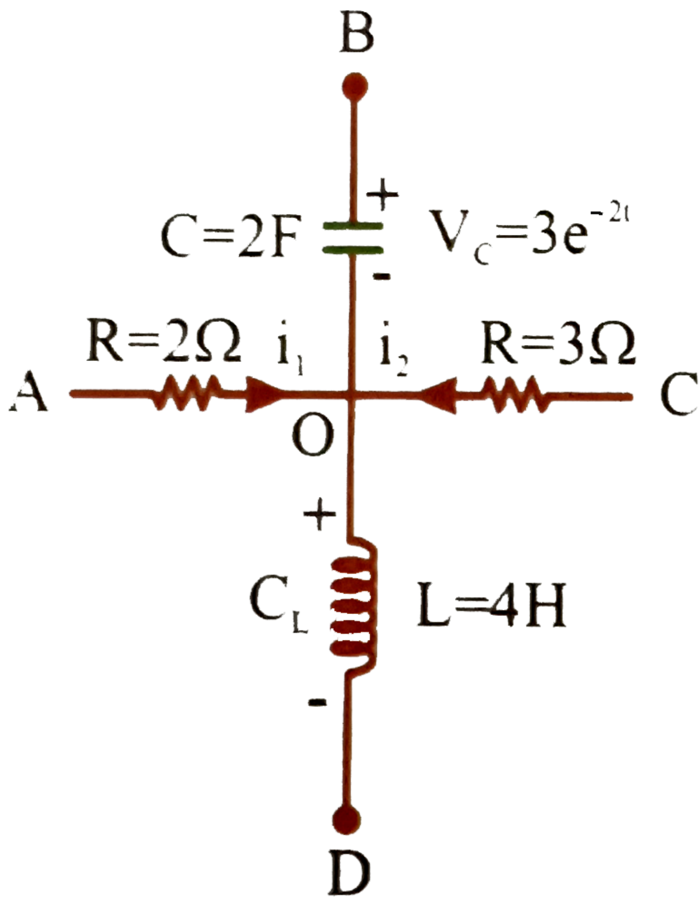
77. In figure $i_1 = 10e^{-2t}A, i_2 = 4A, v_C = 3e^{-2t}V$



The potential difference across $AB\left(V_{AB}\right)$ is:

A. $8e^{-2t}V$

B. $\frac{1}{2}e^{-3t}V$

C. $17e^{-2t}$

D. $16e^{-2t}V$

Answer: C

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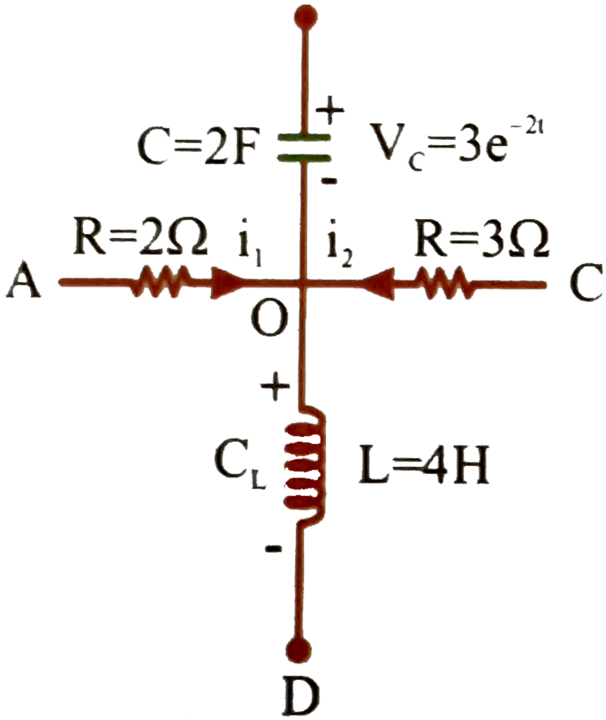
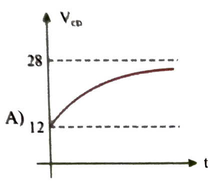
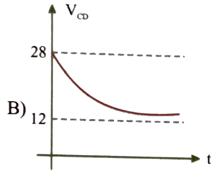
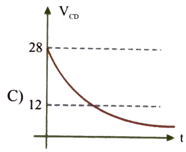
78. In figure $i_1 = 10e^{-2t}A$, $i_2 = 4A$, $v_C = 3e^{-2t}V$

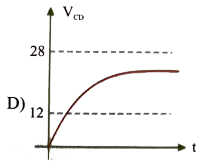


The variation of potential difference acorss A and C with time can be represented as

A. 

B. 

C. 

D. 

Answer: B

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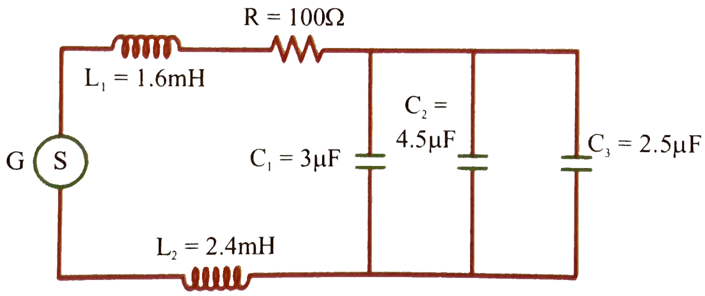
79. An ac generator G with an adjustable frequency of oscillation is used in the circuit, as shown.



Current drawn from the ac souce will be maximum if its angular frequency is

A. $10^5 \mathrm{rad}/s$

B. $10^4 \mathrm{rad}/s$

C. $5000 \mathrm{rad}/s$

D. $50 \mathrm{rad}/s$

Answer: C

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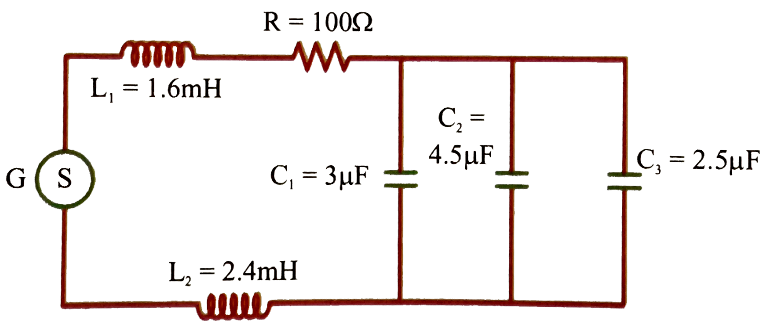
80. An ac generator G with an adjustable frequency of oscillation is used in the circuit, as shown.



To increase resonant frequency of the circuit, some of the changes in the circuit are carried out. Which changes would certainly result in the increase in resonnatn frequency ?

A. R is increased

B. L_1 is increased and C_1 is decreased

C. L_2 is decreased and C_2 is increased

D. C_3 is removed from the circuit

Answer: D

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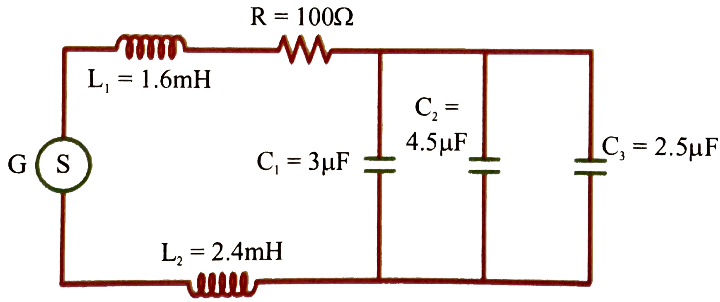
81. An ac generator G with an adjustable frequency of oscillation is used in the circuit, as shown.



If the ac source G is $100V$ rating at resonant frequency of the circuit, then average power supplied by the source is

A. $50W$

B. $100W$

C. $500W$

D. $1000W$

Answer: B

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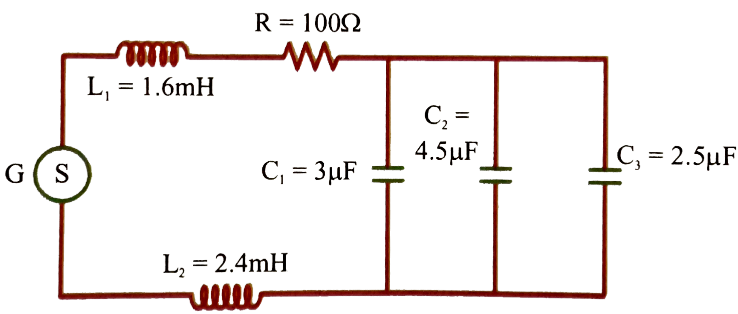
82. An ac generator G with an adjustable frequency of oscillation is used in the circuit, as shown.



Average energy stored by the inductor L_2 (source is at resonance frequency) is equal to

A. zero

B. $1.2mJ$

C. $2.4mJ$

D. $4mJ$

Answer: B

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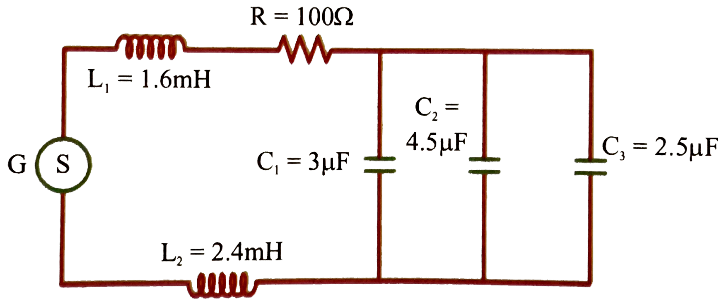
83. An ac generator G with an adjustable frequency of oscillation is used in the circuit, as shown.



If the ac source G is $100V$ rating at resonant frequency of the circuit, then average power supplied by the source is

A. $0J$

B. $1mJ$

C. $100mJ$

D. not possible to calcualte from the given information

Answer: D

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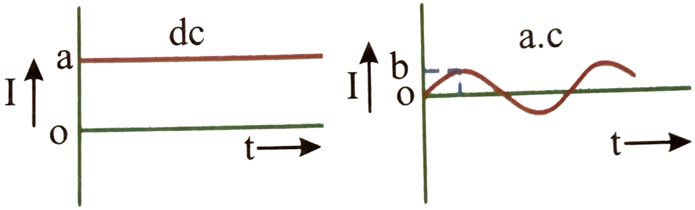
LEVEL - VI

1. If a direct current of value $'a'$ ampere is supermposed on an alternating current $I = b\sin\omega t$ flowing through a wire, what is the effective value of the resulting current in the circuit?



A. $\sqrt{a^2 + b^2}$

B. $\sqrt{a^2 + \frac{b^2}{2}}$

C. $\sqrt{\frac{a^2}{2} + b^2}$

D. $\sqrt{a^2 + \frac{b^2}{3}}$

Answer: B

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2. The secondary coil of an ideal step down transformer is delivering 500 watt power at $12.5 A$ current. If the ratio of turns in the primary to the secondary is $5 : 1$ then the current flowing in the primary coil will be:

A. $62.5 A$

B. $2.5 A$

C. $6 A$

D. $0.4 A$

Answer: B

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3. In a step-up transformer the turn's ratio is 10. If the frequency of the current in the primary coil is $50Hz$ then of the frequency of the current in the second ary coil will be

A. $500Hz$

B. $5Hz$

C. $60Hz$

D. $50Hz$

Answer: D

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4. An alternating voltage of 200 volt, at 400 cycyles/sec in applied in a circuit containing an inductance of 0.01 henry in series with a resistanceof 22.8 ohms. The voltage across the inductance is

A. 148.2 volt

B. 392.4 volt

C. 74.1 volt

D. 196.2 volt

Answer: A

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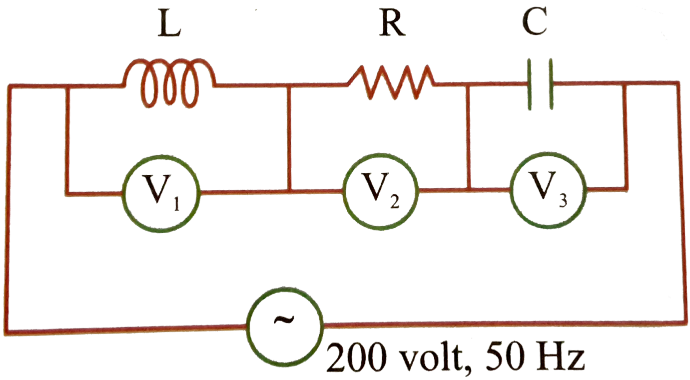
5. If the readings V_1 and V_3 are 10. volt each, then reading of V_2 is:



A. 0 volt

B. 100 volt

C. 200 volt

D. cannot be determined by given information

Answer: C

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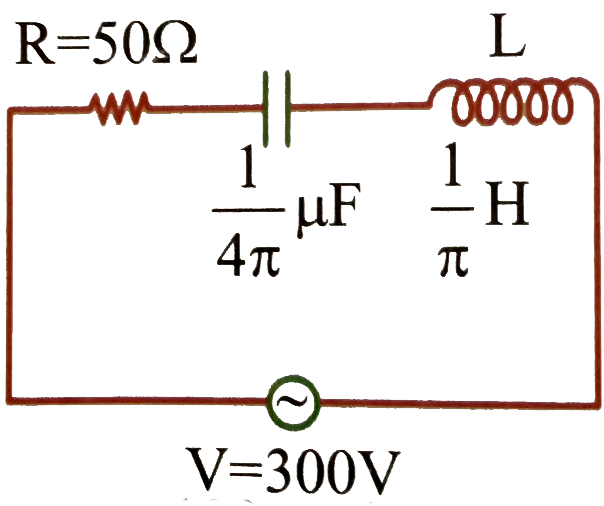
6. In the a.c. circuit shown in the figure. The supply voltage has a constant r.m.s value V but varialbe frequency f. Resonance frequency in hertz is



A. 10

B. 100

C. 1000

D. 200

Answer: C

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7. If the power factor is $1/2$ in a series RL circuit with $R = 100\Omega$. If AC mains, $50Hz$ is used then L is

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

B. π henry

C. $\sqrt{3}$ henry

D. $\sqrt{3}\pi$ henry

Answer: A

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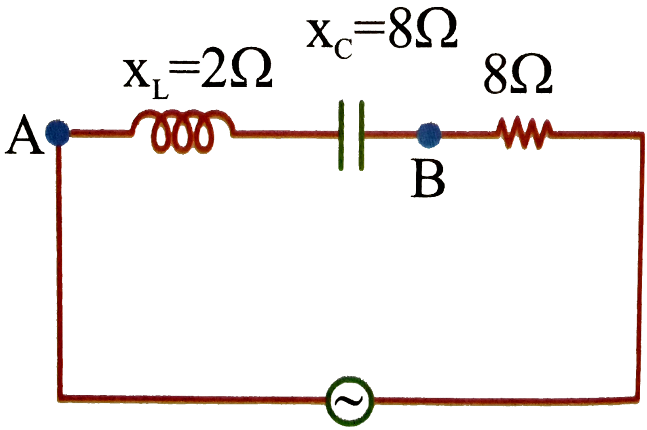
8. An inductor $\left(X_L = 2\Omega\right)$ a capacitor $\left(X_C = 8\Omega\right)$ and a resistance (8Ω) are connected in series with an ac source. The voltage output of $A.C$ source is given by $v = 10\cos 100\pi t$. The instantaneous p.d. between A and B when is half of the voltage output from source will be:



A. $\frac{24}{7}$ volt

B. $\frac{24}{5}$ volt

C. $\frac{7}{24}$ volts

D. $\frac{5}{24}$ volts

Answer: B

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9. A resistor of resistance 100Ω is connected to an AC source $\varepsilon = (12V)\sin\left(250\pi s^{-1}\right)t$. Find the energy dissipated as heat during $t = 0$ to $t = 1.0ms$.

A. $0.61 \times 10^{4}J$

B. $0.61 \times 10^{-4} J$

C. $2.61 \times 10^{-4} J$

D. $2.61 \times 10^{-6} J$

Answer: C

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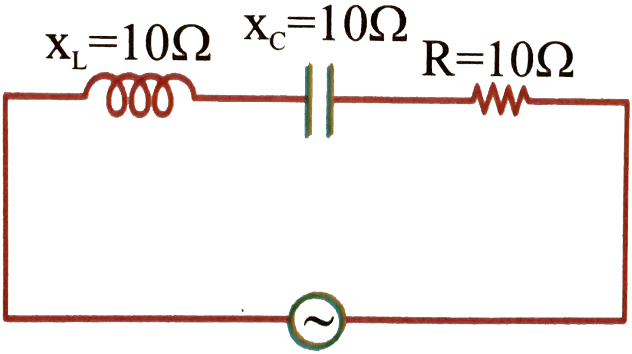
10. In the given AC, circuit, which of the following in incorrect:



$\varepsilon = 100 \sin (100\pi t + \pi/2)$

A. Voltage across resistance is lagging by $90°$ than the voltage across capacitor

B. Voltage across capacitor is lagging by $180°$ than voltage across inductor

C. Voltage across inductor is leading by $90°$ than voltage across resistance

D. resistance of the cicuit is equal to impedance reactance of circuit

Answer: A

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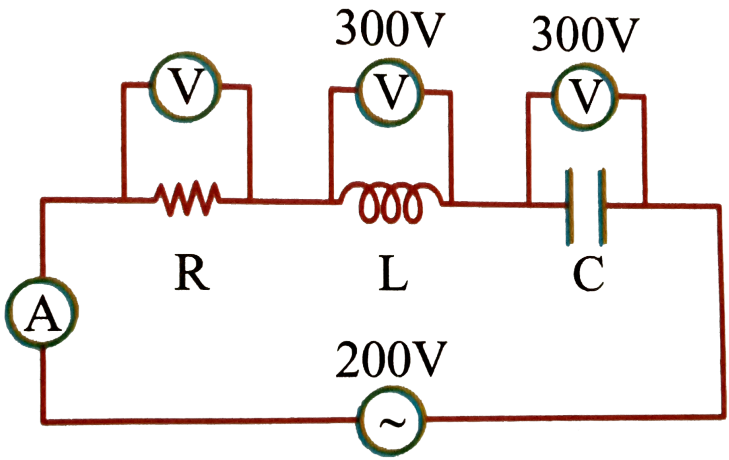
11. In the series circuit shown in the figure the voltmeter reading will be (all the meters are ideal).



A. $300V$

B. $200V$

C. $100V$

D. $600V$

Answer: B

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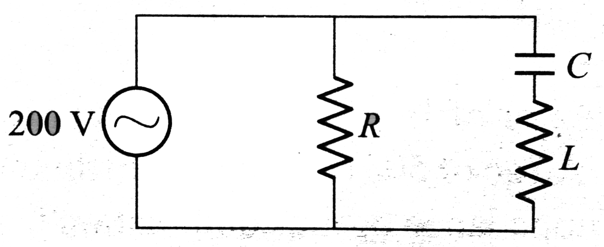
12. In the circuit shown in fig. $X_C = 100\Omega$, $(X_L) = 200\Omega$ and $R = 100\Omega$. The effective current through the source is



A. $2A$

B. $2\sqrt{A}$

C. $0.5A$

D. $\sqrt{0.4}A$

Answer: B

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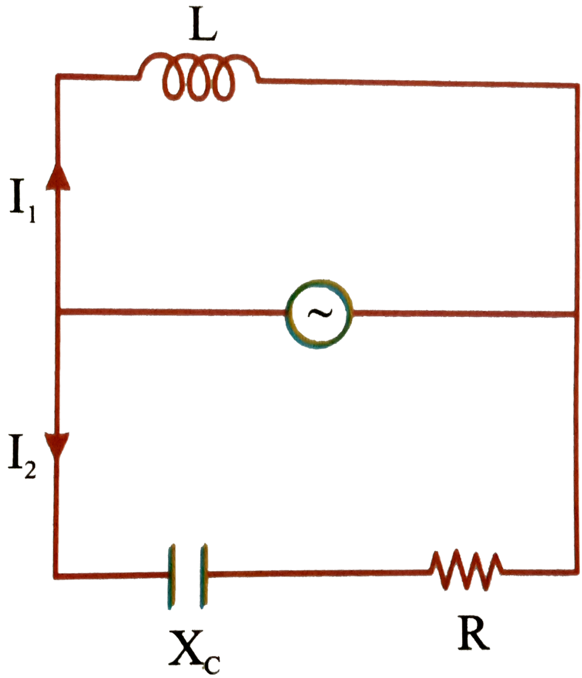
13. In the given circuit assuming inductor and source to be ideal, the phase differece between current I_1 and I_2 :



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

B. $\tan^{-1}\left(\frac{X_C}{R}\right)$

C. $\tan^{-1}\left(\frac{X_C}{R}\right) + \frac{\pi}{2}$

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

Answer: C

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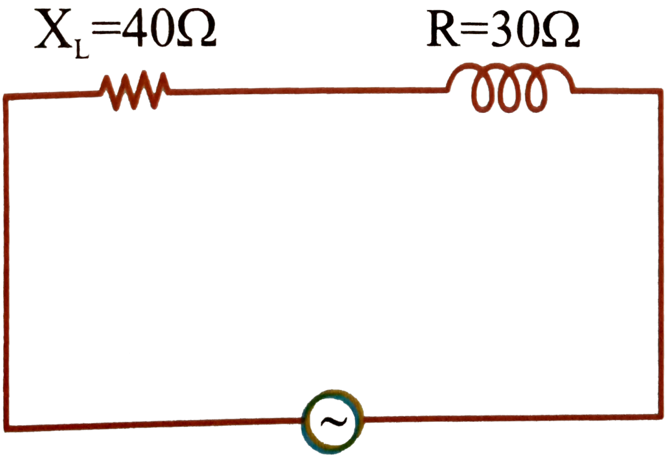
14. In the circuit current through source will be

[Given $\left(\cos^{-1}(0.6) = 53^\circ\right)$]

$$V = 10 + 10\sqrt{2}\sin\left(100\pi + 45^\circ\right)$$



A. $\frac{1}{3} + \frac{\sqrt{2}}{5}\sin\left(100\pi t - 8^\circ\right)$

B. $\frac{1}{5} + \frac{\sqrt{2}}{5}\sin\left(100\pi t - 8^\circ\right)$

C. $\frac{1}{3} + \frac{\sqrt{2}}{5}\sin\left(100\pi t - 98^\circ\right)$

D. $\frac{1}{3} + \frac{\sqrt{2}}{5}\sin\left(100\pi t + 98^\circ\right)$

Answer: B

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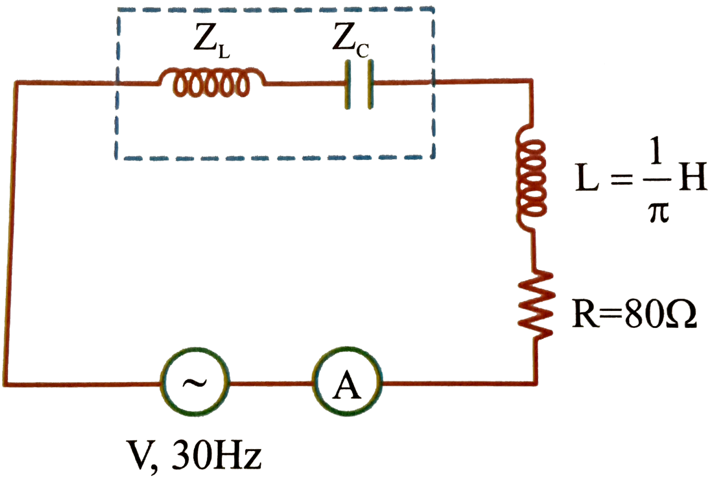
15. In figure below if $Z_1 = Z_C$ and reading of ammeter is $1A$. Find value of source voltage V.



A. 80 volt

B. 60 volt

C. 100 volt

D. None

Answer: C

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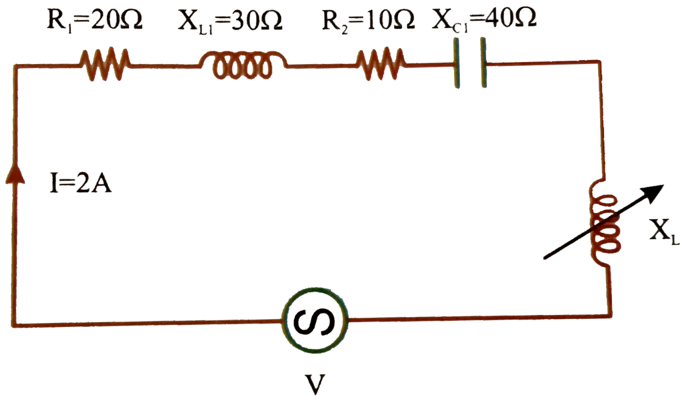
16. As shown in figure value of inductive reactance X_L will be (source voltage is 100 volt)



A. 40Ω

B. 30Ω

C. 50Ω

D. Can have any value

Answer: C

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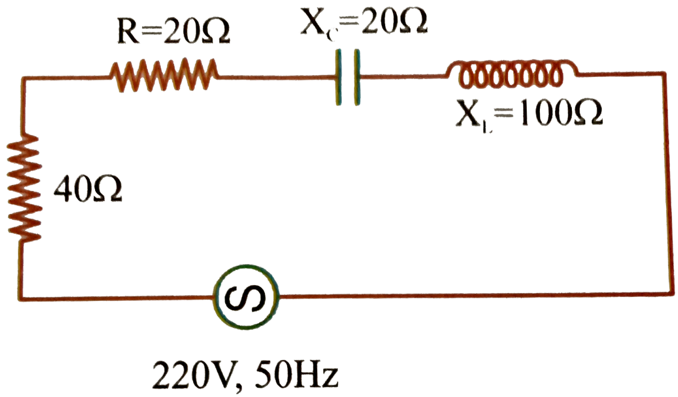
17. The power factor of the circuit shown in the figure is



A. 0.4

B. 0.2

C. 0.8

D. 0.6

Answer: D

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18. In an $L - R - C$ circuit the current is given by $i = I\cos\omega t$. The voltage amplitudes for the resistor. Inductor and capacitor are V_R, V_L and V_C respectively.

(a) The instantaneous power into the resistor is $P_R = V_R I\cos^2\omega t$.

(b) The instantaneous into the inductor is $P_L = -V_L I\sin\omega t\cos\omega t$

(c) The instantaneous power into the capacitor is $P_c = V_c I \sin\omega t \cos\omega t$.

(d) $p_R + p_L + P_c$ equals total power p supplied by the source at each instant of time.

A. (a),(c),(d) are correct

B. (b),(c) are correct

C. (a) is correct

D. (a),(b),(c),(d) are correct

Answer: D

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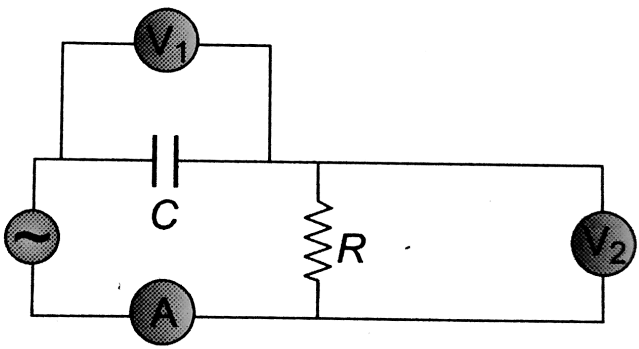
19. The diagram shows a capacitor C and a resistor R connected in series to an AC source. V_1 and V_2 are voltmeters and A is ammeter



Now, consider the following statemensts :

(I) Reading in A and V_2 are always in phase.

(II) Reading in V_1 is ahead in phase with reading in V_2,

(III) Reading in A and V_1 are always in phase.

Which of these statements are/is correct

A. I only

B. II only

C. I and II only

D. II and III only

Answer: A

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20. Two impedances Z_1 and Z_2 when connected separately across a $230V$, $50Hz$ supply consume $100W$ and $60W$ at power factor of 0.5 lagging and 0.6 leading respectively. If these impedances are now connected in series across the same supply, find

(a) total power absorbed and overall power factor

(b) the value of reactance to be added in series so as to raise the overall power factor to unity.

A. $19W$, 295Ω

B. $19W$, 95Ω

C. $99W$, 195Ω

D. $75W$, 195Ω

Answer: C

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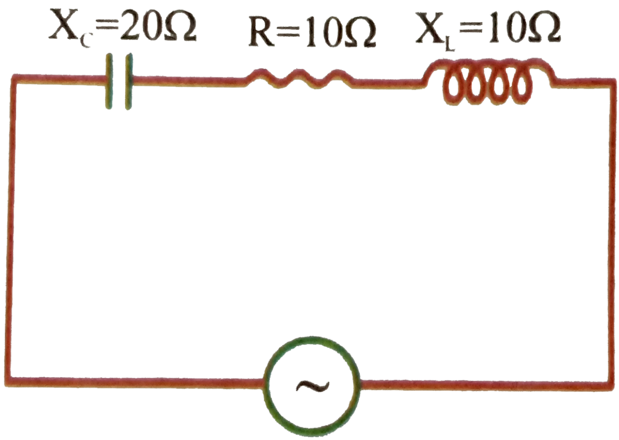
21. In the LCR circuit shown in figure



$$V = 200\sqrt{2}\ \sin \omega t$$

(a) current will lead the voltage

(2) rms value of current in $20A$

(3) power factor of the circuit is $\frac{1}{\sqrt{2}}$

(4) voltage drop across resistance is $100V$

A. (1) and (3) are correct

B. (1) and (4) are correct

C. (2) and (3) are correct

D. (3) and (4) are correct

Answer: A

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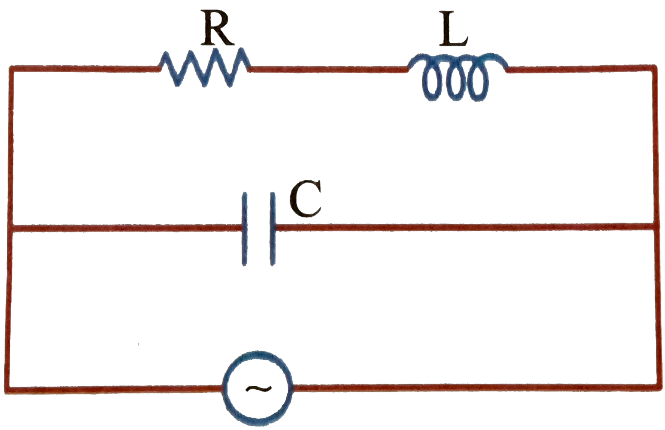
22. The $A.C$ circuit shown in figure. Find the frequency $\left(w_0\right)$ of the AC voltage source so that current through the source will be in same phase with the voltage of source.



A. $W_0 = \sqrt{\frac{1}{LC} + \frac{R^2}{L^2}}$

B. $W_0 = \sqrt{\frac{1}{LC} - \frac{R^2}{L^2}}$

C. $W_0 = \frac{1}{\sqrt{LC}}$

D. $W_0 = \sqrt{\frac{1}{LC} + \frac{R^2}{4L} + \frac{R}{2L}}$

Answer: B

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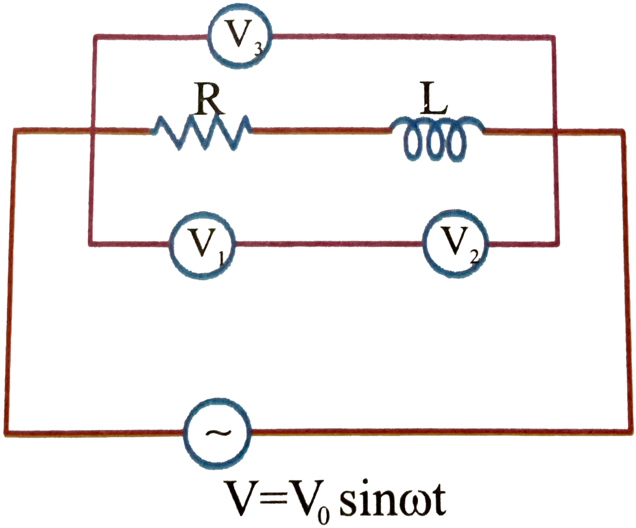
23. A resistance & ideal inductor is connected in the $A.C$ circuit. Here $V_1, V_2 \& V_3$ are the reading of three hotwire ideal voltmeter



A. $V_3 = V_2 + V_1$

B. $V_3 > \left(V_1 + V_2\right)$

C. $V_3 < \left(V_1 + V_2\right)$

D. informations are insufficients to decide

Answer: C

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24. In an AC series circuit, the instanctaneous current is zero when the instantaneous voltage is xamimum. Connected to the source may be a

A. pure inductors

B. pure capacitor

C. pure resistor

D. cambination of an inductor and a capacitor

Answer: A,B,D

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25. Which statement(s) is False for the series resonant condition

A. current maximum and phase difference between E and i is $\pi/2$

B. current maximum and phase difference between E and i is zero

C. voltage maximum and phase difference between E and i is zero

D. voltage maximum and phase difference between E and i is $\pi/2$

Answer: A,C,D

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26. An alternating EMF of frequency $\frac{1}{2\pi\sqrt{LC}}$ is applied to a series LCR circuit. For this frequency of the applied EMF,

A. The circuit is at resonance and its impedance is made up only of a resistive part

B. The current in the circuit is in phase with the applied e.m.f and the voltage across R equal this applied emf

C. The sum of the p.d'a across the inductance and capacitance equals the applied e.m.f which is 180° ahead of phase of the current in the circuit

D. The quality factor of the circuit is $\omega L / R$ or $1 / \omega CR$ and this is a measure of the voltage magnification (produced by the circuit at resonance) as well as the sharpness of resonance of the circiut.

Answer: A,B,C

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27. An LC source rated $100V$ (rms) supplies a current of $10A$ (rms) to a circuit. The average power delivered by the source

A. must be $1000W$

B. may be $1000W$

C. may be greater than $1000W$

D. may be less than $1000W$

Answer: B,D

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28. In a L - R circuit, the value of L is $\left(\frac{0.4}{\pi}\right)$ henry and the value of R is 30 ohm. If in the circuit, an alternating e.m.f of 200 vol at 50 cycles per sec is connected, the impendence of the circuit will be

A. 50 ohm

B. 60 ohm

C. 2 amphere

D. 4 amphere

Answer: A,D

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29. A circuit has three elements, a resistance fo 11Ω, a coil of inductaive reactance 120Ω and a capacitve reactance of 120Ω in series and connected to an $A.C$ source of $110V, 60Hz$. Which of the three elements have minimum potential difference?

A. Resistance

B. Capacitance

C. Inductor

D. All will have equal potential difference

Answer: A

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30. An inductor 20×10^{-3} henry, a capacitor $100\mu F$ and a resistor 50Ω are connected in series across a source of emf $V = 10\sin 314t$.

(a) The energy dissipated in the circuit in 20 minutues is $951J$.

(b) If resistance is removed from the circuit and the value of inductance is doubled, then the varation of current with time in the new circuit

is $0.52\cos(314t)$

A. Both (a) and (b) are correct

B. Both (a) and (b) are false

C. Only (a) is corrects

D. Only (b) is correct

Answer: A

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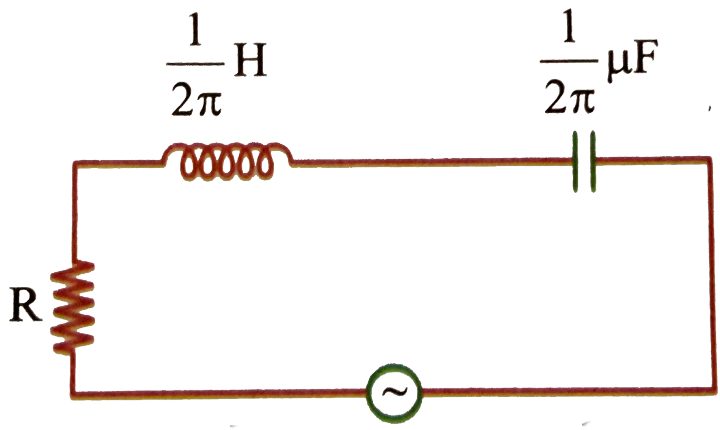
31. In a series LCR circuit



A. the voltage V_L across the inductance leads the current in the circuit by a phase angle of $\pi/2$

B. the voltage V_C across the capacitance lags behind the current by a phase angle of $\pi/2$

C. the voltage V_R across the resistance is in phase with the current

D. the voltage across sereis combination of L, C and R is $V = V_L + V_C + V_R$

Answer: A,B,C

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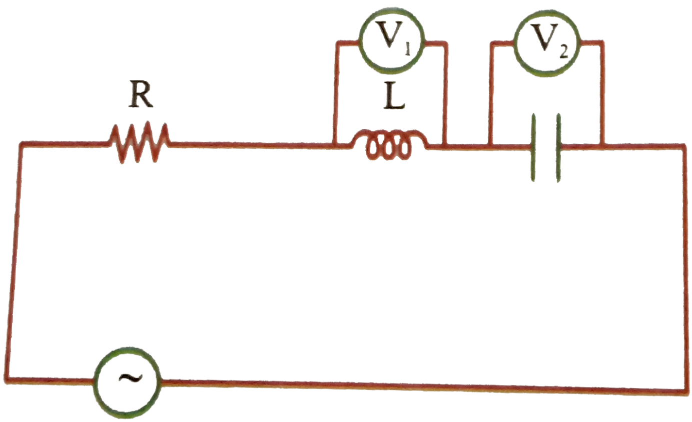
32. In the figure shown $R = 100\Omega L = \frac{2}{\pi}H$ and $C = \frac{8}{\pi}\mu F$ are connected in series with a.c source of 200 volt and frequency $'f'$. V_1 and V_2 are two hot-wire voltmeters. If the readings of V_1 and V_2 are same then:



A. $f = 125Hz$

B. $f = 250Hz$

C. Current through R is $2A$

D. $V_1 = V_2 = 1000$ volt

Answer: A,C,D

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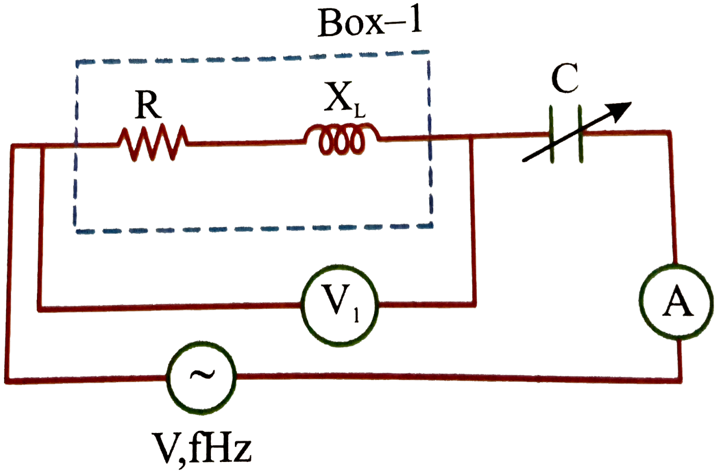
33. Choose correct statement if capcitance increases from zero (0) to inifinity ∞



A. Current increases from 0 (Zero) to maximum then decreases to zero

B. Reading of voltmeter first increases and it will be maximum when $X_L = X_C$

C. Power factor of circuit first increases then decreases

D. V_1 may be greater than V, V_1 may be equal V, V_1 maybe less than V, where V_1 is reading of volmeter and V is source voltage.

Answer: A,B,C,D

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34. A box P and a coil Q are connected in series with an AC source of variable frequency. The emf of the source is constant at $10V$. Box P

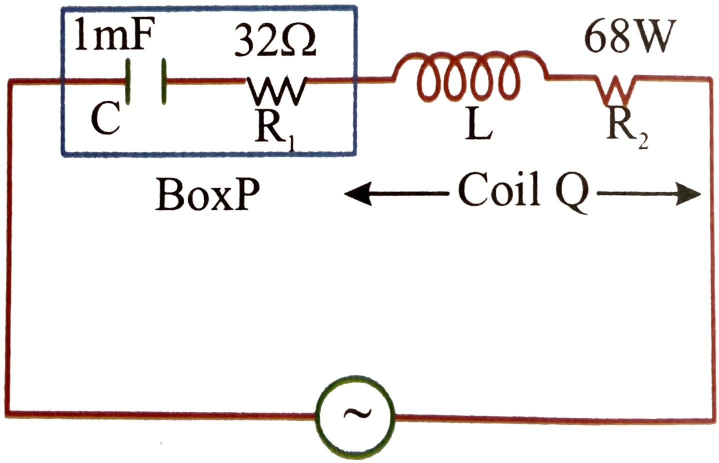
contains a capacitance of $1 \mu F$ in series with a resistance of 32Ω. Coil Q has a self-inductance 4.9 mH and a resistance of 68Ω in series. The frequency is adjusted to that the maximum current flows in P and Q. At this frequency

(a) The impedance of P is 77Ω

(b) The impedance of Q is 85Ω

(c) Voltage across P is $7.7 V$

(d) Voltage across Q is $9.7V$



A. Only (a),(c) are correct

B. Only (a),(d) are correctd

C. Only (c), (d) are correct

D. (a),(c),(d) are correct

Answer: D

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35. A series LCR circuit containing a resistance of 120Ω has angular resonance frequency $4 \times 10^5 \text{rads}^{-1}$. At resonance the voltages across resistance and inductance are $60V$ and $40V$ respectively.

(a) The value of L and C are 0.2 mH, $\frac{1}{32}\mu F$

(b) If angular frequency is changed to $8 \times 10^5 \text{rad}/s$, the current lags the voltage by 45°

(c) If angular frequency is charged to

$6 \times 10^5 \text{rad}/s$, the current lags the voltage by 45°

A. (a),(c) are correct

B. (a),(b) are correct

C. (a),(b) (c) are correct

D. (a),(b),(c) are wrong

Answer: B

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36. A current of $4A$ flows in a coil when connected to a $12VDC$ source. If the same coil is connected to a $12V, 50rad/sAC$ source, a current of $2.4A$ flows in the circuit. Determine the inductance of the coil. Also, find the power developed in the circuit if a$2500\mu F$ capacitor is connected in series with the coil.

A. (a), (c) are correct

B. (b), (c) are correct

C. (a), (b), (c) are correct

D. Only (b) is correct

Answer: (A),(B),(C) are correct

Watch Video Solution

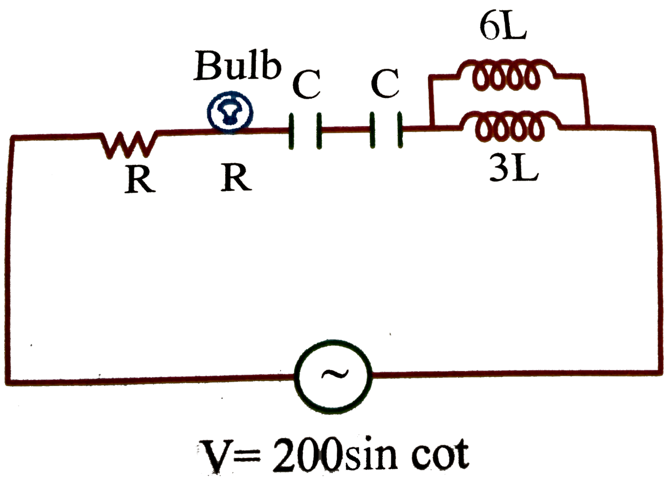
37. In the given series $R - L - C$ circuit,

$R = 100\Omega, L = 10^{-3}H, C = 0.1\mu F, V_0 = 200V$

(a) The resonant frequency is $15924Hz$

(b) The current at resosnance is $1A$

(c) The power dissipated in the circuitd at resonance is $100W$



A. (a),(b),(c) are correct

B. (a),(b),(c) are wrong

C. Only (a),(b) are correct

D. Only (b),(c) are correct

Answer: A

Watch Video Solution

38. An alternating emf of frequency $f = 50Hz$ peak voltage $V_0 = 21$ volt is applied to a series circuit of resistance $R = 20$ ohm, an inductance $L = 100mH$ and a capacitor of $C = 30\mu F$.

(a) The maximum currentd is $3A$

The phase difference between current and applied voltage is 75°

(c) The current i as a function of time $'t'$ is $i = 3\sin\left(314t + 75^\circ\right)$

A. Only (a),(b) are correct

B. Only (b),(c) are correct

C. (a),(b),(c) are correct

D. (a),(b),(c) are wrong

Answer: C

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39. A resistor R is connected in series with a coil. The system is subjected to an AC supply of peak voltage V_0. If the peak voltages dropped across the resistor R and the coil are V_1 and V_2

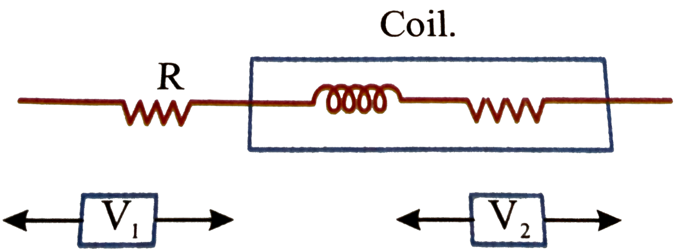
respectively

(a) The powerr dissipated in the coil is

$$\frac{V_0^2 - V_1^2 - V_2^2}{2R}$$

The power dissipated in the circuit is

$$\frac{V_0^2 + V_1^2 - V_2^2}{2R}$$



A. Only (a) is correct

B. Only (b) is correct

C. (a),(b) are wrong

D. (a),(b) are correct

Answer: D

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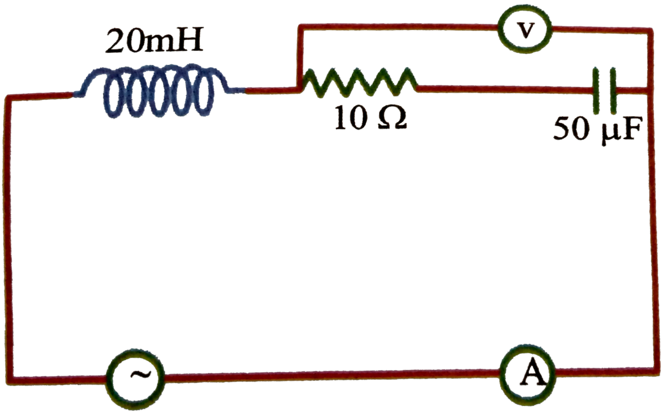
40. For the AC circuit shown, the reading of ammeter and voltmeter are $5A$ and $50\sqrt{5}$ volts respectively, then



A. average power deliverd by the source is

$250W$

B. rms value of AC source is 50 volts

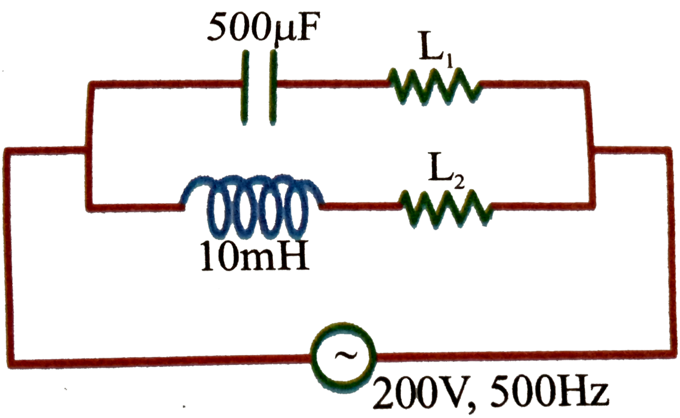
C. voltage gain is 2

D. frequency of ac source is 1000rad/s

Answer: A,B,C,D

Watch Video Solution

41. In the circuit shown in Fig. If both the lamps L_1 and L_2 are identical.



A. their brightness will be same

B. L_1 will be brighter than L_2

C. As the frequency of supply voltage in increased, brightness of L_1 will increase and that of L_1 will decrease

D. Only L_2 will glow because the capacitor has infinite resistance

Answer: B,C

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42. A series LCR circuit with $L = 0.12H, C = 480nF,$ and $R = 23\Omega$ is connected to a $230V$ variable frequency supply.

(a) What is the source frequency for which current amplitude is maximum? Find this maximum value.

(b) What is the source frequency for which average power absorbed by the circuit is maximum? Obtain the value of maximum power.

(c) For which frequencies of the source is the power transferred to the circuit half the power at resonant frequency?

(d) What is the Q-factor of the circuit?

A. The source frequency $663 Hz$, current amplitude is maximum and this maximum value is $14.1 A$.

B. At the source frequency $663 Hz$ average power absorbed by the circuit is maximum and the value of this maximum power is $2300 W$

C. At the frequencies $648Hz, 678Hz$ of the source, the power transferred to the circuit is half the power at resonant frequency. The current amplitude at these frequencies is $10A$

D. The Q-factor of the given circuit is 21.7

Answer: A,B,C,D

Watch Video Solution

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

C. $\sqrt{\frac{3}{4}}$

D. $\sqrt{\frac{4}{3}}$

Answer: A

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44. A circuit has a coil of resistance 60 ohm and inductance 3 henry. It is connected in series with a capacitor of $4\mu F$ and $A.C$ supply voltage of $200V$ and 50 cycle/sec

A. the impedance of the coil is 943Ω

B. the impedance of the coil is 843Ω

C. the p.d. across the inductor coil is $1110V$

D. the p.d. across the capacitor is $924V$

Answer: A,C,D

Watch Video Solution

45. A circuit consists of a noniductive resistor of 50Ω, a coil of inductance $0.3H$ and resistance 2Ω, and a capacitor of $40\mu F$ in series and is supplied with 200 volt rms at 50 cycles / sec. Then

A. the current lag or lead by an angle $15^{\circ} 5^{1}$

B. the power in the circuit is $710.4W$

C. the power in th circuit is $640W$

D. the current lag or lead by an angle $12^{\circ} 5^{1}$

Answer: A,B

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46. A coil of resistance 300Ω and inductance 1.0 henry is connected across an voltages source of frequency $300/2\pi Hz$. The phase difference between the voltage and current in the circuit is

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

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

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

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

Answer: B

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47. A circuit draws a power of 550 watt from a source of 220 volt, $50Hz$. The power factor of the circuit is 0.8 and the current lags in phase behind the potential difference. To make the power factor of the circuit as 1.0, The capacitance should be connected in series with it is

A. $75\mu F$

B. $60\mu F$

C. $50\mu F$

D. $65\mu F$

Answer: A

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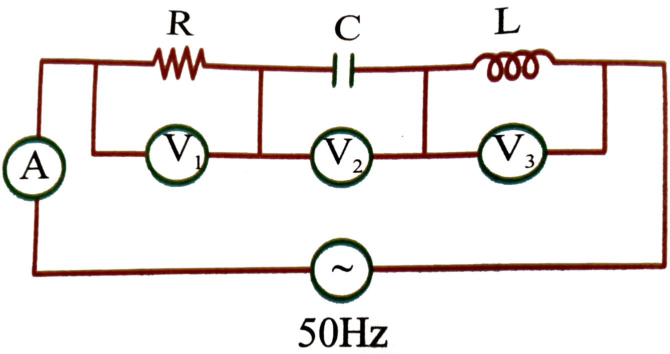
48. In the figure shown V_1, V_2, V_3 are AC voltmeters and A is AC ammeter. The readings of V_1, V_2, V_3 and $10V, 20V, 20V, 2A$ respectively.

If the inductor is short circuited, then



A. the reading of V_1 is $2\sqrt{5}V$

B. the reading of V_2 is $4\sqrt{5}V$

C. the reading of V_2 is $2\sqrt{5}V$

D. the value of A is $\frac{2}{\sqrt{5}}A$

Answer: A,B,D

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49. In a series LCR circuit with an ac source of $50V$, $R = 300\Omega$,frequency $\nu = \frac{50}{\pi} Hz$.The average electric field energy, stored in the capacitor and average magnetic energy stored in the coil are $25mJ$ and $5mJ$ respectively.The RMS current in the circuit is $0.10A$.Then find

A. capacitance C of capacitor is $20\mu F$

B. inductance L of inductor is $2H$

C. peak voltage of source is $50V$

D. the sum of rms voltage across the three elements is $35.4V$

Answer: A,B,C,D

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50. An L - C - R series circuit with 100Ω resistance is connected to an AC source of $200V$ and angular frequency $300rad/s$. When only the capacitance is removed, the current lags behind the voltage by 60°. When only the inductance is removed the current leads the voltage by 60°. Calculate the current and the power dissipated in the L - C - R circuit

A. $200W$

B. $100W$

C. $50W$

D. $400W$

Answer: D

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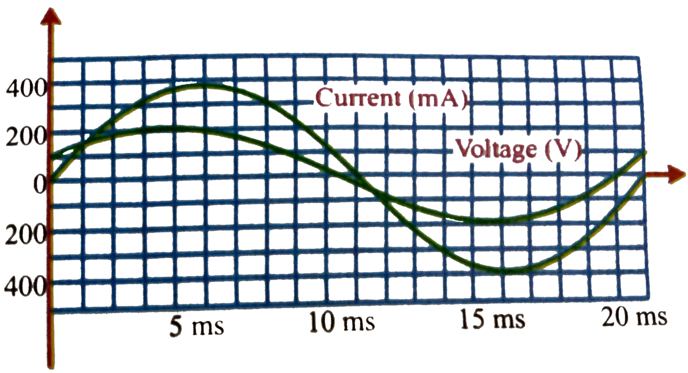
51. The given graph shows variation with time in the source voltage and steady state current drawn by a series RLC circuit. Given curve through origin is the current variation.

Which of the following statements is/are correct ?



A. current lag the voltage

B. Resistance in the circuits is $250\sqrt{3}\Omega$

C. If capacitive reactance is 74Ω, inductance in the circuit is approximately $560mH$.

D. Average power dissipation in the circuit is $20\sqrt{3}W$.

Answer: A,B,D

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52. A 100Ω resistance is connected in series with a $4H$ inductor. The voltage across the resistor is, $V_R = (2.0V)\sin\left(10^3 t\right)$.

Find the expression of circuit current

A. $\left(2 \times 10^{-2} A\right)\sin\left(10^3 t\right)$

B. $\left(2 \times 10^{-3} A\right)\sin\left(10^2 t\right)$

C. $\left(2 \times 10^{-3} A\right)\sin\left(10^3 t\right)$

D. $\left(2 \times 10^{-2} A\right)\sin\left(10^2 t\right)$

Answer: A

Watch Video Solution

53. A 100Ω resistance is connected in series with a $4H$ inductor. The voltage across the resistor is, $V_R = (2.0V)\sin\left(10^3 t\right)$.

Find the inductive reactance

A. 2×10^3 ohm

B. 3×10^3 ohm

C. 4×10^3 ohm

D. 5×10^3 ohm

Answer: C

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54. A 100Ω resistance is connected in series with a $4H$ inductor. The voltage across the resistor is, $V_R = (2.0V)\sin\left(10^3 t\right)$.

Find amplitude of the voltage across the inductor.

A. $40V$

B. $60V$

C. $80V$

D. $90V$

Answer: C

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55. If various elements, i.e., resistance capacitance and inductance which are in series and having values $1000\Omega, 1\mu F$ and $2.0H$ respectively. Given emf as, $V = 100\sqrt{2}\sin 1000t$ volts

Voltage across the resistor is

A. 70.7 Volts

B. 100 Volts

C. 141.4 Volts

D. 270.7 Volts

Answer: A

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56. If various elements, i.e., resistance capacitance and inductance which are in series and having values $1000\Omega, 1\mu F$ and $2.0H$ respectively. Given emf as, $V = 100\sqrt{2}\sin 1000t$

volts

voltage across the inductor is

A. 70.7 Volts

B. 101 Volts

C. 141.4 Volts

D. 270.7 Volts

Answer: C

Watch Video Solution

57. If various elements, i.e., resistance capacitance and inductance which are in series and having values $1000\Omega, 1\mu F$ and $2.0H$ respectively. Given emf as, $V = 100\sqrt{2}\sin 1000t$ volts

voltages across the capacitor is

A. 70.7 Volts

B. 102 Volts

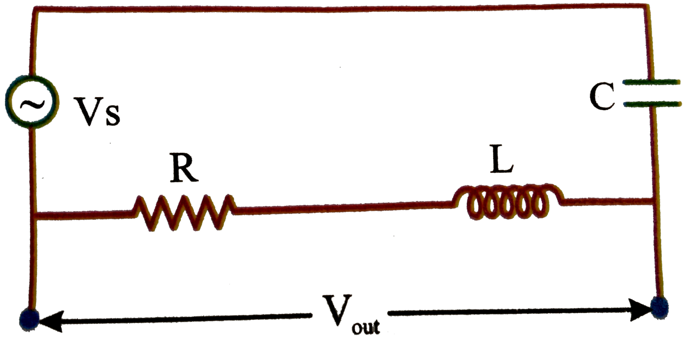
C. 141.4 Volts

D. 270.7 Volts

Answer: A

Watch Video Solution

58. One application of L - R - C series circuit is in high pass or low pass filter, which out either the low or high frequency components of a signal. A has pass filter is shown in figure where the output voltage is taken across the L - R where L - R combination represents and inductive coil that also has resistance due to the large length of the wire in the coil.



Find the ratio V_{out}/V_s as a function of the angular frequency ω of the source

A. $\sqrt{\dfrac{R^2 + \omega L^2}{R^2 + \left(\omega L - \dfrac{1}{\omega C}\right)^2}}$

B. $\sqrt{\dfrac{R^2 + \omega^2 L^2}{R^2 + \left(\omega L - \dfrac{1}{\omega C}\right)^2}}$

C. $\sqrt{\dfrac{R^2 + \omega^2 L}{R^2 + \left(\omega C - \dfrac{1}{\omega L}\right)^2}}$

D. 1

Answer: B

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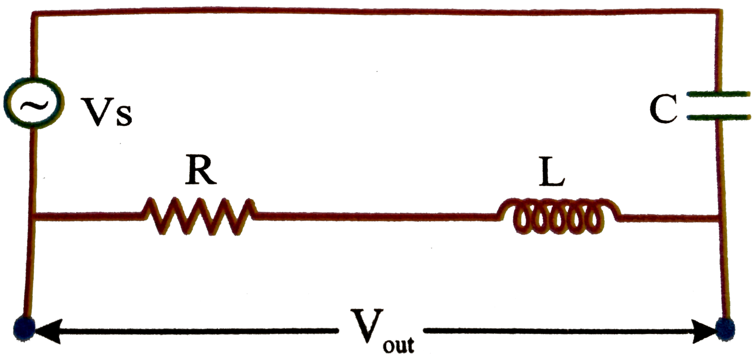
59. One application of $L - R - C$ series circuit is in high pass or low pass filter, which out either the low or high frequency components of a signal. A has pass filter is shown in figure where the output voltage is taken across the L - R where L - R combination represents and inductive coil that also has resistance due to the large length of the wire in the coil.



which of the following statementds is correct when ω is samll in the case of V_{out}/V_s

A. ωRC

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

C. ωRL

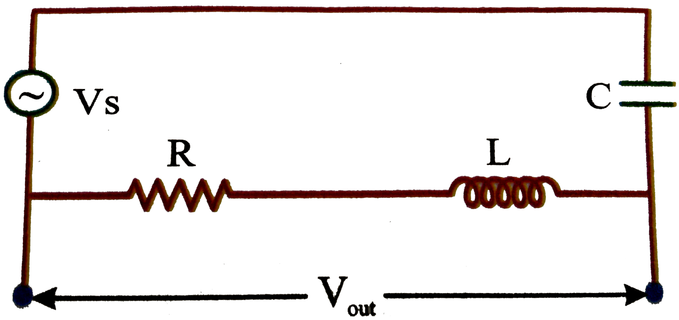
D. $\frac{\omega R}{C}$

Answer: A

Watch Video Solution

60. One application of L - R - C series circuit is in high pass or low pass filter, which out either the low or high frequency components of a signal. A has pass filter is shown in figure where the output voltage is taken across the L - R

where L - R combination represents and inductive coil that also has resistance due to the large length of the wire in the coil.



Which statement is correct in the limit of large frequency is reached? (for V_{out}/V_S)

A. 1

B. ωRC

C. ωRL

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

Answer: A

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61. In $A.C$ source peak value of $A.C$ is the maximum value of current in either direction of the cycle. Root moon square (RMS) is also defined as the direct current which produces the same heating effect in a resistors as the actual $A.C$

$A.C$ mesuring instrument measures its

A. rms value

B. Peak value

C. Average value

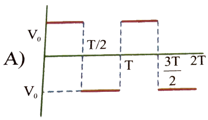
D. Square of current

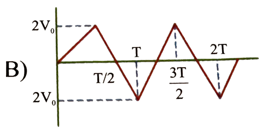
Answer: A

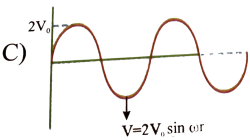
Watch Video Solution

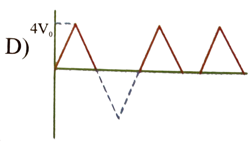
62. In $A.C$ source peak value of $A.C$ is the maximum value of current in either direction of the cycle. Root moon square (RMS) is also defined as the direct current which produces the same heating effect in a resistors as the actual $A.C$

Current time graph of different souce is given which one will have $R.M.S$ value V_0

A. 

B. 

C. 

D. 

Answer: A

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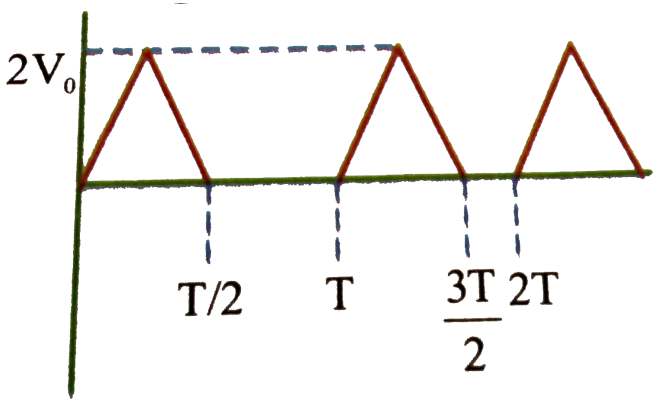
63. In $A.C$ source peak value of $A.C$ is the maximum value of current in either direction of the cycle. Root moon square (RMS) is also defined as the direct current which produces the same heating effect in a resistors as the actual $A.C$

Average voltage for the given source is



A. V_0

B. $2V_0$

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

D. $\frac{3V_0}{2}$

Answer: C

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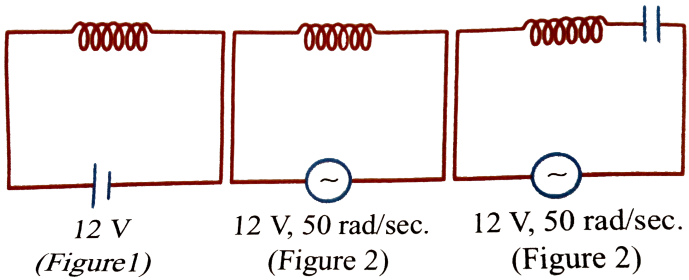
64. A steady $4A$ flows in an inductor coil when connected to a $12V$ source as shown in figure. If the same coil is connected to an ac source of $12V$, $50\text{rad}/s$ a currentd of $2.4A$ flows in the circuit as shown in figure2. Now after these observations , a capacitor fo capacitance $\frac{1}{50}F$ is connected in series with the coil and with same AC source as shown in figure 3.



The resistance of the coil is:

A. $0.01H$

B. $0.02H$

C. $0.04H$

D. $0.08H$

Answer: A

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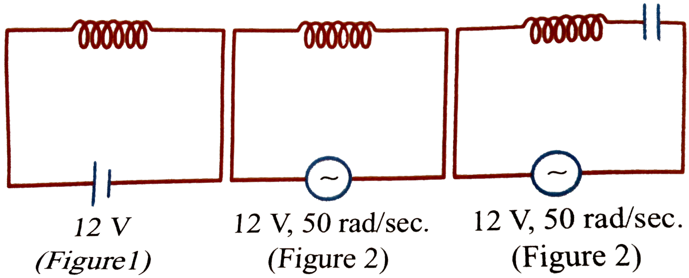
65. A steady $4A$ flows in an inductor coil when connected to a $12V$ source as shown in figure. If the same coil is connected to an ac source of $12V$, $50\text{rad}/s$ a currentd of $2.4A$ flows in the circuit as shown in figure2. Now after these observations , a capacitor fo capacitance $\frac{1}{50}F$ is connected in series with the coil and with same AC source as shown in figure 3.



The resistance of the coil is:

A. 1Ω

B. 2Ω

C. 3Ω

D. 4Ω

Answer: C

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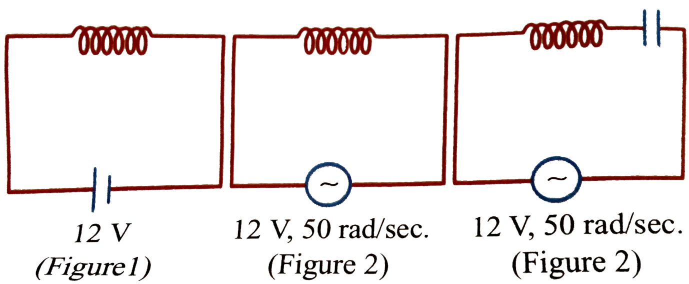
66. A steady $4A$ flows in an inductor coil when connected to a $12V$ source as shown in figure. If the same coil is connected to an ac source of

$12V$, $50\text{rad}/s$ a currentd of $2.4A$ flows in the circuit as shown in figure2. Now after these observations , a capacitor fo capacitance $\frac{1}{50}F$ is connected in series with the coil and with same AC source as shown in figure 3.



The resistance of the coil is:

A. $24W$

B. $72W$

C. $144W$

D. $18.2W$

Answer: D

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67. In a series L-R circuit, connected with a sinusoidal ac source, the maximum potential difference across L and R are respectivaly 3 volts and 4 volts.

At an instant the potemtial difference across resistor is 2 volts. The potential difference in volt, across the inductor at the same instant will be:

A. $3\cos 30^{\circ}$

B. $3\cos 60^{\circ}$

C. $6\cos 45^{\circ}$

D. 6

Answer: A

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68. In a series L - R circuit, connected with a sinusoidal ac source, the maximum potential difference acrosssd L and R are respectively 3 volts and 4 volts

At the same instant, the magnitude of the potential difference in volt, across the ac source will be

A. $3\cos 67\,^{\circ}$

B. $5\sin 37\,^{\circ}$

C. $4\cos 97\,^{\circ}$

D. 0

Answer: B

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69. In a series L - R circuit, connected with a sinusoidal ac source, the maximum potential difference acrosssd L and R are respectively 3 volts and 4 volts

If the current at this instant is decreasing the magnitude of potential difference at that instant across the ac source is

A. increasing

B. decreasing

C. Constant

D. Can't be said

Answer: A

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70. A constant voltage at a frequency of $1MHz$ is applied to an inductor in series with variable capacitor, when capacitor is $500pF$, the current has its maximum value, while it is reduced to half when capacitance is $600pF$. Find

Resistance (R)

A. 30Ω

B. 20Ω

C. 40Ω

D. 50Ω

Answer: A

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71. A constant voltage at a frequency of $1MHz$ is applied to an inductor in series with variable capacitor, when capacitor is $500pF$, the current has its maximum value, while it is reduced to half when capacitance is $600pF$. Find

The inductance L

A. $0.05mH$

B. $0.5mH$

C. $0.005mH$

D. $5mH$

Answer: A

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72. A constant voltage at a frequency of $1MHz$ is applied to an inductor in series with variable capacitor, when capacitor is $500pF$, the current has its maximum value, while it is reduced to half when capacitance is $600pF$. Find Q factor of the circuit is

A. 10.4

B. 20.8

C. 5.2

D. 9.4

Answer: A

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73. When $1A$ is passed through three coils A, B, C in series the voltage drops are respectively 6,3 and 8 volt on direct current source and 7,5 and 10 volt on Alternating current source

Power factor of coil B, will be

A. 0.6

B. 0.8

C. 0.7

D. None

Answer: A

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74. When $1A$ is passed through three coils A, B, C in series the voltage drops are respectively 6,3 and 8 volt on direct current source and 7,5 and 10 volt on Alternating current source

Power dissipated in coil C

A. 10 watt

B. 6 watt

C. 5 watt

D. 8 watt

Answer: D

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75. When $1A$ is passed through three coils A, B, C in series the voltage drops are respectively 6,3 and 8 volt on direct current source and 7,5 and 10 volt on Alternating current source

Power factor of whole circuit when atlernating current flow

A. 0.6

B. 0.8

C. 0.78

D. 1

Answer: C

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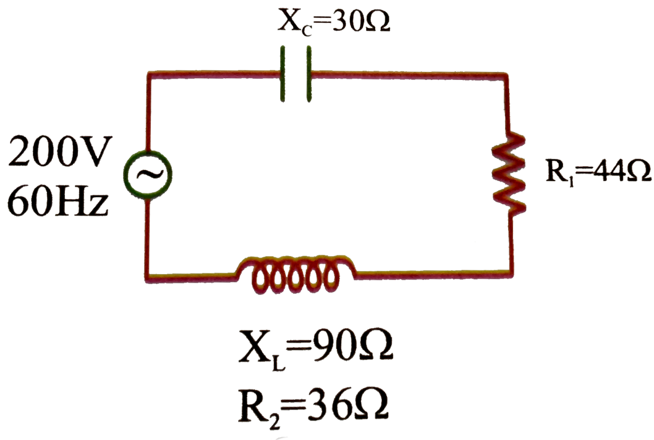
76. A series circuit connected across a $200V, 60Hz$ line consists of a capacitive reactance 30Ω non inductive resistor of 44Ω and a coil of inductive reactance 90Ω and resistance 36Ω as shown in the diagram



The potentail difference across the coil is

A. $100v$

B. $194V$

C. $97V$

D. zero

Answer: B

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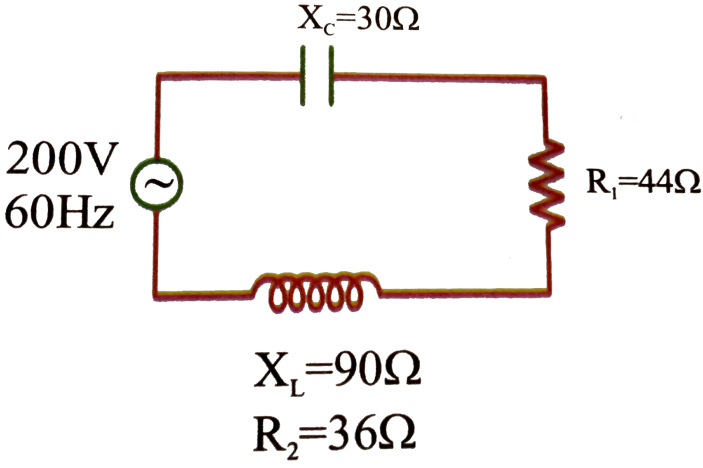
77. A series circuit connected across a $200V, 60Hz$ line consists of a capacitive reactance 30Ω non inductive resistor of 44Ω and a coil of inductive reactance 90Ω and resistance 36Ω as shown in the diagram



The power used in the circuit is

A. $320W$

B. $144W$

C. $160W$

D. $96W$

Answer: A

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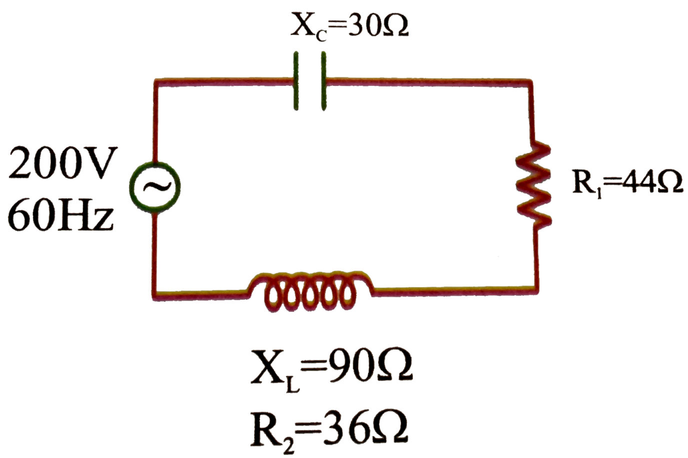
78. A series circuit connected across a $200V, 60Hz$ line consists of a capacitive reactance 30Ω non inductive resistor of 44Ω and a coil of inductive reactance 90Ω and resistance 36Ω as shown in the diagram



The power dissipated in the inductance coil is

A. zero

B. $320W$

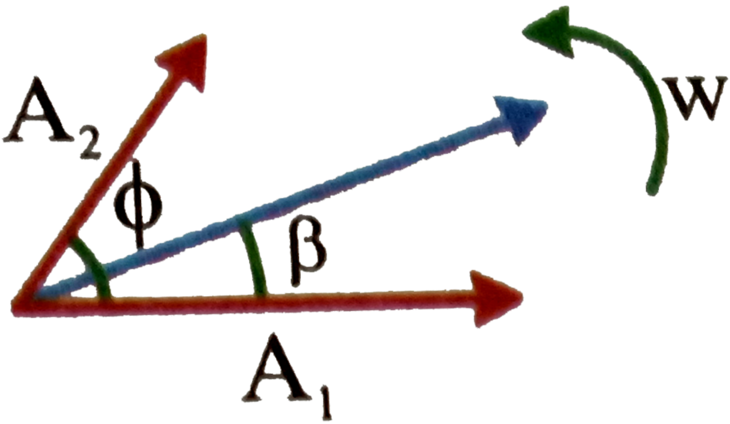
C. $144W$

D. $160W$

Answer: C

Watch Video Solution

79. The maximum values of the phasors (currents and voltage) in AC circuits can be treated as vectors rotating with an angular frequency equal to the angular frequency of the rotor of the generator. If the phase difference between two phasors $\vec{A_1}$ and $\vec{A_2}$ is ϕ the resultant phasor is :



$$A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2\cos\phi}$$

and the phase of $\vec{A}$ with respects to A_1 is

$$\beta = \tan^{-1}\frac{A_2\sin\phi}{A_1 + A_2\cos\phi}$$

RHS value

The rms value of $y = f(t)$ is

$$y_{\text{rms}} = \left\{\frac{\int_0^T [f(t)]^2 dt}{T}\right\}^{\frac{1}{2}}$$

Average value

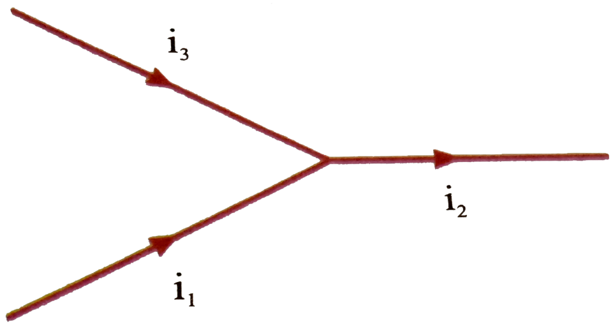
The average value of $y = f(t)$ is $y_{av} = \frac{\int_0^T y dt}{T}$

Using the above concept, answer the following questions.

The current i_1 and i_2 in $A.C$ circuit are given as:

$i_1 = 4\sin\left(\omega t - \frac{\pi}{3}\right)$ and $i_2 = 4\sin\left(\omega t + \frac{\pi}{3}\right)$

The current i_3 can be given as :



A. $4\sqrt{3}\sin\left(\omega t - \frac{2\pi}{3}\right)$

B. $2\sqrt{3}\cos\left(\omega t + \frac{\pi}{3}\right)$

C. $4\sin(\omega t)$

D. $4\cos(\omega t)$

Answer: C

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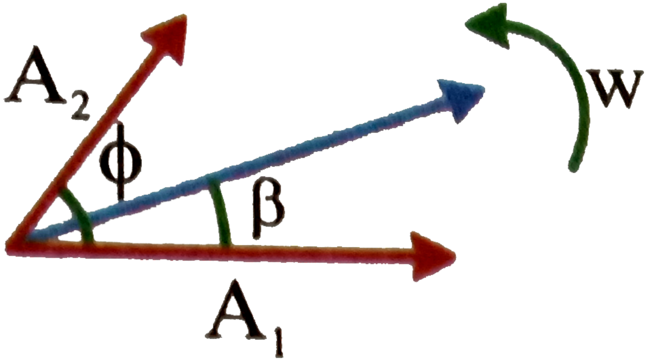
80. The maximum values of the phasors (currents and voltage) in AC circuits can be treated as vectors rotating with an angular frequency equal to the angular frequency of the rotor of the generator. If the phase difference between two phasors $\vec{A_1}$ and $\vec{A_2}$ is ϕ the resultant phasor is :



$$A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2\cos\phi}$$

and the phase of $\vec{A}$ with respects to A_1 is

$$\beta = \tan^{-1}\frac{A_2\sin\phi}{A_1 + A_2\cos\phi}$$

RHS value

The rms value of $y = f(t)$ is

$$y_{\text{rms}} = \left\{\frac{\int_0^T [f(t)]^2 dt}{T}\right\}^{\frac{1}{2}}$$

Average value

The average value of $y = f(t)$ is $y_{av} = \dfrac{\int_0^T y dt}{T}$

Using the above concept, answer the following questions.

The rms value of i_3 is

A. $2\sqrt{6}$

B. $\sqrt{6}$

C. $3\sqrt{2}$

D. $2\sqrt{2}$

Answer: D

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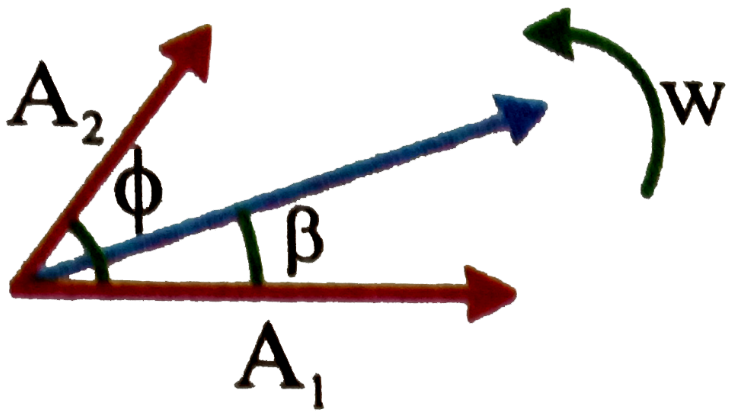
81. The maximum values of the phasors (currents and voltage) in AC circuits can be treated as vectors rotating with an angular frequency equal to the angular frequency of the rotor of the generator. If the phase difference between two phasors $\vec{A_1}$ and $\vec{A_2}$ is ϕ the resultant phasor is :



$$A = \sqrt{A_1^2 + A_2^2 + 2A_1A_2\cos\phi}$$

and the phase of $\vec{A}$ with respects to A_1 is

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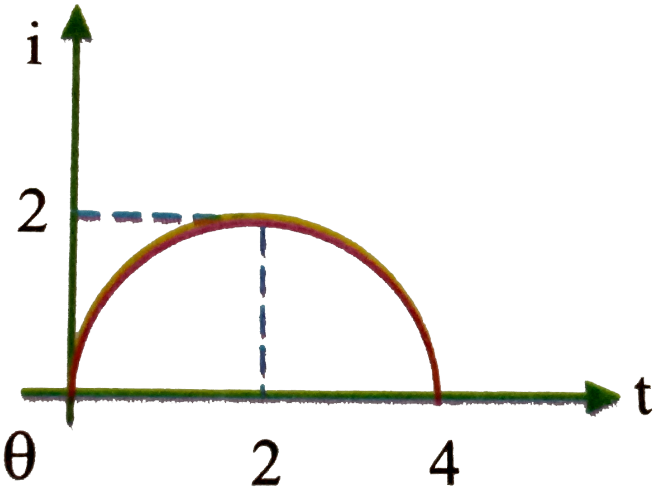
Average value

The average value of $y = f(t)$ is $y_{av} = \dfrac{\int_0^T y dt}{T}$

Using the above concept, answer the following questions.

The average value of i in i - t graph (Semi circular) is



A. π

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

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

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

Answer: B

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82. A series R - L - C circuit has $R = 100$ ohm. $L = 0.2mH$ and $C = \frac{1}{2}\mu F$. The applied voltage $V = 20\sin\omega t$. Then

At resonant frequency ω_0, $\frac{(V_R)_{\max}}{(V_L)_{\max}} =$

A. 2

B. 5

C. 3

D. 4

Answer: B

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83. A series R - L - C circuit has $R = 100$ ohm. $L = 0.2mH$ and $C = \frac{1}{2}\mu F$. The applied voltage $V = 20\sin\omega t$. Then

When the currentsd lags the applied voltage by 45°, the value of ω is approximately

A. $5 \times 10^5 \text{rad}/s$

B. $3 \times 10^{5} \mathrm{rad}/s$

C. $4 \times 10^{5} \mathrm{rad}/s$

D. $4 \times 10^{10} \mathrm{rad}/s$

Answer: A

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84. A series R - L - C circuit has $R = 100 Ohm. L = 0.2 mH$ and $C = \frac{1}{2} \mu F$. The applied voltage $V = 20 \sin \omega t$.

When the current lags the applied voltage by $45°$, the equation of the current is

A. $0.2\sin\left(\omega t + \tan^{-1}0.3\right)$

B. $0.2\sin\left(\omega t - \tan^{-1}0.3\right)$

C. $0.3\sin\left(\omega t + \tan^{-1}0.3\right)$

D. $0.3\sin\left(\omega t - \tan^{-1}0.3\right)$

Answer: B

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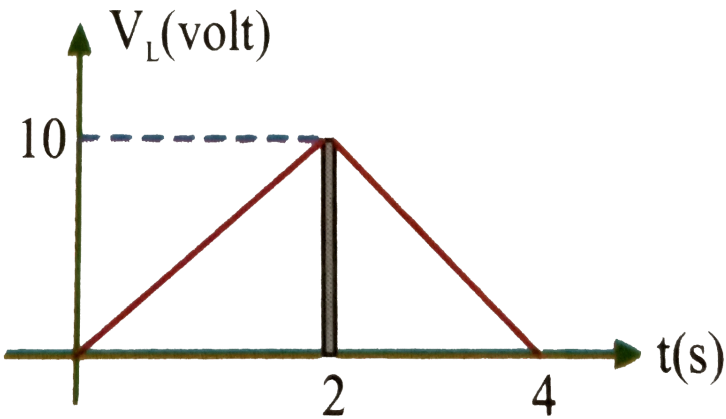
85. The potential difference across a $2H$ inductor as a function of time is shown in figure. At time $t = 0$, current is zero

Current $t = 2$ second is



A. $1A$

B. $3A$

C. $4A$

D. $5A$

Answer: D

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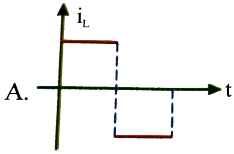
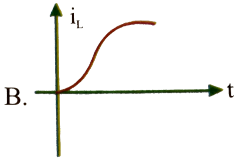
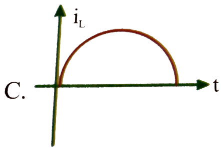
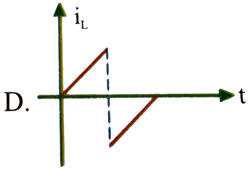
86. The potential difference a $2H$ inductor as a function of time is shown in figure. At time $t = 0$, current is zero

Current versus time graph across the inductor will be

A. 

B. 

C. 

D. 

Answer: B

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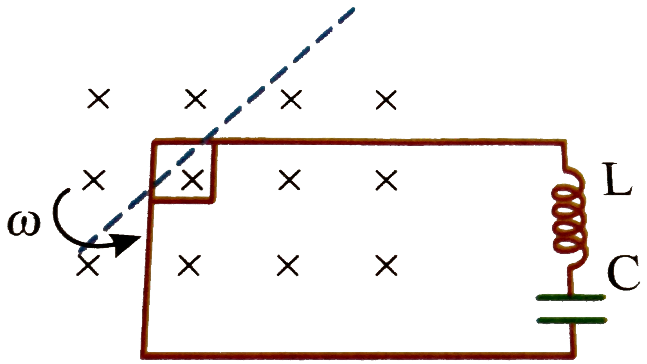
87. In the given arrangement the square loop of area $10 cm^2$ rotates with an angular velocitys ω about its diagonal. The loop is connected to a inductance of $L = 100 mH$ and a capacitance of $10 mF$ in series. The lead wires have a net resistance of 10Ω. Given that $B = 0.1 T$ and $\omega = 63 \mathrm{rad}/s$



Find the rms current

A. $6 \times 10^{5} A$

B. $5 \times 10^{-5} A$

C. $4 \times 10^{-5} A$

D. $7 \times 10^{-5} A$

Answer: C

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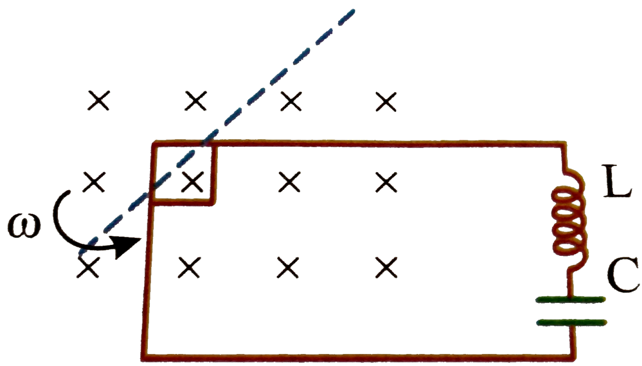
88. In the given arrangement the square loop of area $10 cm^{2}$ rotates with an angular velocitys ω about its diagonal. The loop is connected to a inductance of $L = 100mH$ and a capacitance of $10mF$ in series. The lead wires have a net resistance of 10Ω. Given that $B = 0.1T$ and $\omega = 63\text{rad}/s$



Find the rms current

A. $6.12 \times 10^{-6} J$

B. $8.12 \times 10^{-5} J$

C. $5.12 \times 10^{-5} J$

D. $8.12 \times 10^6 J$

Answer: B

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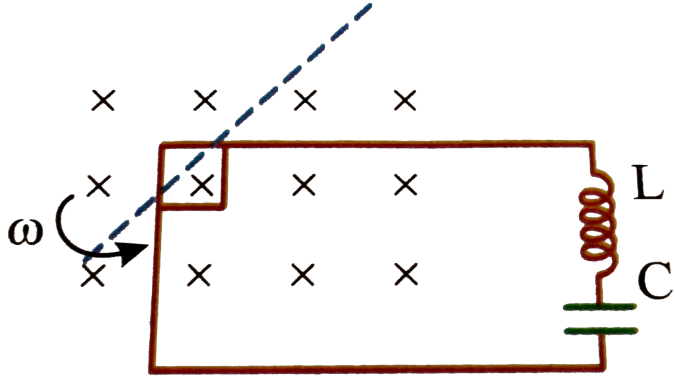
89. In the given arrangement the square loop of area $10cm^2$ rotates with an angular velocitys ω about its diagonal. The loop is connected to a inductance of $L = 100mH$ and a capacitance of $10mF$ in series. The lead wires have a net resistance of 10Ω. Given that $B = 0.1T$ and $\omega = 63\text{rad}/s$



If the current is in phase with voltage, what shouldl be the frequency of rotation of the coil.

A. $31.6 \mathrm{rad}/s$

B. $29.5 \mathrm{rad}/s$

C. $25.6 \mathrm{rad}/s$

D. $20.5 \mathrm{rad}/s$

Answer: A

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90. A $20V$ 5 watt lamp is used in ac main $220V$ and frequency 50 c.p.s.

Capacitance of capacitor, to be put in series to run the lamp

A. $2 \cdot F$

B. $4 \cdot F$

C. $6 \cdot F$

D. $8 \cdot F$

Answer: B

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91. A $20V$ 5 watt lamp is used in ac main $220V$ and frequency 50 c.p.s.

Inductance of inductor,to be put in series to run tha lamp.

A. $2.53H$

B. $5H$

C. $7.5H$

D. $9H$

Answer: A

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92. A $20V$ 5 watt lamp is used in ac main $220V$ and frequency 50 c.p.s.

What pure resistance should be included in place of the above passive elements so that the lamp can run on its rated voltage?

A. 120Ω

B. 240Ω

C. 800Ω

D. 720Ω

Answer: C

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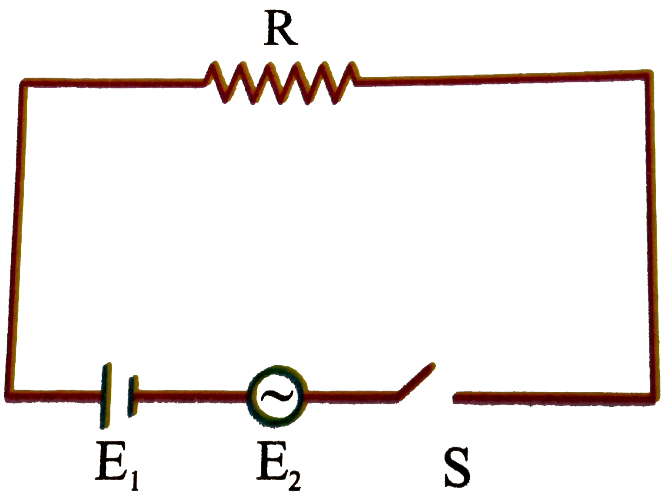
93. In the circuit shown in the figure $R = 50\Omega, E_1 = 25\sqrt{3}$ volt and $E_2 = 25\sqrt{6}\sin\omega t$ volt where $\omega = 100\pi s^{-1}$. The switch is closed at time $t = 0$ and remains closed for 14 minutes, then it is opened.

Find the amount of heat produced in the resistor



A. $64000J$

B. $56000J$

C. $63000J$

D. $75000J$

Answer: C

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94. In the circuit shown in the figure $R = 50\Omega, E_1 = 25\sqrt{3}$ volt and $E_2 = 25\sqrt{6}\sin\omega t$ volt where $\omega = 100\pi s^{-1}$. The switch is closed at time $t = 0$ and remains closed for 14 minutes, then it is opened.

If total heat produced is usedd to raise the temperature of 3 kg of water at $20^\circ C$, what would be the final temperature of water ?

A. $15\,^{\circ}C$

B. $25\,^{\circ}C$

C. $45\,^{\circ}C$

D. $75\,^{\circ}C$

Answer: B

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95. In the circuit shown in the figure $R = 50\Omega, E_1 = 25\sqrt{3}$ volt and $E_2 = 25\sqrt{6}\sin\omega t$ volt where $\omega = 100\pi s^{-1}$. The switch is closed at time $t = 0$ and remains closed for 14 minutes, then it is opened.

Find the value of the direct currentds that will produce same amount of heat in the resistor in same time as combination of DC source and AC source produce. Specific heat of water $= 4200 J/kg\text{-}^{\circ}C$.

A. $1.23A$

B. $1.22A$

C. $2.24A$

D. $3.25A$

Answer: C

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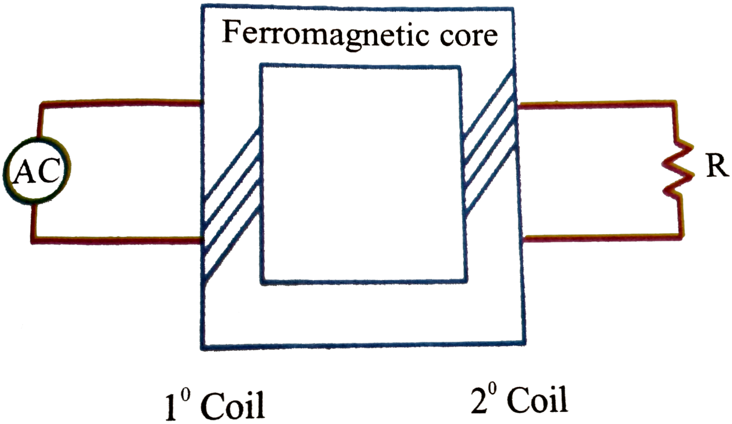
96. A physics lab is designed to study the transfer of electrial energy from one circuit to another by means of a magnetic field using simple transformers. Each transformer has two coils of wire electrically insulated from each other but wound a round a common core of ferromagnetic material. The two wires are close together but do not touch each other

The primary $\left(1^{\circ}\right)$ coil is connected to a source of alternating (AC) current. The secondary $\left(2^{\circ}\right)$ coil is connected to resistor such as a light bulb. The AC source produces on oscillating voltage and current in the primary coil that produces an oscillating megnetic field in the core. material. This in turn induces an oscillating voltage and AC curent in the secondary coil

Students collected the following data comparing the number of turns per coil (N), the voltage (V) and the current (I) in the coils of three transformers.

Transformer	primary coil	secondary coil
1	$100.\ 10V.10A$	$200.20V.5A$
2	$100.10V.10A$	$50.5V.5A$
3	$100.10V.10A$	$100.5V.20A$



The primary coil of a transformer has 100 tunrs and is connected to a $120VAC$ source. How many turns are in the secondary coil if there is $2400V$ across it

A. 5

B. 50

C. 200

D. 2000

Answer: D

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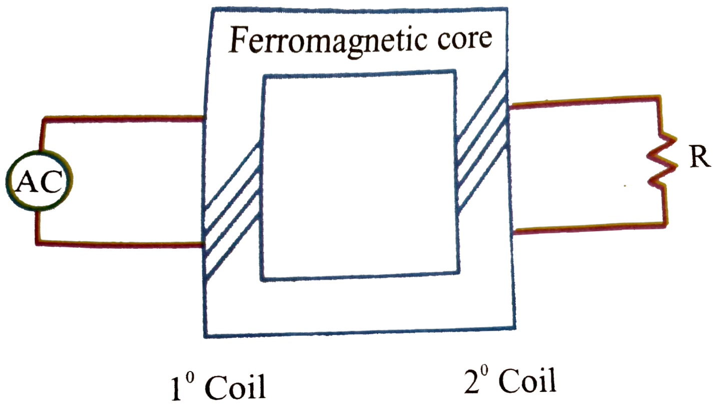

A trasnsformer with 40 turns in its primary coil is connected to a $120VAC$ source. If $20W$ of power if supplied to the primary coil, how much power is developed in the secondary coil ?

A. $10W$

B. $20W$

C. $80W$

D. $160W$

Answer: B

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98. A physics lab is designed to study the transfer of electrial energy from one circuit to another by means of a magnetic field using simple transformers. Each transformer has two coils of wire electrically insulated from each other but wound a round a common core of ferromagnetic material. The two wires are close together but do not touch each other

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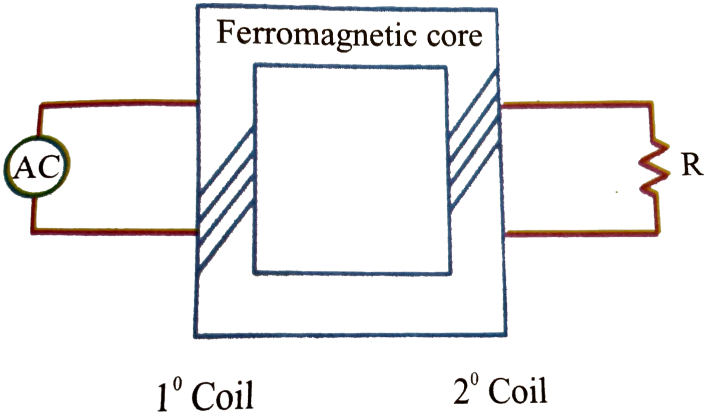

Which of the following is a correct expression for R, the resistance of the load connected to the secondary coil

A. $\left(\frac{V_{1^\circ}}{I_{1^\circ}}\right)\left(\frac{N_{2^\circ}}{N_{1^\circ}}\right)$

B. $\left(\frac{V_{1^\circ}}{I_{1^\circ}}\right)\left(\frac{N_{2^\circ}}{N_{1^\circ}}\right)^2$

C. $\left(\frac{V_{1^\circ}}{I_{1^\circ}}\right)\left(\frac{N_{1^\circ}}{N_{2^\circ}}\right)$

D. $\left(\frac{V_{1^\circ}}{I_{1^\circ}}\right)\left(\frac{N_{1^\circ}}{N_{2^\circ}}\right)^2$

Answer: D

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99. A physics lab is designed to study the transfer of electrial energy from one circuit to another by means of a magnetic field using simple transformers. Each transformer has two coils of wire electrically insulated from each other but wound a round a common core of ferromagnetic material. The two wires are close together but do not touch each other

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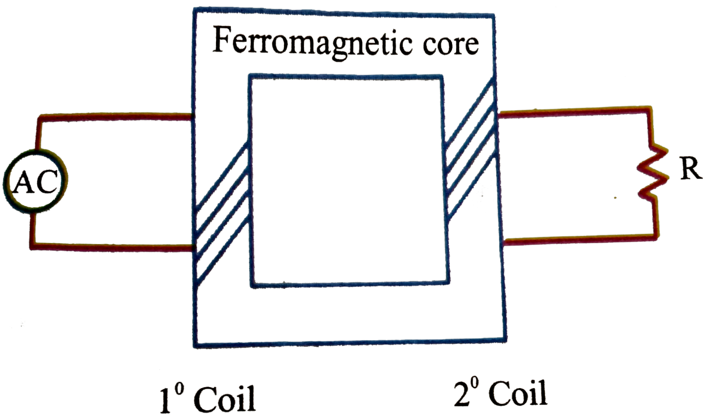

A $12V$ battery is used to supply $2.0mA$ of current to the 300 turns in the primary coil of a given transformer. What is the current in the secondary coil if $N_2 = 150$ turns.

A. zero

B. $1.0mA$

C. $2.0mA$

D. $4.0mA$

Answer: A

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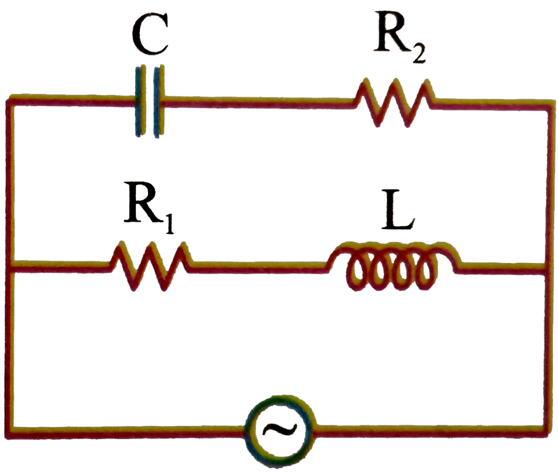
100. In the circuit shown in figure :

$R = 10\Omega, L = \frac{\sqrt{3}}{10}H, R_2 = 20\Omega$ and $C = \frac{\sqrt{3}}{2}mF.$

Current in L - R_1 circuit is I_1 in C - R_1 circuit is I_2 and the main current is I



$V = 200\sqrt{2} \sin(100t) V$

Phase difference between I_1 and I_2 is

A. 0°

B. 90°

C. 180°

D. 60°

Answer: B

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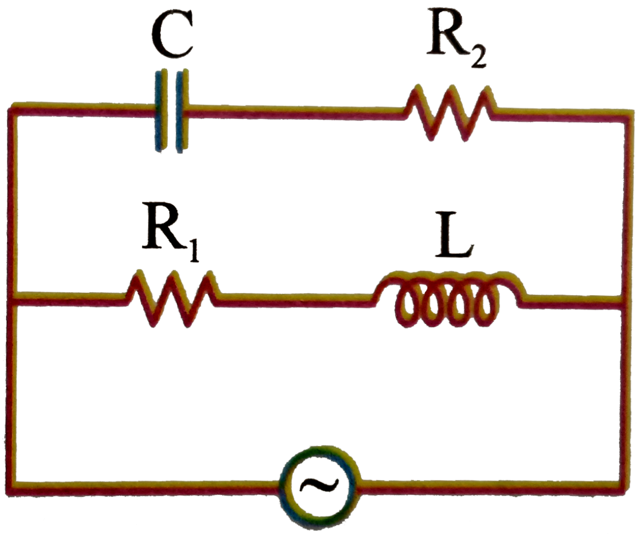
101. In the circuit shown in figure :

$R = 10\Omega, L = \frac{\sqrt{3}}{10}H, R_2 = 20\Omega$ and $C = \frac{\sqrt{3}}{2}mF.$

Current in L - R_1 circuit is I_1 in C - R_1 circuit is I_2 and the main current is I



$V = 200\sqrt{2}\sin(100t)V$

At some instant current in L - R_1 circuit is $10A$.

At the same instant current in C - R_2 branch will be

A. $5A$

B. $5\sqrt{2}A$

C. $5\sqrt{6}A$

D. $5\sqrt{3}A$

Answer: D

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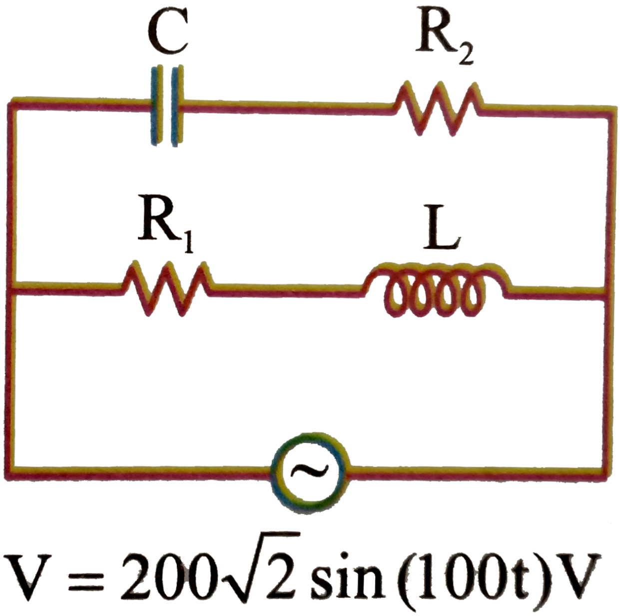
102. In the circuit shown in figure :

$R = 10\Omega, L = \frac{\sqrt{3}}{10}H, R_2 = 20\Omega$ and $C = \frac{\sqrt{3}}{2}mF.$

Current in L - R_1 circuit is I_1 in C - R_1 circuit is I_2 and the main current is I



At some instant I_1 in the circuit is $10\sqrt{2}A$, then at this instant current I will be

A. $20A$

B. $10\sqrt{2}A$

C. $20\sqrt{2}A$

D. $25A$

Answer: B

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103. A solenoid with inductance $L = 7mH$ and active resistance $R = 44\Omega$ is first connected to a source of direct voltage V_0 and then to a source of sinusoidal voltage with effective value $V = V_0$. At what frequency of the oscillator will be power consumed by the solenoid be $\eta = 5.0$ times less than in the former case ?

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104. An LCR circuit has L = 10 mH, $R = 3\Omega$ and $C = 1\mu F$ connected in series to a source of $15\cos\omega t$.volt. Calculate the current ampliuted and the average power dissipated per cycle at a frequency 10% lower than the resonance frequency.

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105. A series LCR circuit with $R = 20\Omega$, $L = 1.5H$ and $C = 35\mu F$ is connected to a variable frequency $200V$ ac supply. When the frequency of the supply equals the natural frequency of the circuit, what is the average power in Kw transferred to the circuit in one complete cycle?

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106. A sinusoidal voltage of peak value $283V$ and frequency $50Hz$ is applied to a series LCR

circuit in which $R = 3\Omega, L = 25.48mH$, and $C = 796\mu F$. Find the impdedance of the circuit.

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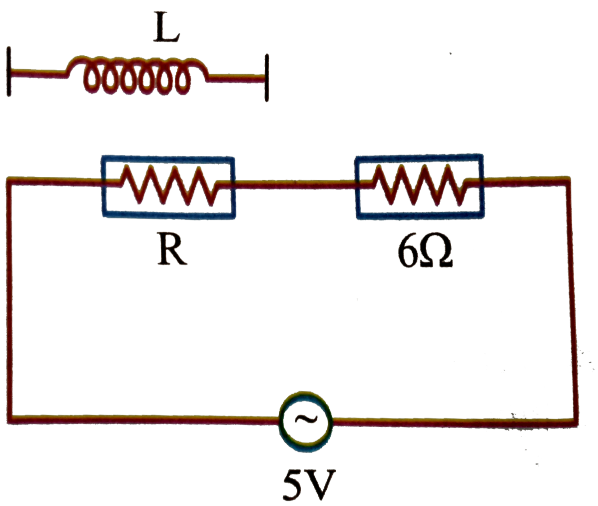
107. Two resistors are connected in series across $5V$ rms source of alternating potentail. The potential difference across 6Ω resistor is $3V_m$. If R is replaced by a pure inductor L of such magnitude that current remains same, then the potential difference across L is



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108. In LCR circuit current resonant frequency is $600 Hz$ and half power points are at 650 and $550 Hz$. The quality factor is

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109. An ac ammeter is used to measure currnet in a circuit. When a given direct current passes through the circuit. The ac ammeter reads 3 A. When another alternating current passes through the circuit, the ac ammeter reads 4A. Then find the reading of this ammeter (inA), if dc and ac flow through the circuit simultaneously.

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110. In a series LCR circuit the voltage across the resistance, capacitance and inductance is 10 V each. If the capacitance is short circuited, the voltage across the inductance will be $\frac{10^x}{\sqrt{2}}$ what is value of x

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111. An ideal choke takes a current fo $10A$ when connected to an ac supply of $125V$ and $50Hz$. A pure resistor under the same conditions take a current of $12.5A$. If the two are connected to an ac supply of $100V$ and $40Hz$, then the current in series combination of above resistor and inductor is $\frac{10^x}{\sqrt{2}}$ what is the value of x

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112. In a region of uniform magnetic induction $B = 10^2$ tesla, a circular coil of radius $30cm$ and resistance π^2 ohm is rotated about an axis which is perpendicular to the directon of B and which form a diameter of the coil. If the coil rotates at 200rpm the amplitude of the alternating current induced in the coil is

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113. An inductor of inductance $2.0mH$ s connected across a charged capacitor of capacitance $5.0\mu F$ and the resulting LC circuit is set oscillating at its natural frequency. Let Q denote the instantaneous charge on the capacitor and I the current in the circuit. It is found that the maximum value of charge Q is $200\mu C$.

a. When $Q = 100\mu C$, what is the value of $\left|\frac{dI}{dt}\right|$?

b. When $Q = 200\mu C$, what is the value of I?

c. Find the maximum value of I.

d. When I is equal to one-half its maximum value, what is the value of $|Q|$?

A. When $Q = 100\mu C$, what is the value of $|dI/dt|$?

B. when $Q = 200\mu C$ what is the value of I?

C. Find the maximum value of I ?

D. When I is equal to one-half its maximum value, what is the value of $|Q|$?

Answer: A::B::C::D

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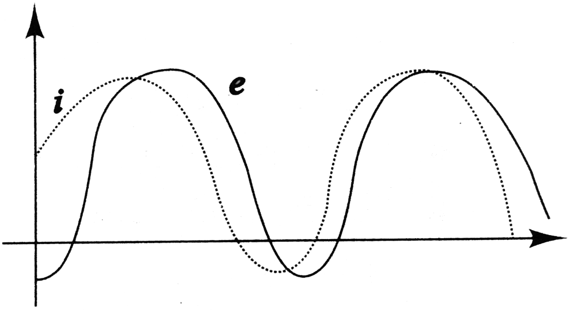
114. When an ac source of emf $e = E_0 \sin(100t)$ is connected across a circuit, the phase difference between emf e and currnet I in the circuit is observed to be $(\pi)/(4)$ as shown in fig. If the circuit consists possibly only of R-C or R-C of L-R series, find the relationship find the relationship between the two elements.



A. $R = 1k\Omega, C = 10\mu F$

B. $R = 1k\Omega, C = 1\mu F$

C. $R = 1k\Omega, L = 10H$

D. $R = 1k\Omega, L = 1H$

Answer: A

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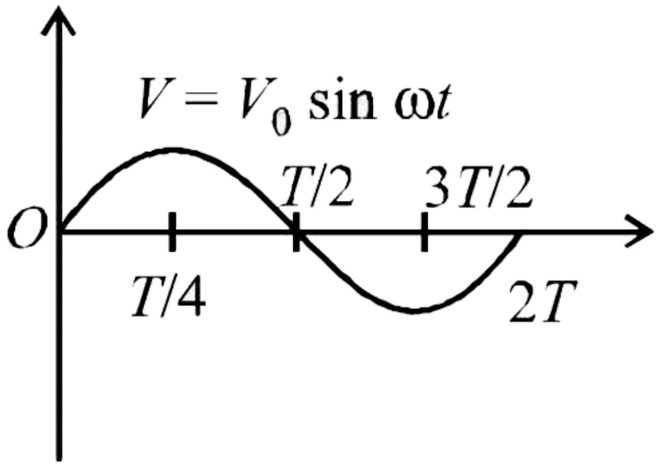
115. In a series L-R circuit $(L = 35mH$ and $R = 11\Omega)$, a variable emf source $\left(V = V_0 \sin \omega t\right)$ of $V_{rms} = 220V$ and frequency 50 Hz is applied. Find the current amplitude in the circuit and phase of current with respect to voltage. Draw current-time graph on given graph $\left(\pi = \frac{22}{7}\right)$.



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116. An AC voltage source of variable angular frequency (ω) and fixed amplitude V_0 is connected in series with a capacitance C and an electric bulb of resistance R (inductance zero). When (ω) is increased

A. The bulb glows dimmer

B. the bulb glows brighter

C. total impedance of the circuit is unchanged

D. total impedence of the circuit increases

Answer: A::B::D

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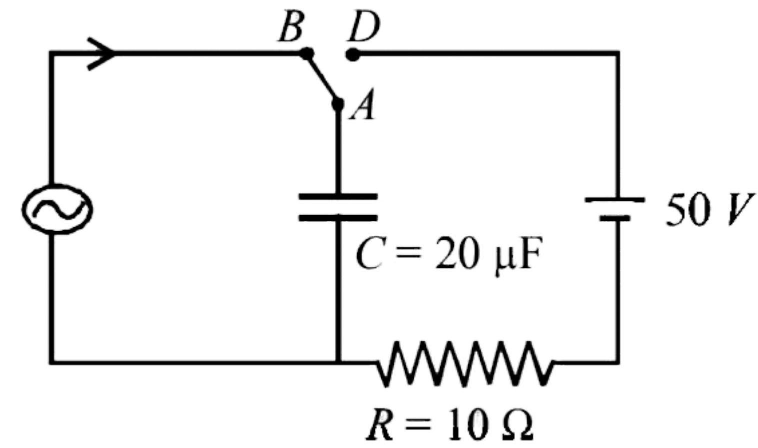
117. At time $t = 0$, terminal A in the circuit shown in the figure is connected to B by a key and an alternating current $I(t) = I_0\cos(\omega t)$, with $I_0 = 1A$ and $(\omega) = 500 rads^{-1}$ starts flowing in it with the initial direction shown in the figure. At $t = (7\pi/6\omega)$, the key is switched from B to D. Now onwards only A and D are connected. A total charge Q flows from the battery to charge the capacitor fully. If `C=20(mu)F, R = 10(Omega) and the battery is ideal with emf of 50 V, identify the correct statement(s).



A. Magnitude of the maximum charge on the capacitor before $t = \frac{7\pi}{6\omega}$ is $1 \times 10^{-3} C$

B. The current in the left part of the circuit just before $t = \frac{7\pi}{6\omega}$ is clockwise

C. Immediately after A is connected to D, the current in R is $10A$

D. $Q = 2 \times 10^{-3} C$

Answer: B

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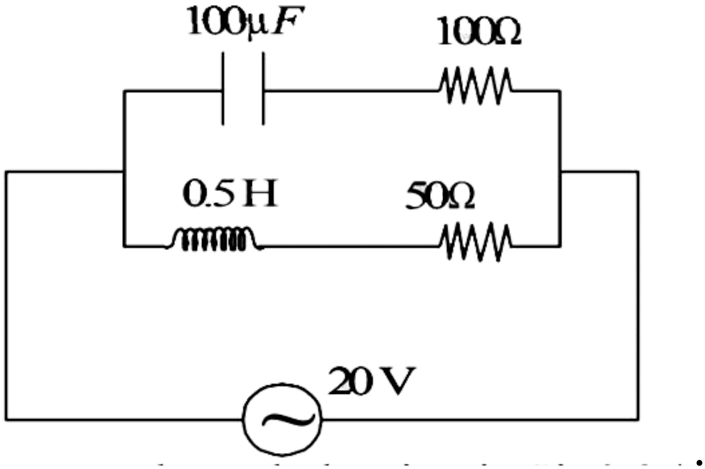
118. In the given circuit, the AC source has $(\omega) = 100 rad/s$. Considering the inductor and capacitor to be ideal, the correct choice(s) is

(are)



A. the current through the circuit, I is $0.3A$

B. the current through the circuit, I is

$0.3\sqrt{2}A$

C. the voltage across 1000Ω resistor

$= 10\sqrt{2}V$

D. the voltage across 50Ω resistor $= 10V$

Answer: C::D

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119. A sereis R-C circuit is connected to AC voltage source. Consider two cases, (A) when C is without a dielectric medium and (B) when C is filled with dielectric of constant 4. The current I_R through the resistor and voltage V_c across the capacitor are compared in the two cases. Which of the following is/ are true?

A. $I_R^A > I_R^B$

B. $I_R^A < I_R^B$

C. $V_C^A > V_C^B$

D. $V_C^A < V_C^B$

Answer: A::C

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120. A series R-C combination is connected to an AC voltage of angular frequency $\omega = 500 radian/s$. If the impendance of the R-C circuit is $R\sqrt{1.25}$, the time constant (in millisecond) of the circuit is

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LEVEL - I (H.W)

1. For a given AC source the average emf during the positive half cycle

A. depends on E_0

B. depends on shape of wave

C. both 1 and 2

D. depends only on peak value of E_0

Answer: 4

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2. The peak value of an alternating emf E given by

$E = \left(E_0\right)\cos\omega t$

is 10V and frequency is 50 Hz. At time $t = (1/600)s$ the instantaneous value of emf is

A. $10V$

B. $5\sqrt{3}V$

C. $5V$

D. $1V$

Answer: 3

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3. The equation of $A.C$ of frequency $75Hz$, if it's RMS value is $20A$ is

A. $I = 20\sin(150\pi t)$

B. $I = 20\sqrt{2}\sin(150\pi t)$

C. $I = \frac{20}{\sqrt{2}}\sin(150\pi t)$

D. $I = 20\sqrt{2}\sin(75\pi t)$

Answer: 2

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4. The voltage of an $A.C$ source varies with time according to the equation

$V = 50\sin 100\pi t \cos 100\pi t.$

Where $'t'$ is in and $'V'$ is in volt. Then

A. The peak voltage of the source is $100V$

B. The peak voltage of the source is $100/\sqrt{2}V$

C. The peak voltage of the source is $25V$

D. The frequency of the source is $50Hz$

Answer: 3

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5. The form factor for a sinusoidal $A.C$ is

A. $2\sqrt{2}$

B. $\pi : 2\sqrt{2}$

C. $\sqrt{2} : 1$

D. $1 : \sqrt{2}$

Answer: 2

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6. At resonance the peak value of current in $L - C - R$ series circuit is

A. E_0/R

B. $\dfrac{E_0}{\sqrt{R^2 + \left(\omega L - \dfrac{1}{\omega C}\right)^2}}$

C. $\dfrac{E_0}{\sqrt{R^2 + \left(\omega L - \dfrac{1}{\omega^2 C^\circ}\right)^2}}$

D. $\dfrac{E_0}{\sqrt{2}R}$

Answer: 1

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

A. $I_{\text{rms}} = \frac{1}{\pi} I_0$

B. $I_{\text{rms}} = \frac{1}{\sqrt{2}} I_0$

C. $I_{\text{rms}} = \sqrt{2} I_0$

D. $I_{\text{rms}} = \pi I_0$

Answer: 2

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8. A voltmeter connected in an $A.C$ circuit reads $220V$. It represents,

A. peak voltage

B. RMS voltage

C. Average voltage

D. Mean square voltage

Answer: 2

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9. If the instantaneous current in a circuit is given by $I = 20\cos(\omega t + \phi)A$, the rms value of the current is

A. $2A$

B. $\sqrt{2}A$

C. $2\sqrt{2}A$

D. zero

Answer: 2

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10. The time taken by an AC of $50Hz$ in reaching from zero to its maximum value will be

A. $0.5s$

B. $0.005s$

C. $0.05s$

D. $5s$

Answer: 2

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11. A generator produces a time varying voltage given by $V = 240\sin 120t$, where t is in second. The rms voltage and frequency are

A. $60Hz$ and $240V$

B. $19Hz$ and $120V$

C. $19Hz$ and $170V$

D. $754Hz$ and $170V$

Answer: 3

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12. A $220V$, $50HzAC$ supply is connected across a resistor of $50k\omega$. The current at time t second. Assuming that it is zero at $t = 0$, is

A. $4.4\sin(314t)mA$

B. $6.2\sin(314t)mA$

C. $4.4\sin(157t)mA$

D. $6.2\sin(157t)mA$

Answer: 2

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13. A resistance of 20Ω is connected to a source of alternating current rated $110V, 50Hz$. Find (a) the rms current, (b) the maxium instantaneous current in the resistor and the time taken by the current to change from its maximum value to the rms value.

A. 2.5×10^{-3}sec

B. 2.5×10^{-2}sec

C. 5×10^{-3}sec

D. 25×10^{-3}sec

Answer: 1

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14. A conductor of capacity 1pF is connected to an $A.C$ source of $220V$ and $50Hz$ frequency. The current flowing in the circuit will be

A. $6.9 \times 10^{-8}A$

B. $6.9A$

C. $6.9 \times 10^{-6}A$

D. zero

Answer: 1

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15. In a circuit, the frequency is $f = \frac{1000}{2\pi} Hz$ and the inductance is 2 henry, then the reactance will be

A. 200Ω

B. $200\mu\Omega$

C. 2000Ω

D. $2000\mu\Omega$

Answer: 3

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16. The transformer ratio of transformer is $10:1$. The current in the primary circuit if the secondary current required is $100A$ assuming the transformer be ideal, is

A. $500A$

B. $200A$

C. $1000A$

D. $2000A$

Answer: 3

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17. The transformer ratio of transformer is $10:1$

. If the primary voltage is 440 V`, secondary emf

is

A. $44V$

B. $440V$

C. $4400V$

D. $44000V$

Answer: 3

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18. The frequency at which the inductive reactance of $2H$ inductance will be equal to the capactive reactance of $2\mu F$ capactiance (nearly)

A. $80Hz$

B. $40Hz$

C. $60Hz$

D. $20Hz$

Answer: 1

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19. In a series LCR circuit, resistance $R = 10\Omega$ and the impedence $Z = 20\Omega$ the phase difference between the current and the voltage is

A. 60°

B. 20°

C. 45°

D. 90°

Answer: 1

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20. In an L - C - R series circuit,

$R = \sqrt{5}\Omega, \ = 9\Omega, X_C = 7\Omega$. If applied voltage in the circuit is $50V$ then impedance of the circuit in ohm will be

A. 2

B. 3

C. $2\sqrt{5}$

D. $3\sqrt{5}$

Answer: 2

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21. In an ac circuit the potential differences across an inductance and resistance joined in series are, respectively, 16 V and 20 V. The total potential difference across the circuit is

A. $20V$

B. $25.6V$

C. $31.0V$

D. $53.5V$

Answer: 2

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22. Current in an ac circuit is given by $I = 3\sin\omega t + 4\cos\omega t$, then

A. rms volue fo current is $5A$

B. mean value of this current in one half period will be $6/\pi$

C. if voltage applied is $V = V_m \sin\omega t$ then the circuit must be containing resistance and capacitance

D. ir voltage applied is $V = V_m \sin\omega t$, the circuit may contains resistance and inductance

Answer: 3

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23. 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: 1

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LEVEL - II(H.W)

1. An alternating current $'I'$ is given by $I = i_0 \sin 2\pi(t/T + 1/4)$. Then the average current in the first one quarter time period to

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

B. $\frac{i_0}{\pi}$

C. $\frac{i_0}{2\pi}$

D. $\frac{3i_0}{\pi}$

Answer: 1

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2. In an LR circuit, $R = 100\Omega$ and $L = 2H$. If an alternating voltage of $120V$ and $60Hz$ is connected in this circuit, then the value of current flowing in it will be ______ A nearly

A. 0.32

B. 0.16

C. 0.48

D. 0.8

Answer: 2

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3. The equation of an alternating current is $I = 50\sqrt{2}\sin 400\pi t A$, then the frequency and the root mean square value of current are respectively.

A. $200Hz, 50A$

B. $400Hz, 50\sqrt{2}A$

C. $200Hz, 50\sqrt{2}A$

D. $500Hz, 200A$

Answer: 1

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4. A circuit operating at $\frac{360}{2\pi}Hz$ contains a $1\mu F$ capacitor and a 20Ω. resistor. How large an inductor must be added in series to make the phase angle for the circuit zero? Calculate the current in the circuit if the applied voltage is $120V$.

A. $7.7H$

B. $10H$

C. $3.5H$

D. $15H$

Answer: 1

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5. A resistor R and the capacitor C are connected in series across an ac source of rms voltage $5V$ if the rms voltage across C is $3V$ then that across R is .

A. $1V1$

B. $2V$

C. $3V$

D. $4V$

Answer: 4

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6. An LCR series circuit containing a resistance of 12Ω has angular resonance frequency $4 \times 10^5 \text{rad} S^{-1}$. At resonance the voltage across resistance and inductance are $60V$ and $40V$ respectively. Then the values of L and C are respectively.

A. $0.2mH, 1/32\mu F$

B. $0.4mH, 1/16\mu F$

C. $0.2\mu, 1/16\mu F$

D. $0.4mH, 1/32\mu F$

Answer: 1

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7. The natural frequency of an LC- circuit is 1,25,000 cycles per second. Then the capacitor C is replaced by another capacitor with a dielectric medium of dielectric contant k. In this case, the frequency decreases by 25 kHz. The value of k is

A. 3.0

B. 2.1

C. 1.56

D. 1.7

Answer: 3

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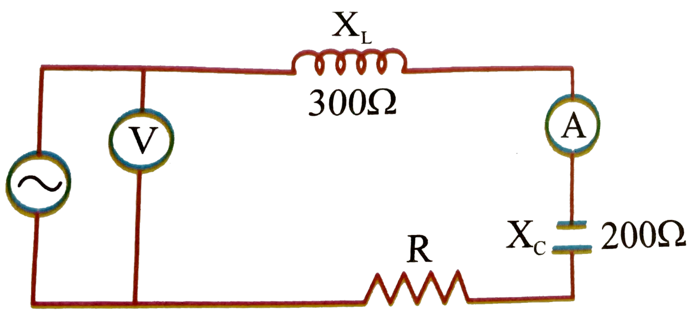
8. In the given figure, the instantaneous value of alternating e.m.f. is $e = 14.14 \sin \omega t$. The reading of voltmeter in volt will be



A. 141.0

B. 10

C. 200

D. 70.7

Answer: 2

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9. A coil of inductance $0.1H$ is connected to $50V, 100Hz$ generator and current is found to be $0.5A$. The potential difference across resistance of coil is:

A. $15V$

B. $20V$

C. $25V$

D. $39V$

Answer: 4

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10. The voltage of $A.C$ source varies with tiem according equation. $V = 120\sin 100\pi t\cos 100\pi t$ .Then the frequency of source is

A. $50Hz$

B. $100Hz$

C. $150Hz$

D. $200Hz$

Answer: 2

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11. The current in a coil of self inductance 5 henry in increasing according to $I = 2\sin^2 t$. The amount of energy spen during the period when current changes from 0 to 2 amperes is

A. $10J$

B. $5J$

C. $100J$

D. $2J$

Answer: 4

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12. In an AC circuit the voltage applied is $E = E_0 \sin \omega t$. The resulting current in the circuit is $I = I_0 \sin\left(\omega t - \frac{\pi}{2}\right)$. The power consumption in the circuit is given by

A. $P = \frac{E_0 I_0}{\sqrt{2}}$

B. $P =$ zero

C. $P = \frac{E_0 I_0}{2}$

D. $P = \sqrt{2} E_0 I_0$

Answer: 2

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13. The efficiency of a transformer is 98%. The primary voltage and current are$200V$ and $6A$. If the secondary voltage is $100V$, the secondary current

A. $11.76A$

B. $12.25A$

C. $3.06A$

D. $2.94A$

Answer: 3

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ILLUSTRATION

1. The peak value of alternating current is 5A and its frequency is 60Hz. Find its rms value. How long will the current take to reach the peak starting from zero?

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2. The electric current in a circuit is given by $I = i_0\left(\frac{t}{\tau}\right)$ for some time. Calculate the rms current for the period $t = 0$ to $t = (\tau)$.

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3. An alternating emf is represented by $E = 100 sin(120\pi t + \pi/4)$ volt. Calculate

(i) Average or mean value of emf

(ii) RMS value of emf

(iii) Frequency of alternating emf

(iv) the shortest time interval after start at which emf is zero.

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4. A pure inductor of 25.0 mH is connected to a source of 220 V. Find the inductive reactance and rms current in the circuit if the frequency of the source is 50 Hz.

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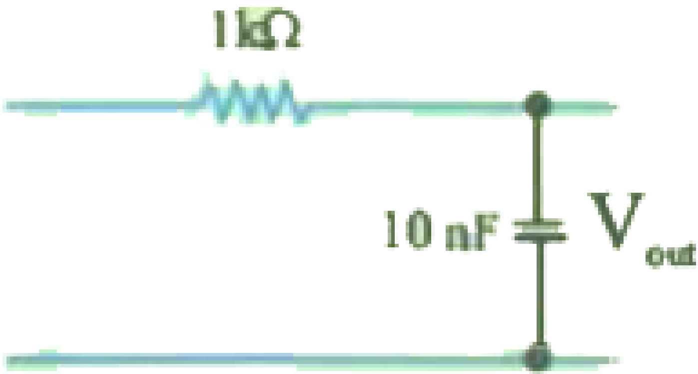
5. If an input of 50mV is applied as V_{in} then V_{out} at 100kHz will be



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6. A $15.0\mu F$ capacitor is connected to a 220 V, 50 Hz source. Find the capacitive reactance and the current (rms and peak) in the circuit. If the frequency is doubled, what happens to the capacitive reactance and the current ?

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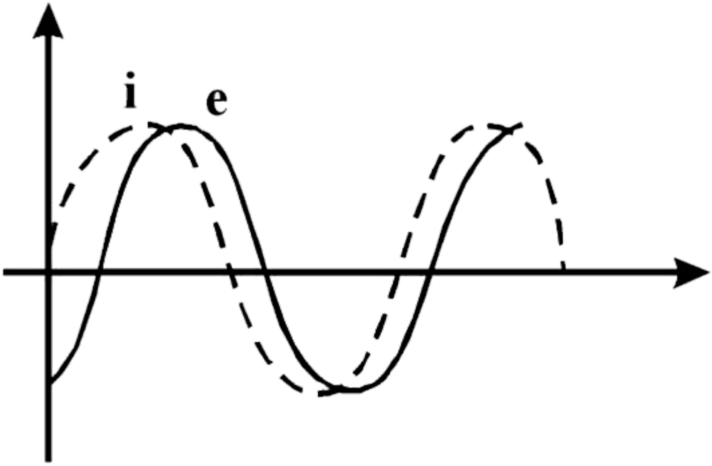
7. When an AC source of $emfe = E_0 \sin(100t)$ is connected across a circuit i in the circuit, the phase difference between the emf e and the current i in the circuit is observed to be $(\pi/4)$, as shown in the diagram. If the circuit consists possibly only of R-C or R-L or L-C in series, find the relationship between the two elements



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8. An LCR circuit contains resistance of 100Ω and a supply of $200V$ at $300 rad s^{-1}$ angular frequency. If only capacitance is taken out from the circuit and the rest of the circuit is joined,

current lags behind the voltage by 60°. If, on the other hand , only inductor is taken out,the current leads the voltage by 60^{o}. The current flowing in the circuit is

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9. In a series resonant circuit, the ac voltage across resistance R, inductance L and capacitance C are $V_R = 4V, V_L = 10V$ and $V_C = 7V$ respectively. Find the voltage applied to the circuit.

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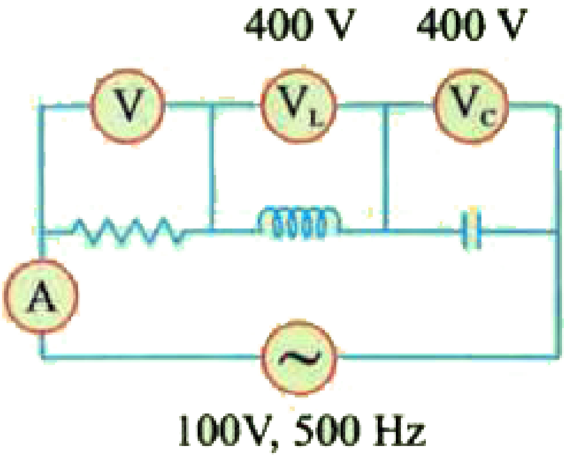
10. Find the power factor of the circuit shown in figure.



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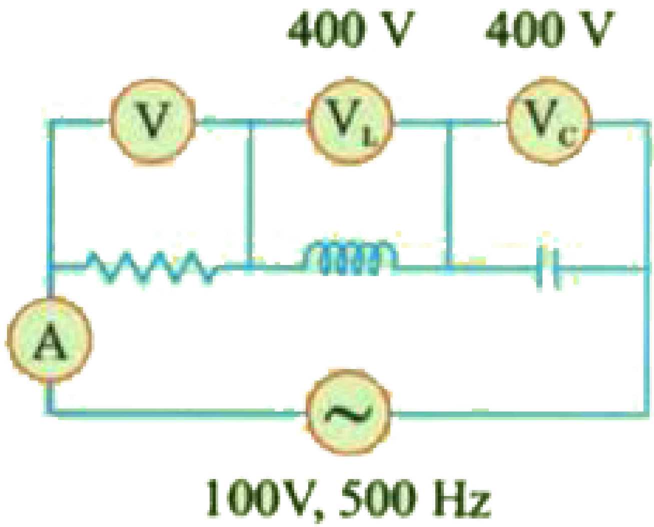

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(a) What frequency should be chosen to maximise the current in the circuit? (b) What is the value of this maximum current?

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14. A 50Ω electric iron is connected to an ac supply of 200V, 50 Hz. Calculate (i) average power delivered to iron (ii) peak power and (iii) energy spent in one minute.

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16. The potential difference V across and the current I flowing through an instrument in an AC circuit are given by:

$V = 5\cos\omega t$ volt

$I = 2\sin\omega t$ Amp.

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17. A capacitor, an inductor and an electric bulb are connected in series to an AC supply of variable frequency. If the frequency of the supply is increased gradually, what will happen to brightness of bulb.

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18. A power transformer is used to step up an alternating emf of 200V to 4 KV and to transmits 5KW power. If the primary is of 1000 turns, calculate, assuming the transformer to be ideal.

(i) The number of turns in the secondary

(ii) The current rating of the secondary

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19. A $1\mu F$ condenser is charged to 50V. The charging battery is then disconnected and a

10mH coil is connected across capacitor so that the LC oscillations occur. Find the maximum current in the coil?

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20. An inductance of $2H$ carries a current of $2A$. To prevent sparking when the circuit is broken a capacitor of $4\mu F$ is connected across the inductance. The voltage rating of the capacitor is of the order of

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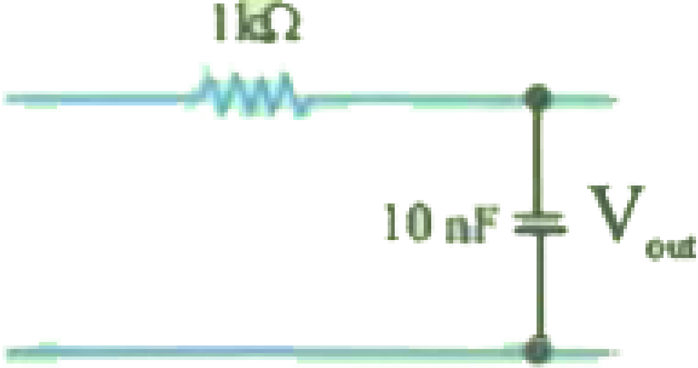

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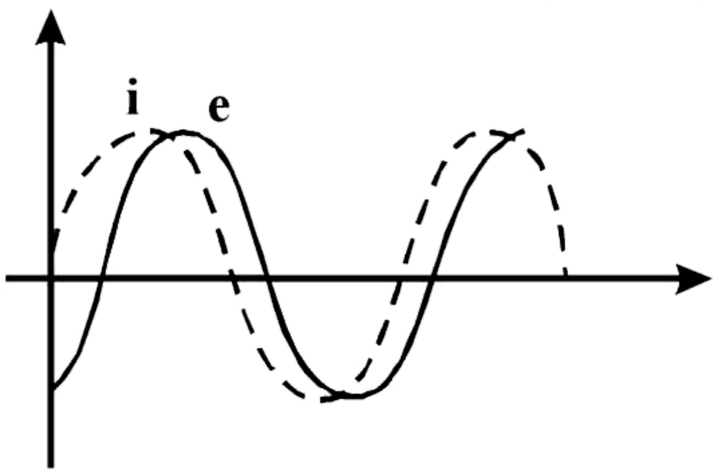

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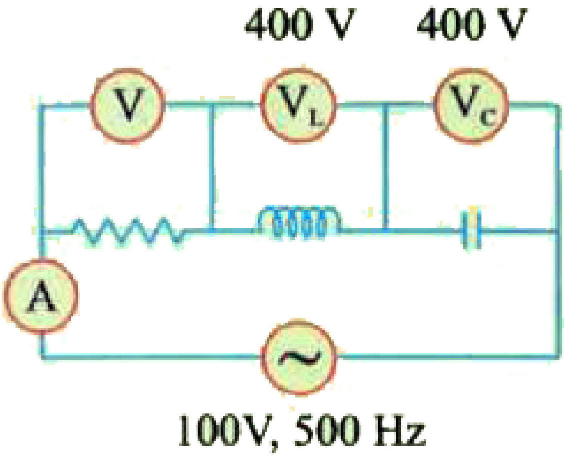

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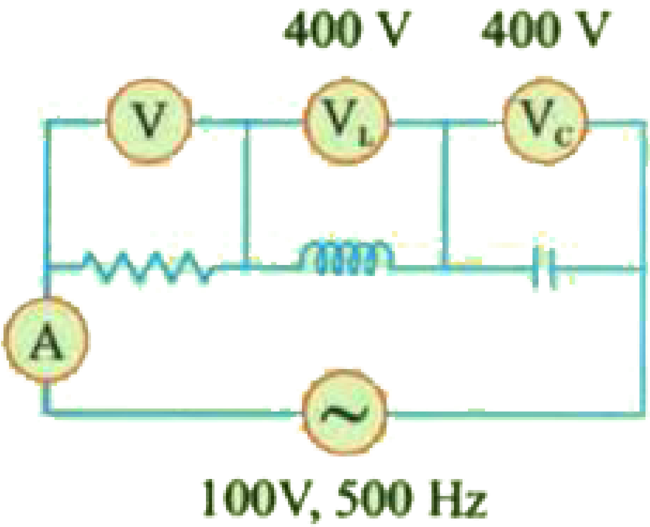

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35. The LCR series circuit is connected to an external emf $e = 200\sin 100\pi t$. The values of the capacitance and resistance in the circuit are $1\mu F$ and 100Ω respectively. The amplitude of the current in the circuit will be maximum when the inductance is

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36. The potential difference V across and the current I flowing through an instrument in an AC circuit are given by:

$V = 5\cos\omega t$ volt

$I = 2\sin\omega t$ Amp.

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37. A capacitor, an inductor and an electric bulb are connected in series to an AC supply of variable frequency. If the frequency of the supply is increased gradually, what will happen to brightness of bulb.

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38. A $1\mu F$ condenser is charged to 50V. The charging battery is then disconnected and a 10mH coil is connected across capacitor so that the LC oscillations occur. Find the maximum current in the coil?

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39. An inductance of $2H$ carries a current of $2A$. To prevent sparking when the circuit is broken a capacitor of $4\mu F$ is connected across the inductance. The voltage rating of the capacitor is of the order of

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EVALUATE YOURSELF-1

1. If E_0 represents the peak value of the voltage in an ac circuit, the r.m.s. value of the voltage will be

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2. The electric current in a circuit is given by $I = 2i_0/\tau$ for some time. What is the rms current for the period $t = 0$ to $t = \tau$?

Watch Video Solution

3. The frequency of A.C. is 50 Hz. How many times the current becomes zero in one second?

Watch Video Solution

4. If the instantaneous current in a circuit is given by $I = 2\cos(\omega t + \phi)$ amperes, the rms value of the current is

Watch Video Solution

5. The equation of alternating current is given by E = 158 sin 200 πt . The value of voltage at time $t = 1/400$ sec is

Watch Video Solution

6. A generator produces a time varying voltage given by $V = 240\sin 120t$, where t is in second. The rms voltage and frequency are

Watch Video Solution

7. If E_0 represents the peak value of the voltage in an ac circuit, the r.m.s. value of the voltage will be

Watch Video Solution

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10. If the instantaneous current in a circuit is given by $I = 2\cos(\omega t + \phi)$ amperes, the rms value of the current is

Watch Video Solution

11. The equation of alternating current is given by E = 158 sin 200 πt . The value of voltage at time $t = 1/400$ sec is

Watch Video Solution

12. A generator produces a voltage that is given by V = 240 sin 120 t volt, where t is in second. The frequency and r.m.s. voltage are

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EVALUATE YOURSELF-2

1. Assertion (A) : An electric lamp is connected in series with a long solenoid of copper with air core and then connected to AC source. If an iron rod is inserted in solenoid the lamp will become dim.

Reason (R) : If iron rod is inserted in solenoid, the induction of solenoid increases.

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2. A resistor, an inductance and a capacitance are connected in series toan a.c. supply. When measured with the help of an a.c. voltmeter, the p.d. across the resistor is found to be 40V, across the inductance 30V, and across the capacitance 60V. What is the supply voltage?

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Watch Video Solution

3. A 60 volt-10 watt bulb is operated at 100 volt-60 Hz ac. The inductance required is

Watch Video Solution

4. In L-R circit, the A.C. source has voltage $220V$. If potential difference across inductor is $176V$, the potential difference across the resistor (in Volts) is $K \times 33$. Find the value of K

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5. A coil having an inductance of $1/\pi$ henry is connected in series with a resistance of 300Ω. If 20 volt from a 200 cycle source are impressed across the combination, the value of the phase angle between the voltage and the current is :

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6. A 20volts AC is applied to a circuit consisting of a resistance and a coil with negligible resistance. If the voltage across the resistance is $12V$, the voltage across the coil is

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7. Alternating voltage V = 400 sin $(500\pi t)$ is applied across a resistance of $0.2k\Omega$. The r.m.s. value of current will be equal to

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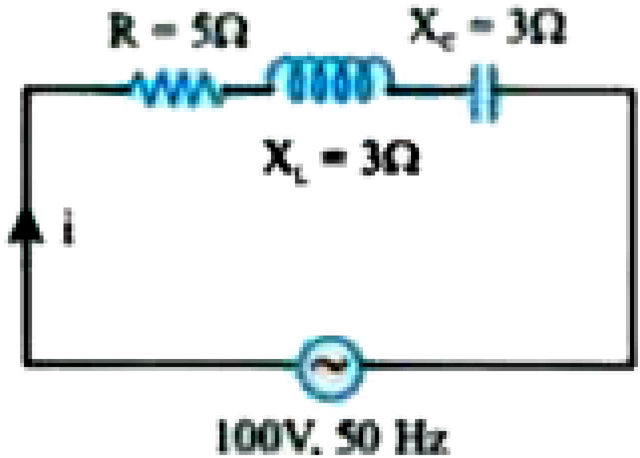
8. A series L-C-R circuit is given in figure . The current through the circuit is



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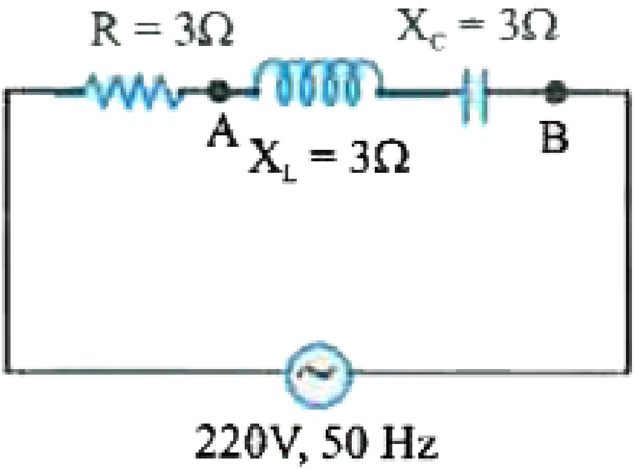
9. In serial L-C-R circuit as shown in figure. The potential difference across A & B is



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10. If resistance of 100Ω , inductance of 0.5 henry and capacitor of $10 \times 10^{-6} F$ are connected in series through $50Hz$ AC supply, then impedence is

Watch Video Solution

11. The values of current and voltage in an AC circuits are respectively I=4 sin ωt and $e = 100\cos[\omega t + (\pi/3)]$. The phase difference between voltage and current is

Watch Video Solution

12. Assertion (A) : An electric lamp is connected in series with a long solenoid of copper with air core and then connected to AC source. If an iron rod is inserted in solenoid the lamp will become dim.

Reason (R) : If iron rod is inserted in solenoid, the induction of solenoid increases.

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14. A 60 volt-10 watt bulb is operated at 100 volt-60 Hz ac. The inductance required is

Watch Video Solution

15. In L-R circuit, the a.c. source has voltage 220 volt. If the potential difference across the inductance is 176 volt, the p.d. across the resistance will be

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Watch Video Solution

16. Alternating voltage V = 400 sin $(500\pi t)$ is applied across a resistance of $0.2k\Omega$. The r.m.s. value of current will be equal to

Watch Video Solution

17. If resistance of 100Ω , inductance of 0.5 henry and capacitor of $10 \times 10^{-6}F$ are connected in series through $50Hz$ AC supply, then impedence is

Watch Video Solution

18. The instantaneous values of current and voltage in an A.C. circuit are respectively $I = 4\sin\omega t$ and $E = 100\cos(\Omega t + \pi/3)$. The phase difference between voltage and current is

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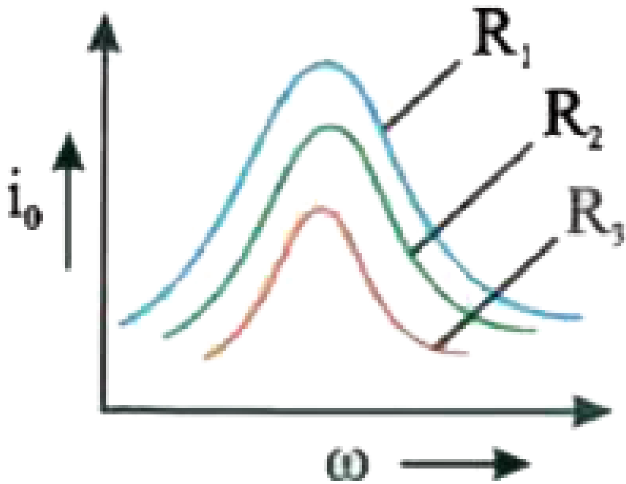
EVALUATE YOURSELF-3

1. The graph between current and frequency for LCR series circuit is drawn for three different resistor R_1, R_2 & R_3 . Which one is correct regarding resistance.



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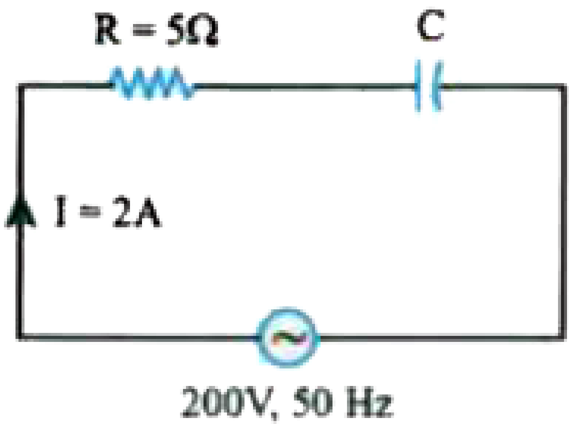
2. In the given A.C. circuit the average power consumed in the circuit is



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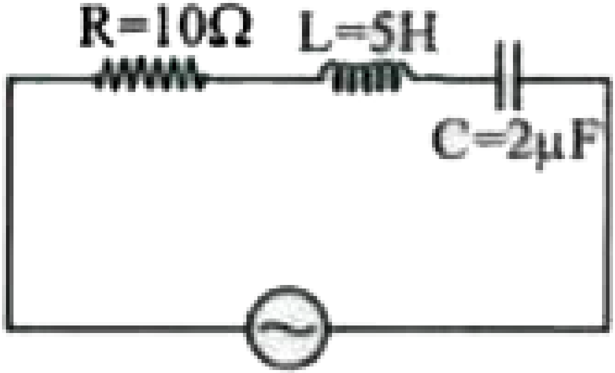
3. The circuit shown in the diagram is in resonance. Power factor of the circuit is



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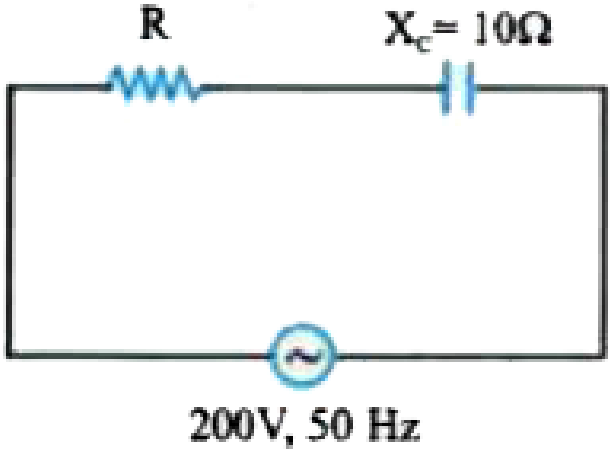
4. Power factor of the A.C. circuit given in figure is 0.6 . The value of R is



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5. A 30 mH pure inductor is connected to 220V, 50 Hz A.C. supply .Net power absorbed by the circuit over a complete cycle is

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6. A resistor, a capacitor of $100\mu F$ capacitance and an inductor are in series with on AC source of frequency 50Hz. If the current in the circuit is in phase with the applied voltage. The inductance of the inductor is

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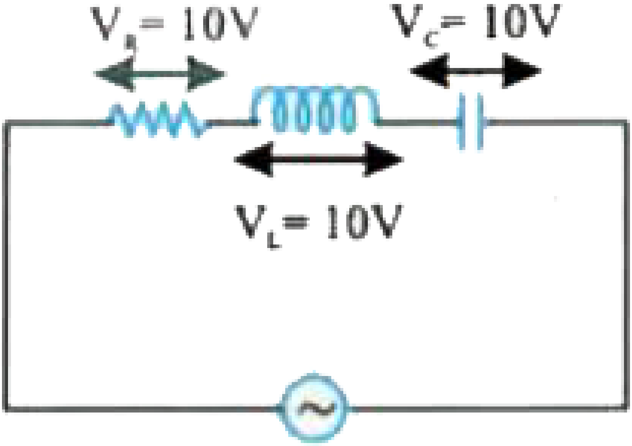
7. In series L-C-R circuit as shown in figure the voltage of the source is



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8. In series L-C-R circuit the quality factor is

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9. The average power delivered to a series AC circuit is given by (symbols have their usual meaning):

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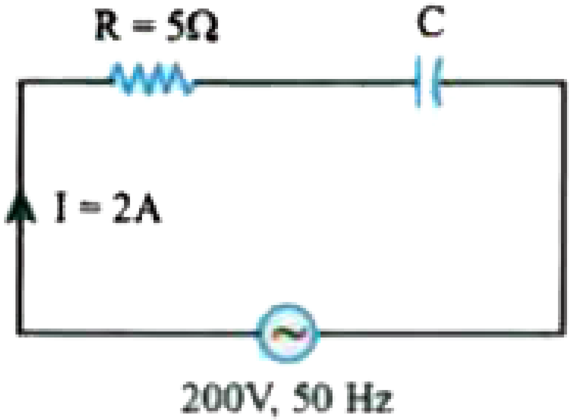
10. In the given A.C. circuit the average power consumed in the circuit is



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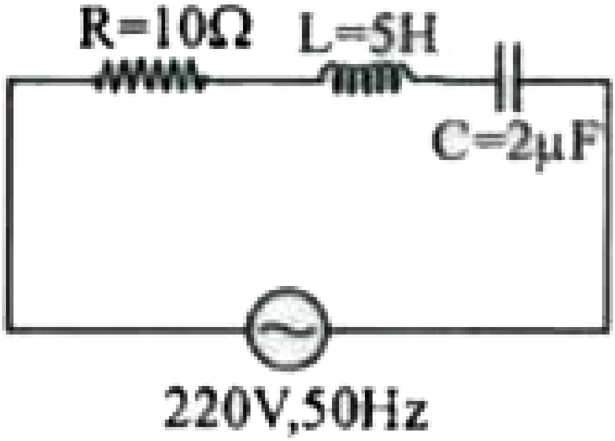
11. The circuit shown in the diagram is in resonance. Power factor of the circuit is



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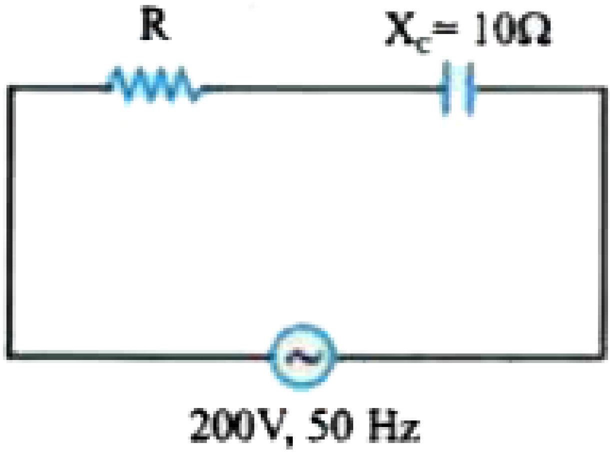
12. Power factor of the A.C. circuit given in figure is 0.6 . The value of R is



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13. A 30 mH pure inductor is connected to 220V, 50 HzA.C. supply .Net power absorbed by the circuit over a complete cycle is

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14. A resistor 10Ω, a capacitor of $100\mu F$ capacitance and an inductor are in series with on AC source of frequency 50Hz. If the current in the circuit is in phase with the applied voltage. The inductance of the inductor is

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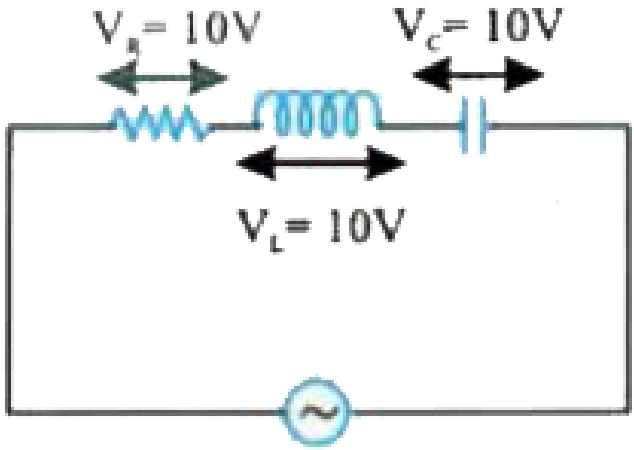
15. In series L-C-R circuit as shown in figure the voltage of the source is



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16. In series L-C-R circuit the quality factor is

Watch Video Solution

17. The average power in LCR series circuit is

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EVALUATE YOURSELF-4

1. A transformer is used to illuminate a bulb of (36W and 12 V) with the help of 220 volt mains. If the efficiency of the transformer is 75%, then current in primary coil is

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2. 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

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3. A transformer has an efficiency of 80% and works at 100 volt and 4 kw. If the secondary voltage is 240 V. The current in secondary is

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4. A small town with a demand of 800 kW of electric power at 220 V is situated 15 km away from an electric plant generating power at 440 V. The resistance of the two line wires carrying power is 0.5Ω per km. The town gets power from the lines through a 4000-220 V step down transformer at a substation in the town.

Estimate the line power loss in the form of heat.

(b) How much power must the plant supply. assuming there is negligible power loss due to leakage?

(c) Characterize the step up transformer at the plant.

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5. The core of a transformer is laminated to reduce

Watch Video Solution

6. In step down transformer 220 / 110 V the primary is connected to 10V battery. The out put voltage is

Watch Video Solution

7. In an LCR series circuit the capacitance is changed from C to $4C$ For the same resonant fequency the inductance should be changed from L to .

Watch Video Solution

8. A transformer is used to illuminate a bulb of (36W and 12 V) with the help of 220 volt mains. If the efficiency of the transformer is 75%, then current in primary coil is

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9. 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

Watch Video Solution

10. A transformer with efficiency 80% works at $4kW$ and $100V$. If the secondary voltage is $200V$, then the primary and secondary currents are respectively

Watch Video Solution

11. A small town with a demand of 800 kW of electric power at 220 V is situated 15 km away from an electric plant generating power at 440

V. The resistance of the two line wires carrying power is 0.5Ω per km. The town gets power from the lines through a 4000-220 V step down transformer at a substation in the town.

Estimate the line power loss in the form of heat.

(b) How much power must the plant supply. assuming there is negligible power loss due to leakage?

(c) Characterize the step up transformer at the plant.

Watch Video Solution

12. The core of any transformer is laminated so as to

Watch Video Solution

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14. In an LCR series circuit the capacitance is changed from C to $4C$ For the same resonant fequency the inductance should be changed from L to .

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EXERCISE-1(C.W)

1. The r.m.s. value of $I = I_1 \sin\omega t + I_2 \cos\omega t$ is

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2. The frequency of A.C. is 50 Hz. How many times the current becomes zero in one second?

Watch Video Solution

3. The values of current and voltage in an AC circuits are respectively I=4 sin ωt and $e = 100\cos[\omega t + (\pi/3)]$. The phase difference between voltage and current is

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4. An a.c. source is of 120 volts, 60 Hz . The value of the voltage after $1/360$ sec. from the start will be

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5. In general in an alternating current circuit

Watch Video Solution

6. The voltage of an AC supply varies with time (t) as V = 120 sin $100\pi t \cos 100\pi t$. The maximum voltage and frequency respectively are

Watch Video Solution

7. An inductance of negligible resistance, whose reactance is 22 ohm at 200 Hz is connected to a 220 V V, 50 Hz power line. What is the value of inductance and reactance ?

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8. In L-R circit, the A.C. source has voltage $220V$. If potential difference across inductor is $176V$, the potential difference across the resistor (in Volts) is $K \times 33$. Find the value of K

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9. A pure resistance and a pure inductance are connected in series across a 100 volt. A.C. line. A voltmeter gives same reading whether connected across resistance or inductance. What does it read ?

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10. A direct current of 10A is superimposed on an alternating current I = 40 $\cos wt$. Amperes flowing through a wire. The effective value of the resulting current will be

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11. In an AC circuit resistance, inductance and capacitance are connected in series. The values of potential differences across the three are 70

V, 90 V and 65 V respectively. The value of the potential difference of the AC source is

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12. A $10\mu F$ capacitor is connected across a $200V$, $50Hz$ A.C. supply. The peak current through the circuit is

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13. In a LCR circuit having $L = 8.0$ henry, $C = 0.5\mu F$ and $R = 100$ ohm in series. The resonance frequency in per second is

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14. An L - C - R series circuit has a maximum current of $5A$. If $L = 0.5H$ and $C = 8\mu F$, then the angular frequency of AC voltage is

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15. The current in series LCR circuit will be the maximum when ω is

Watch Video Solution

16. The resonant frequency of a circuit of negligible resistance containing an inductance of 50 mH and a capacitance of 500 pf is

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17. A series LCR circuit is tuned to resonance. The impedance of the circuit now is

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18. In a resonant LCR circuit,

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19. Energy required to establish a current of 4 A in a coil of self-inductance L=200 mH is

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20. If a power of 100 W is being supplied across a potential difference of 200 V, current flowing is

Watch Video Solution

21. In an AC circuit voltage applied is e=220 sin 100 t. if the impedance is 110Ω and phase difference between the current and voltage is 60° the power consumption is equal to

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22. An alternating voltage is applied across the R-L combination V = 220 sin 120 t and the current I = 4 sin (120 t - 60°) develops. The power consumption is

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23. In an A.C. circuit , e and I are given by, $e = 100\sin(100t)$ volt, $I = 100\sin\left(100t + \frac{\pi}{3}\right)mA$.

The power dissipated in circuit is

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

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25. An rms voltage of 110 V is applied across a series circuit having a resistance 11Ω and an impedance 22Ω. The power consumed is

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26. Power factor is one for

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27. A coil of inductive reactance 31Ω has a resistance of $8 ohm$. It is placed in series with a condenser of capacitive reactance 25Ω. The combination is connected to an ac source of $110V$. The power factor of the circuit is

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Watch Video Solution

28. An ac ammeter is used to measure currnet in a circuit. When a given direct current passes through the circuit. The ac ammeter reads 3 A. When another alternating current passes through the circuit, the ac ammeter reads 4A. Then find the reading of this ammeter (inA), if dc and ac flow through the circuit simultaneously.

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29. A transformer steps an $A.C$ voltage from $230V$ ot $2300V$. If the number of turns in the secondary coil is 1000, the number of turns in the primary coil will be

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30. The transformer ratio of a transformer is 5. If the primary voltage of the transformer is $400V, 50Hz$ the secondary voltage will be

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31. A step-up transformer works on $220V$ and gives $2A$ to an external resistor. The turn ratio between the primary and secondary coils is 2 : 25. Assuming 100% efficiency, find the secondary voltage, primary current and power delivered respectively

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32. The transformer ratio of transformer is $10:1$. The current in the primary circuit if the secondary current required is $100A$ assuming the transformer be ideal, is

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33. The transformer ratio of transformer is $10:1$. If the primary voltage is 440 V`, secondary emf is

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34. 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

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43. A pure resistance and a pure inductance are connected in series across a 100 volt. A.C. line. A voltmeter gives same reading whether connected across resistance or inductance. What does it read ?

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44. In an oscillating system, a restoring force is a must. In a L-C circuit, restoring force is provided by $a/$ An

A. Inductor

B. Resistor

C. Both 1 and 2

D. Capacitor

Watch Video Solution

Watch Video Solution

45. A direct current of 5A is superimposed on an alternating current I = 10 $\sin\omega t$ flowing through a wire . The effective value of the resulting current will be

Watch Video Solution

46. In an AC circuit resistance, inductance and capacitance are connected in series. The values of potential differences across the three are 70

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Watch Video Solution

51. The resonant frequency of a circuit of negligible resistance containing an inductance of 50 mH and a capacitance of 500 pf is

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52. A series LCR circuit is tuned to resonance. The impedance of the circuit now is

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53. Energy needed to establish an alternating current I in a coil of self inductance L is

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54. If a power of 100 W is being supplied across a potential difference of 200 V , current flowing is

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57. In an A.C. circuit, V and I are given by V = 100 sin (100t) volt.

I = 100 sin (100 t + $\pi/4$) mA

The power dissipated in the circuit is

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58. An rms voltage of 110 V is applied across a series circuit having a resistance 11Ω and an impedance 22Ω. The power consumed is

Watch Video Solution

59. Power factor is one for

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66. The transformer ratio of transformer is $10:1$. If the primary voltage is 440 V`, secondary emf is

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67. 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

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EXERCISE-1(H.W)

1. An inductor has a resistance R inductance L. It is connected to an $A.C$ source of e.m.f. E_V and angular frequency ω then the current I_v in the circuit is

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2. The rms value of an ac of 50Hz is 10A. The time taken by an alternating current in reaching from zero to maximum value and the peak value will be

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3. The peak value $A.C$ is $2\sqrt{2}A$. It's apparent value will be

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4. Alternating current in circuit is given by $I = I_0 \sin 2\pi nt$. Then the time by the current to rise from zero to r.m.s value is equal to

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5. The form factor for a sinusoidal $A.C$ is

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6. The voltage of an $A.C$ source varies with time according to the equation

$V = 50\sin 100\pi t \cos 100\pi t.$

Where $'t'$ is in second and $'V'$ is in volt. Then

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7. A coil of self-inductance $\left(\frac{1}{\pi}\right)H$ is connected is series with a 300Ω resistance. A voltage of $200V$ at frequency $200Hz$ is applied to this combination. The phase difference between the voltage and the current will be

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8. In an LCR series circuit the rms voltages across R, L and C are foundd to be $10V, 10V$ and $20V$ respectively. The rms voltage across the entire combination is

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9. An alternating voltage of $e = 100\sqrt{2}\sin(100t)$ volt is connected to a condenser of $0.5\mu F$ through an A.C. ammeter. The reading of the ammeter will be

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Watch Video Solution

10. In a circuit, the frequency is $f = \frac{1000}{2\pi} Hz$ and the inductance is 2 henry, then the reactance will be

Watch Video Solution

11. A conductor of capacity $1pF$ is connected to an $A.C$ source of $220V$ and $50Hz$ frequency. The current flowing in the circuit will be

Watch Video Solution

12. The frequency at which the inductive reactance of $2H$ inductance will be equal to the capactive reactance of $2\mu F$ capactiance (nearly)

Watch Video Solution

13. If the instantaneous current in a circuit is given by $I = 2\cos(\omega t + \phi)$ amperes, the rms value of the current is

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14. A $100km$ telegraph wire hasd capacity of $0.02\mu F/km$, if it carries an alternating current of frequency $5kHZ$. The value of an inductrance required to be connected in series so that the impedance is minimum.

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15. In a series LCR circuit, resistance $R = 10\Omega$ and the impedence $Z = 20\Omega$ the phase difference between the current and the voltage is

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16. In an L - C - R series circuit, $R = \sqrt{5}\Omega, X_L = 9\Omega, X_C = 7\Omega$. If applied voltage in the circuit is $50V$ then impedance of the circuit in ohm will be

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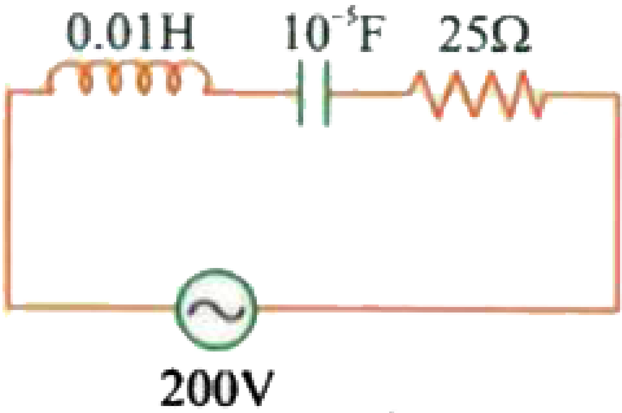
17. In the following circuit, the values of current flowing in the circuit at f= 0 and f $= \infty$ will

respectively be



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18. Radio receiver receives a message at 300m band, If the available inductance is lmH, then calculate required capacitance.

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19. In oscillating Lc circuit, the total stored energy is U and maximum charge upon capacitor is $\frac{Q}{2}$, the energy stored in the inductor is

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20. A voltage 10V and frequency 10^3HZ is applied to $\frac{1}{\pi}\mu F$ capacitor is series with a resistor of 500Ω. Find the power factor of the circuit and the power dissipated

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21. If power factor of a R-L series circuit is $\frac{1}{2}$ when applied voltage is $V = 100\sin 100\pi t$ volt and resistance of circuit is 200Ω then the inductance of the circuit is

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22. A circuit consisting of an inductance and a resistance joined to a 200 volt supply (A.C.) It draws a current of 10 ampere. If the power used in the circuit is 1500 watt, then the watt less current component is

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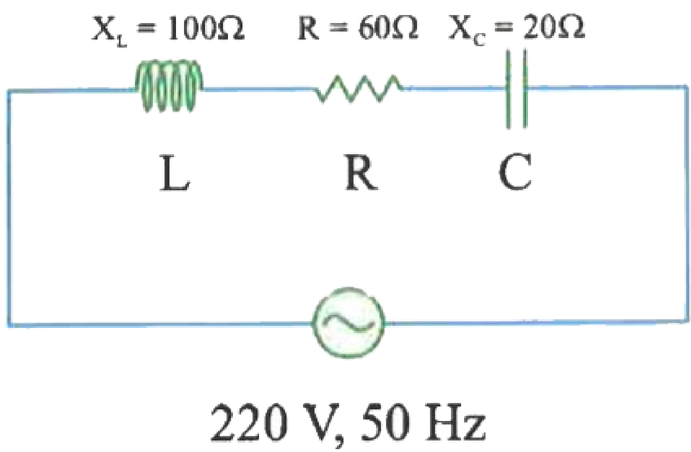

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24. A series L-C-R circuit is connected across an AC source E = $10\sin\left[100\pi t - \frac{\pi}{6}\right]$. Current from the supply is I = $2\sin\left[100\pi t + \frac{\pi}{12}\right]$, What is the average power dissipated?

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25. If power factor is $1/2$ in a series $RL,$ circuit $R = 100\Omega$. AC mains is used then L is

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26. An LC circuit contains a 20 mH inductor and a $50\mu F$ capacitor with an initial charge of 10 mC. The resistance of the circuit is negligible. Let the instant the circuit is closed be t = 0.

(a) What is the total energy stored initially ? Is it conserved during the oscillalions?

(b) What is the natural frequency of the circuit?

(c) At what time is the energy stored? (i) Completely electrical ? (ii) Completely magnetic ?

(d) At what time is the total energy shared equally between the inductor and the capacitor ?

(e) If a resistor is inserted in the circuit, how much energy is eventually dissipated as heat ?

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27. In a step up transformer, if ratio of turns of primary to secondary is $1:10$ and primary voltage si $230V$. If the load current is $2A$. Then the current in primary is

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Watch Video Solution

28. In a transformer, number of turns in the primary coil are 140 and that in the secondry coil are 280. If current i primary ciol is 4A, then that in the secondary coil is

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29. The number of turns in the primary and secondary coils of a transformer are 200 and 800 respectively. If the voltage developed

across the secondary is 240 V, then the potential difference across each turn of the primary will be

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30. 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

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31. A transformer has 1500 turns in the primary coil and 1125 turns in the secondary coil. If a voltage of 200V is applied across the primary coil , then the voltage in the secondary coil is :

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32. In a primary coil $5A$ current is flowing on 220 volts. In the secondary coil $2200V$ voltage produces. Then ratio of number of turns in secondary coil and primary coil will be

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36. An inductor has a resistance R inductance L. It is connected to an $A.C$ source of e.m.f. E_V and angular frequency ω then the current I_v in the circuit is

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37. The r.m.s value of an a.c of $59Hz$ is $10A$. The time taken by the alternating current in reaching from zero to maximum value and the peak value of current will be

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38. The peak value $A.C$ is $2\sqrt{2}A$. It's apparent value will be

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39. The electric current in an AC circuit is given by $I = I_0 \sin\omega t$.What is the time taken by the current to change from its maximum value to the rms value?

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40. The form factor for a sinusoidal $A.C$ is

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41. The voltage of an $A.C$ source varies with time according to the equation

$V = 50\sin 100\pi t \cos 100\pi t.$

Where $'t'$ is in second and $'V'$ is in volt. Then

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42. A coil of self-inductance $\left(\frac{1}{\pi}\right)H$ is connected is series with a 300Ω resistance. A voltage of $200V$ at frequency $200Hz$ is applied to this combination. The phase difference between the voltage and the current will be

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43. In an LCR series circuit the rms voltages across R, L and C are foundd to be $10V, 10V$ and $20V$ respectively. The rms voltage across the entire combination is

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44. An alternating voltage $E = 200\sqrt{2}\sin(100t)V$ is applied to a $2\mu F$ capacitor through an A.C. ammeter. The reading of the ammeter is

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45. In a circuit, the frequency is $f = \frac{1000}{2\pi} Hz$ and the inductance is 2 henry, then the reactance will be

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46. A conductor of capacity $1pF$ is connected to an $A.C$ source of $220V$ and $50Hz$ frequency. The current flowing in the circuit will be

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47. The frequency at which the inductive reactance of $2H$ inductance will be equal to the capactive reactance of $2\mu F$ capactiance (nearly)

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48. If the instantaneous current in a circuit is given by $I = 2\cos(\omega t + \phi)A$, the rms value of the current is

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49. A $100km$ telegraph wire hasd capacity of $0.02\mu F/km$, if it carries an alternating current of frequency $5kHZ$. The value of an inductrance required to be connected in series so that the impedance is minimum.

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50. In a series LCR circuit, resistance $R = 10\Omega$ and the impedence $Z = 20\Omega$ the phase difference between the current and the voltage is

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51. In an L - C - R series circuit, $R = \sqrt{5}\Omega, X_L = 9\Omega, X_C = 7\Omega$. If applied voltage in the circuit is $50V$ then impedance of the circuit in ohm will be

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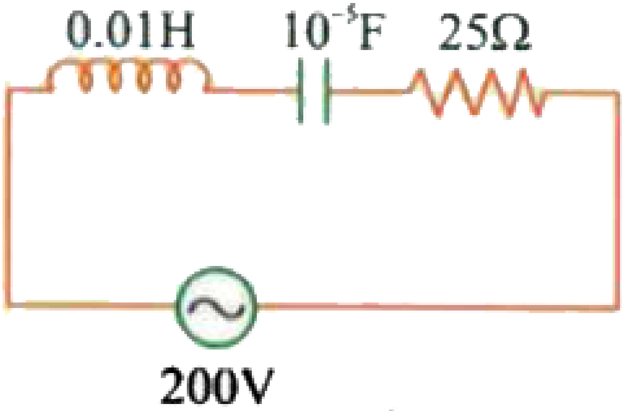
52. In the following circuit, the values of current flowing in the circuit at f= 0 and f $= \infty$ will

respectively be



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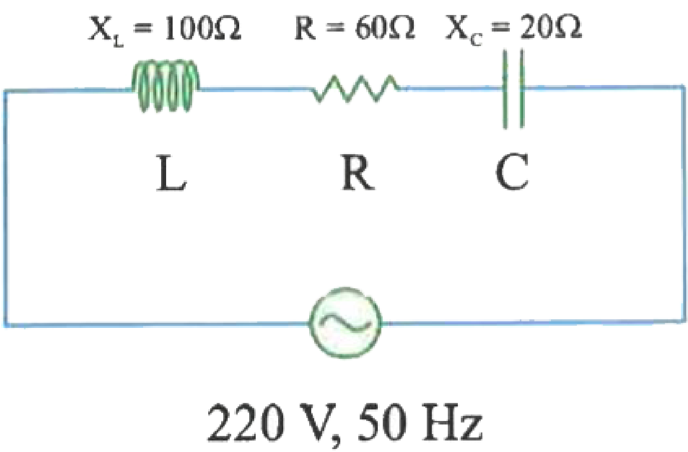

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EXERCISE-2(C.W)

1. The rms value of an ac of 50Hz is 10A. The time taken by an alternating current in reaching from zero to maximum value and the peak value will be

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2. Two alternating voltage generators produce emfs of the same amplitude $\left(E_0\right)$ but with a phase difference of $(\pi)/3$. The resultant emf is

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3. A resistance of 20Ω is connected to a source of an alternating potential $V = 220\sin(100\pi t)$. The time taken by the current to change from the peak value to rms value is

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4. An inductor, a capacitor and a resistor are connected in series to an a.c. supply. When measured with an a.c. voltmeter, the potential difference across the inductor, capacitor and resistor are respectively 90 volt, 60 volt and 40 volt. Then the supply voltage is

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5. The magnetic field energy in an inductor changes from maximum value to minimum value in $5.0 ms$ when connected to an AC source.

The frequency of the source is

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6. In an L-R circuit, an inductance of 0.1 H and a resistance of 1Ω are connected in series with an ac source of voltage V = 5 sin 10 t. The phase difference between the current and applied voltage will be

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7. The coil of choke in a circuit

Watch Video Solution

8. In a circuit, the current lags behind the voltage by a phase difference of $\pi/2$, the circuit will contain which of the following ?

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

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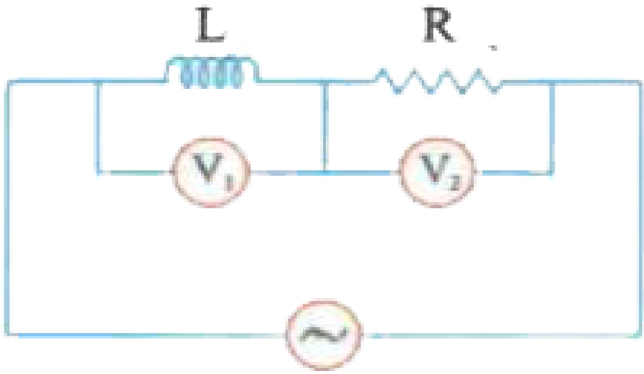
10. A pure inductor and a pure resistor are connected in series and an ac supply is connected across this combination. Ideal ac volt meters v_1 and v_2 show 120 volt and 160 volt respectively . What is the phase difference between V_1 and V_2.



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11. In L-R circit, the A.C. source has voltage $220V$. If potential difference across inductor is $176V$, the potential difference across the resistor (in Volts) is $K \times 33$. Find the value of K

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12. In an LCR circuit, the capacitance is made one-fourth, when in resonance. Then what should be the change in inductance, so that the circuit remains in resonance?

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13. A coil of inductance 5.0 mH and negligible resistance is connected to an alternating voltage $V = 10\sin(100t)$. The peak current in the circuit will be:

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16. An e.m.f. $E = 4\cos(1000t)$volt is applied to an LR circuit of inductance $3mH$ and resistance $4ohm$. The amplitude of current in the circuit is

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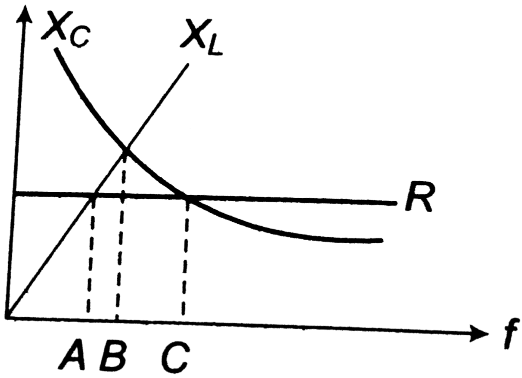
17. The figure shows variation of R, X_L and X_C with frequency f in a series L, C, R circuit. Then for what frequency point, the circuit is

inductive ?



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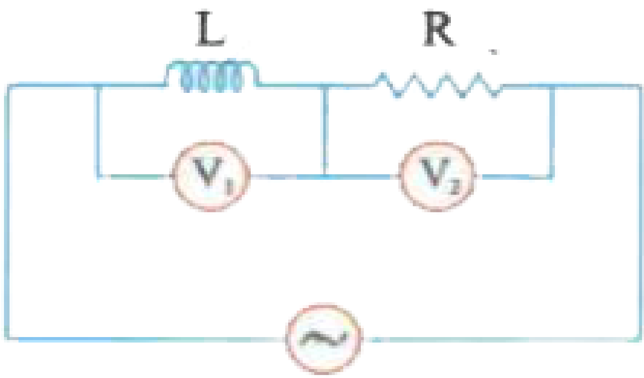

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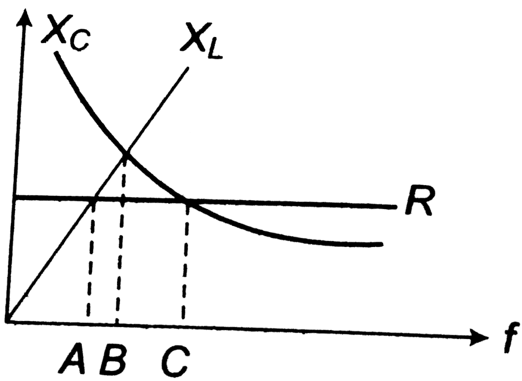

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Watch Video Solution

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EXERCISE-2(H.W)

1. The voltage over a cycle varies as

$V = V_0 \sin\omega t$ for $0 \leq t \leq \dfrac{\pi}{\omega}$

$= \ - V_0 \sin\omega t$ for $\dfrac{\pi}{\omega} \leq t \leq \dfrac{2\pi}{\omega}$

The average value of the voltage one cycle is

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2. A pure inductor of 25.0 mH is connected to a source of 220 V. Find the inductive reactance and rms current in the circuit if the frequency of the source is 50 Hz.

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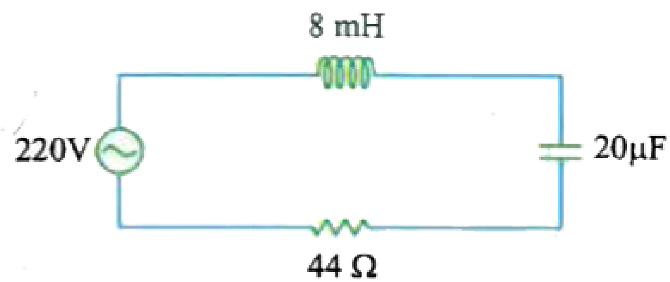
3. For the sereis LCR circuit shown in figure, the resonating frequency and current amplitude at resonance respectivley are



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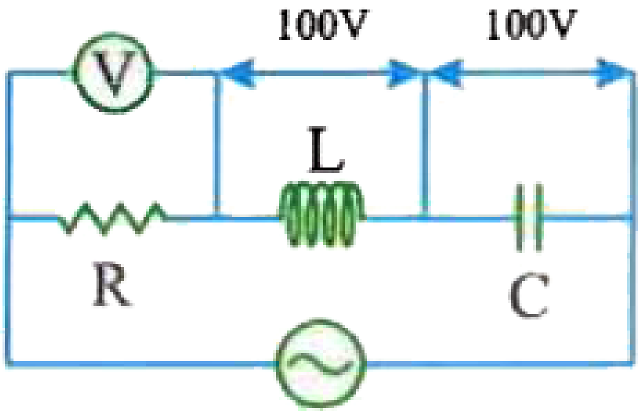
4. In the circuit shown in figure, what will be the reading of the voltmeter ?



200 V, 100 Hz

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5. In a series LCR circuit the voltage across the resistance, capacitance and inductance is 10 V each. If the capacitance is short circuited, the voltage across the inductance will be $\frac{10^x}{\sqrt{2}}$ what is value of x

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6. 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.

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7. An e.m.f. $E = 4\cos(1000t)$volt is applied to an LR circuit of inductance $3mH$ and resistance $4ohm$. The amplitude of current in the circuit is

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8. In a LCR circuit the $P.D$ between the terminals of the inductance is $60V$, between the terminals of the capacitor is $30V$ and that between the terminals of resistance is $40V$. The supply voltage will be equal to......

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9. A series LCR circuit has $R = 5\Omega, L = 40mH$ and $C = 1\mu F$, the bandwidth of the circuit is

Watch Video Solution

10. A pure resistive circuit element X when connected to an ac supply of peak voltage 400 V gives a peak current of 5 A which is in phase with the voltage. A second circuit element Y, when connected to the same ac supply also gives the same value of peak current but the current lags behind by 90°. If the series combination of X and Y is connected to the same suply, what will be the rms value of current?

Watch Video Solution

11. 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 $200 rad/s$. At resonance the voltage across L is

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12. A charged capacitor discharges through a resistance R with time constant τ. The two are now placed in series across an AC source of angular frequency $\omega = \frac{1}{\tau}$. The impedance of the circuit will be

Watch Video Solution

13. An inductor of inductance 2H and a resistance of 10Ω are connected in series to an ac source of 1109 V, 60 Hz. The current in the circuit will be

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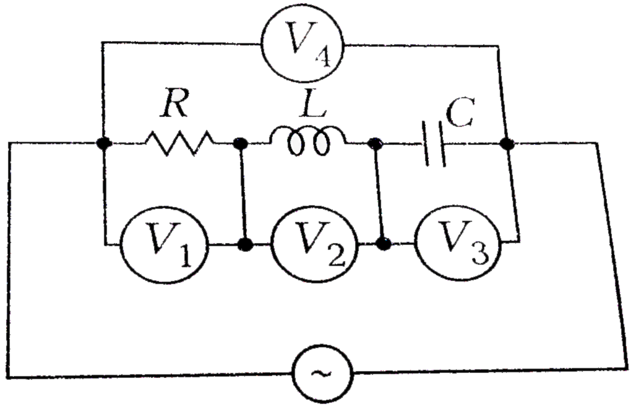
14. An ideal resistance R, ideal inductance L , ideal capacitance C and AC voltmeters V_1 , V_2 , V_3 and V_4 are connected to an AC source as shown . At resonance



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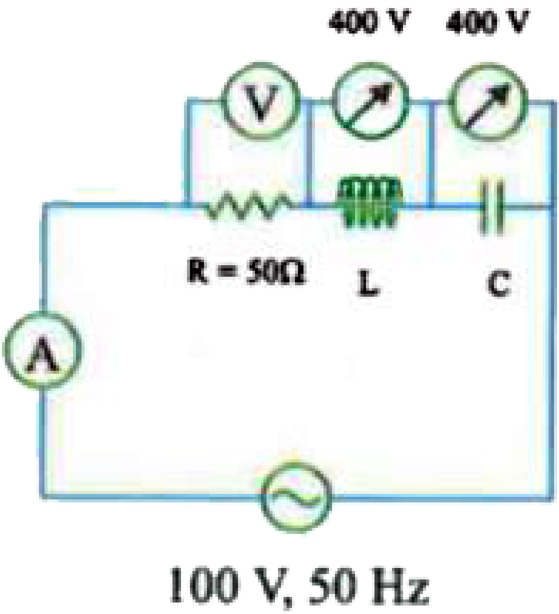
15. In the series LCR circuit as shown in the figure, the voltmeter V and ammeter A reading are



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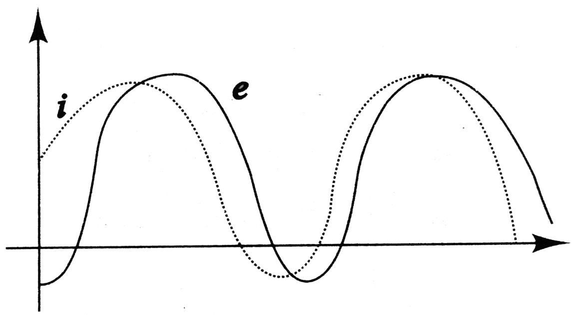
16. When an ac source of emf $e = E_0 \sin(100t)$ is connected across a circuit, the phase difference between emf e and currnet I in the circuit is observed to be $(\pi)/(4)$ as shown in fig. If the circuit consists possibly only of R-C or R-C of L-R series, find the relationship find the relationship between the two elements.



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17. An inductance of $\frac{200}{\pi} mH$ a capacitance of $\frac{10^{-3}}{\pi}$ and a resistance of 10Ω are connected in series with an AC source of $220V, 50Hz$. The phase angle of the circuit is

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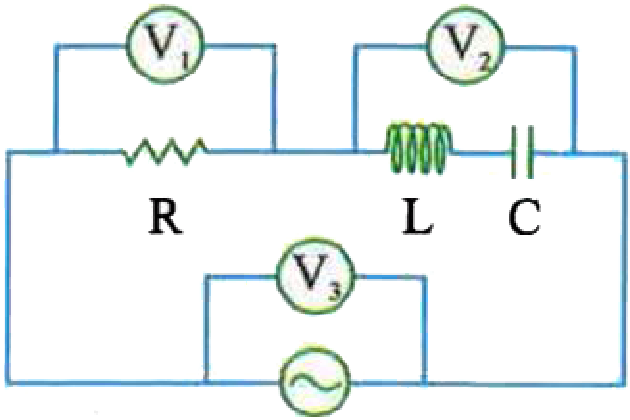
18. An LCR series ac circuit is at resonance with 10 V each across L.C and R. If the resistance is halved, the respective voltages across L,C and R are



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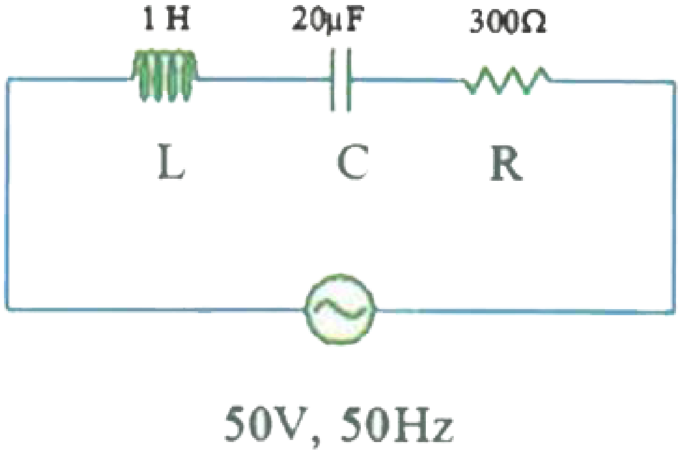
19. In the series LCR circuit shown, the impedance is



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20. In a series resonant LCR circuit, the voltage across R is 100V and the value of $R = 1000\Omega$. The capacitance of the capacitor is $5 \times 10^{-6}F$, angular frequency of ac is $200 rads^{-1}$. Then the potential difference across the inductance coil is

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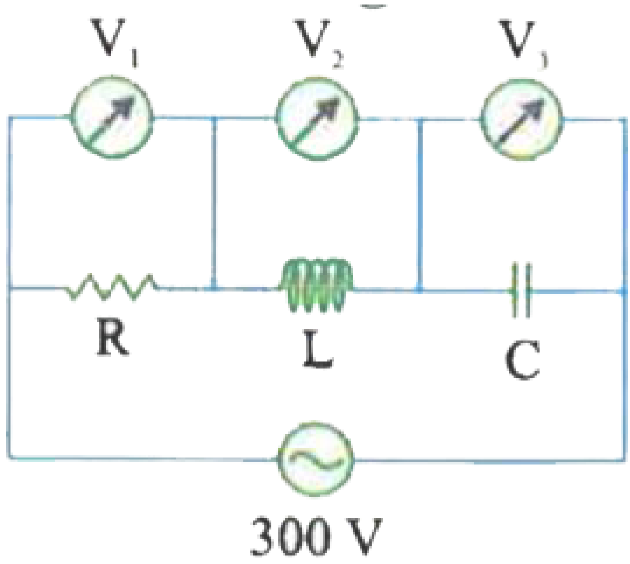
21. The figure shows a LCR netework connected to 300V ac supply. The circuit elements are such that $R = X_L = X_C = 10\Omega$ V_1, V_2 and V_3 are three ac voltmeters connected as shown in the figure. Which of the following represents the correct set of readings of the voltmeters ?



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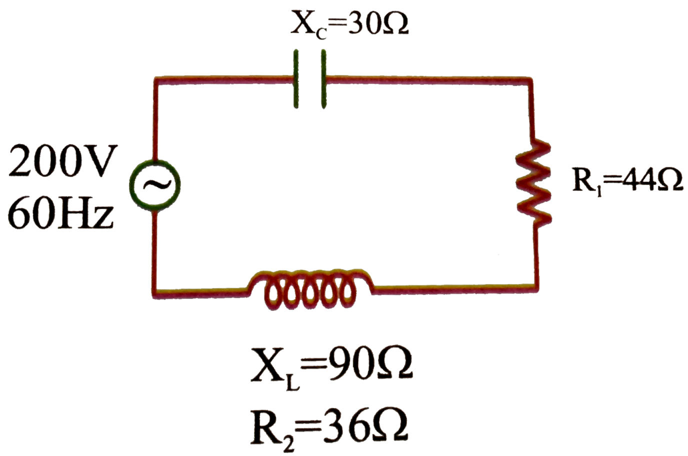
22. A series circuit connected across a $200V, 60Hz$ line consists of a capacitive reactance 30Ω non inductive resistor of 44Ω

and a coil of inductive reactance 90Ω and resistance 36Ω as shown in the diagram



The power dissipated in the inductance coil is

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23. In an AC circuit, the reactannce is equal to the resistance. The power factor of the circuit

will be

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24. An inductance L, a cpacitance C and a resistance R may be connected to an AC souorce of angular frequency ω in three different combinations of RC, RL and LC in series. Assume that $\omega L = \frac{1}{\omega C}$. The power drawn by the three combinatios are P_1, P_2, P_3 respectively. THen

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25. An Lc circuit contains a 40 mH inductor and a $25\mu F$ capacitor. The resistance of the circuit is negligible.The time is measured from the instant the circuit is closed. The energy stored in the circuit is completely magnetic at time (in milliseconds)

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26. An alternating supply of 220 V is applied across a circuit with resistance 22Ω and impedance 44Ω. The power dissipated in the circuit is

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27. In an AC circuit, the current is given by $i = 5\sin\left(100t - \frac{\pi}{2}\right)$ and the AC potential is $V = 200\sin(100t)$volt. Then the power consumption is

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28. A capacitor of capacitance $1\mu F$ is charged to a potential of $1V$, it is connected in parallel to an inductor of inductance $10^{-3}H$. The maximum current that will flow in the circuit has the value

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29. A coil of inductance $0.1H$ is connected to $50V, 100Hz$ generator and current is found to be $0.5A$. The potential difference across resistance of coil is:

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30. An alternating voltage (in volts) given by $V = 200\sqrt{2}\sin(100t)$ is connected to $1\mu F$ capacitor through an ideal ac ammeter in series. The reading of the ammeter and the average power consumed in the circuit shall be

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31. In an circuit, V and I are given by $V = 150\sin(150t)V$ and $I = 150\sin\left(150t + \frac{\pi}{3}\right)A.$

The power dissipated in the circuit is

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32. A series resonant LCR circuit has a quality factor (Q-factor)=0.4. If $R = 2k\Omega$, $C = 0.1\mu F$ then the value of inductance is

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33. A resistor of 500Ω and an inductance of 0.5 H are in series with an ac source which is given by $V = 100\sqrt{2}\sin(1000t)$. The power factor of the combination is

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35. A transformer has 100 turns in the primary coil and carries $8A$ current. If input power is one kilowatt, the number of turns required in the secondary coil to have $500V$ output will be

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36. A transmitting station transmits radiowave of wavelength 360 m. What is the inductance of a coil required with a condenser of capacity

1.20 μF in the resonant circuit to receive the radiowaves ? (Use π^2=10)

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37. A step-down transformer is used on a $1000V$ line to deliver $20A$ at $120V$ at the secondary coil. If the efficiency of the transformer is 80% the current drawn from the line is.

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38. A power transmission line feeds input power at 2300 V to a step down trnasformer with it primary windings having 4000 turns. What should be the number of turns in the seconday windings in order to get output power at 230 V?

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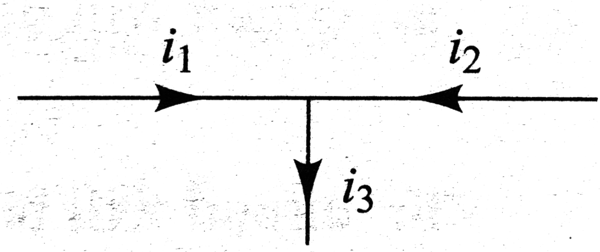
39. If $i_1 = 3\sin\omega t$ and $\left(i_2\right) = 4\cos\omega t$, then $\left(i_3\right)$ is



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40. The voltage over a cycle varies as

$V = V_0 \sin\omega t$ for $0 \le t \le \dfrac{\pi}{\omega}$

$= - V_0 \sin\omega t$ for $\dfrac{\pi}{\omega} \le t \le \dfrac{2\pi}{\omega}$

The average value of the voltage one cycle is

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41. A pure inductor of 25.0 mH is connected to a source of 220 V. Find the inductive reactance and rms current in the circuit if the frequency of the source is 50 Hz.

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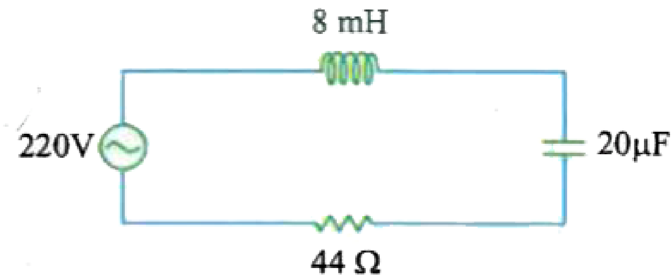
42. For the sereis LCR circuit shown in figure, the resonating frequency and current amplitude at resonance respectivley are



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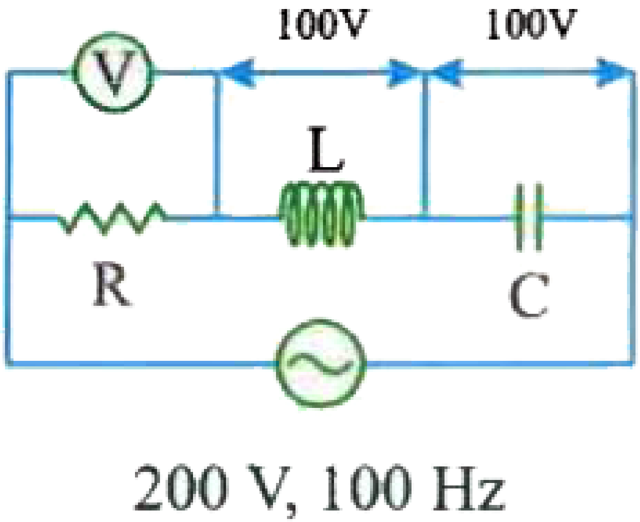
43. In the circuit shown in figure, what will be the reading of the voltmeter ?



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44. In a series LCR circuit the voltage across the resistance, capacitance and inductance is 10 V each. If the capacitance is short circuited, the voltage across the inductance will be $\frac{10^x}{\sqrt{2}}$

what is value of x

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45. 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.

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46. An e.m.f. $E = 4\cos(1000t)$volt is applied to an LR circuit of inductance $3mH$ and resistance $4ohm$. The amplitude of current in the circuit is

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47. In a LCR circuit the $P.D$ between the terminals of the inductance is $60V$, between the terminals of the capacitor is $30V$ and that between the terminals of resistance is $40V$. The supply voltage will be equal to......

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48. A series LCR circuit has $R = 5\Omega, L = 40mH$ and $C = 1\mu F$, the bandwidth of the circuit is

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49. A pure resistive circuit element X when connected to an ac supply of peak voltage 400 V gives a peak current of 5 A which is in phase with the voltage. A second circuit element Y, when connected to the same ac supply also gives the same value of peak current but the current lags behind by 90°. If the series combination of X and Y is connected to the same suply, what will be the rms value of current?

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50. In a series resonant LCR circuit the voltage across R is 100 volts and R = $1k(\Omega)withC = 2(\mu)F$. The resonant frequency (ω) is $200rad/s$. At resonance the voltage across L is

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51. A charged capacitor discharges through a resistance R with time constant τ. The two are now placed in series across an AC source of angular frequency $\omega = \frac{1}{\tau}$. The impedance of the circuit will be

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52. An inductor of inductance 2H and a resistance of 10Ω are connected in sereis to an ac source of 1109 V, 60 Hz. The current in the circuit will be

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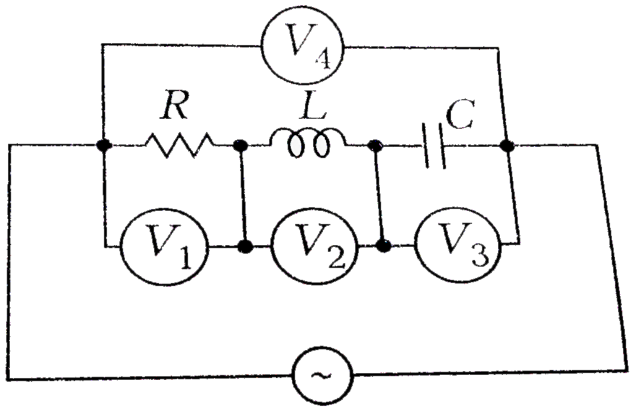
53. An ideal resistance R, ideal inductance L, ideal capacitance C and AC voltmeters V_1, V_2, V_3 and V_4 are connected to an AC source as shown . At resonance



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54. A series LCR circuit is connected to an ac source of variable frequency. When the frequency is increased continuously, starting from a small value, the power factor

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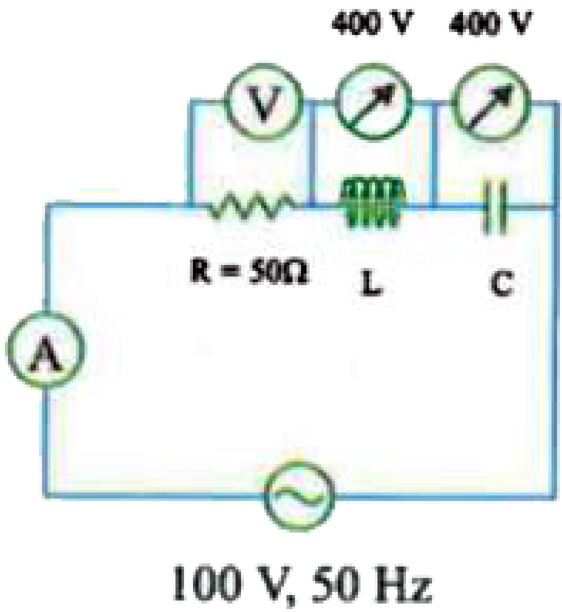
55. In the series LCR circuit as shown in the figure, the voltmeter V and ammeter A reading are



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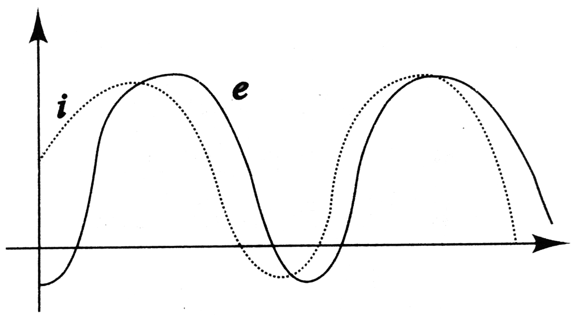
56. When an ac source of emf$e = E_0 \sin(100t)$ is connected across a circuit, the phase difference between emf e and currnet I in the circuit is observed to be $(\pi)/(4)$ as shown in fig. If the circuit consists possibly only of R-C or R-C of L-R series, find the relationship find the relationship between the two elements.



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57. An inductance of $\frac{200}{\pi}mH$ a capacitance of $\frac{10^{-3}}{\pi}$ and a resistance of 10Ω are connected in series with an AC source of $220V, 50Hz$. The phase angle of the circuit is

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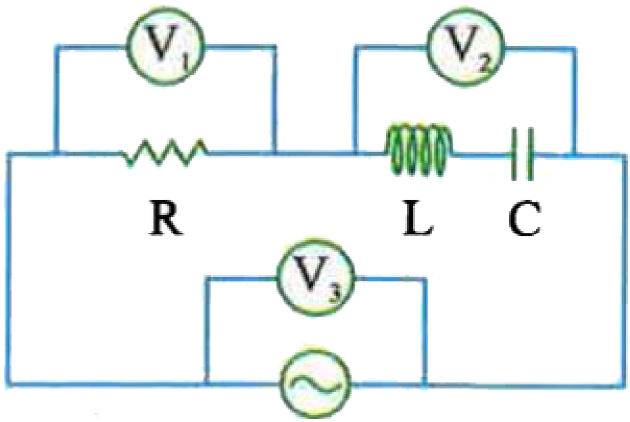

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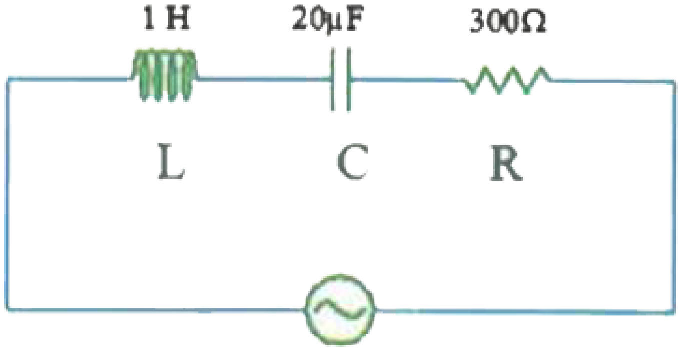
59. In the series LCR circuit shown, the impedance is



50V, 50Hz

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60. In a series resonant LCR circuit, the voltage across R is 100V and the value of $R = 1000\Omega$. The capacitance of the capacitor is $5 \times 10^{-6} F$, angular frequency of ac is $200 rad s^{-1}$. Then the potential difference across the inductance coil is

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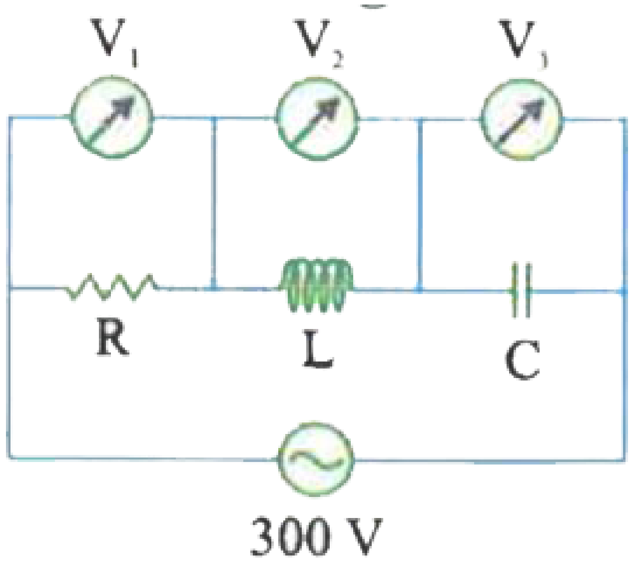

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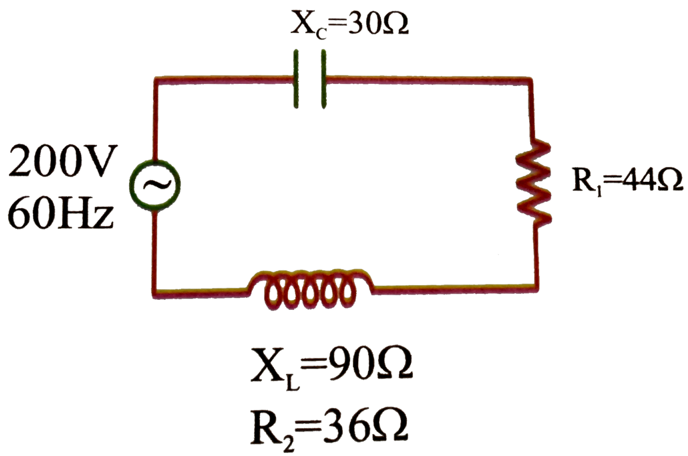

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67. In an A.C. circuit, the current flowing in inductance is $I = 5\sin(100t - \pi/2)$ amperes and the potential difference is $V = 200\sin(100t)$ volts. The power consumption is equal to

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$e = 100\sin(100t)$ volt, $I = 100\sin\left(100t + \frac{\pi}{3}\right)mA.$

The power dissipated in circuit is

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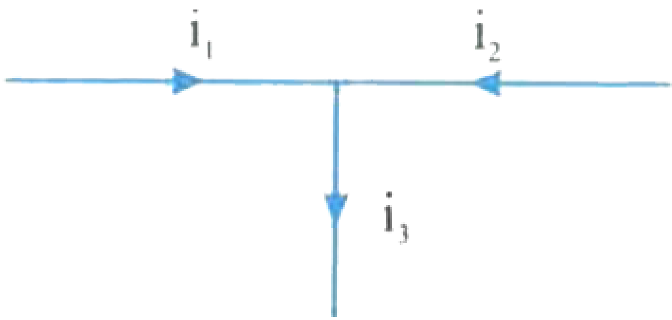

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EXERCISE - 3

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

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2. 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

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3. A wire of reistance R is connected in series with an inductor of reactance ω L. Then quality factor of RL circuit is

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4. An LCR series circuit having 220 V ac source, inductance $L = 25mH$ and resistance R = 100Ω. If voltage across inductor is just double of voltage across resistor then find out frequency of source.

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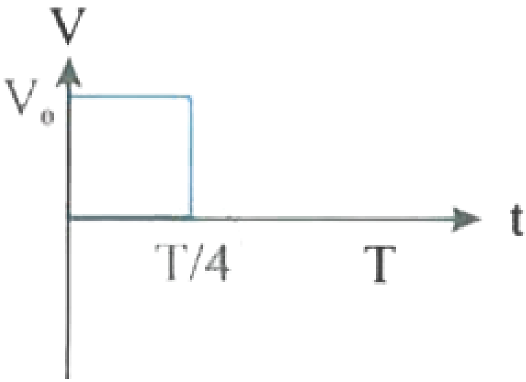
5. A periodic voltage V varies with time t as shown in figure. T is the time period. Find the runs value of the voltage.



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6. An a.c. voltage is applied to a pure inductor L, drives a current in the inductor. The current in the inductor would be

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7. Power dissipated in an L - C - R series circuit connected to an AC source of emf ε is

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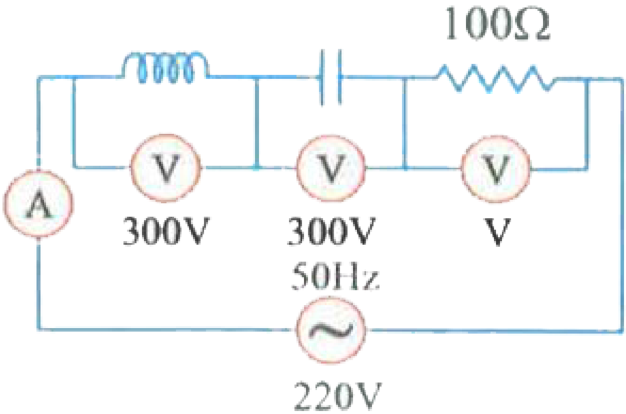
8. In the circuit shown below what will be the reading of the voltmeters and ammeter?



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9. In an AC circuit, an alternating voltage e = 200sin 100t V is connected to a capacitor of capacity $1\mu F$. The rms value of the current in the circuit is

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10. 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 3Ω, the phase difference between the applied voltage and the current in the circuit is

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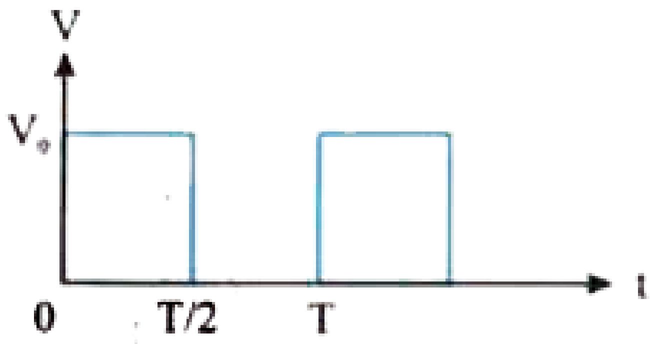
11. The rms value of potential difference V shown in the Fig. is



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12. 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

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

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14. 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

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15. 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 impedence of the circuit becomes Z, the power drawn will be

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16. An inductor 20 mH, a capacitor 50 μF and a resistor 40 Ω are connected in series across a source of emf V = 10 sin 340 t. The power loss in A.C. circuit is :

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17. A small signal voltage $V(t) = V_0 \sin \omega t$ is applied across an ideal capacitor C:

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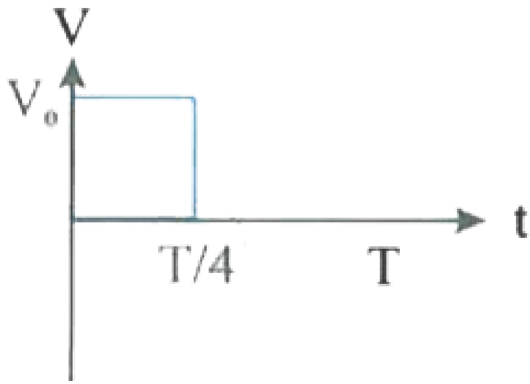

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A. ahead voltage by $\pi/2$

B. lagging voltage by $\pi/2$

C. ahead voltage by $3\pi/2$

D. lagging voltage by $3\pi/2$

Answer: B

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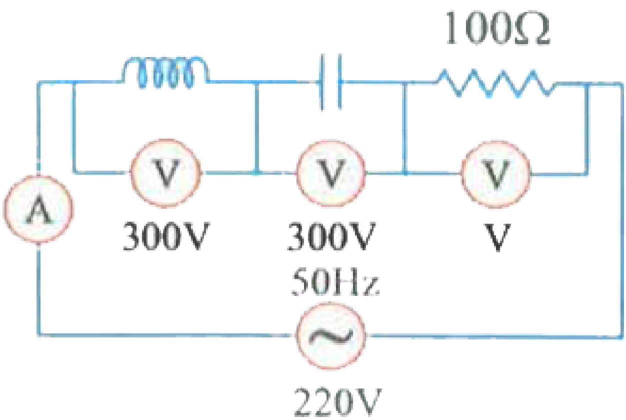

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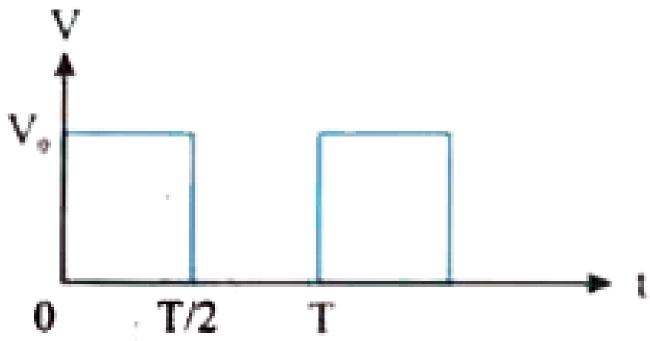

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EXERCISE-4

1. If the rms current in a 50 Hz ac circuit is 5 A, the value of the current $1/300$ second after its value becomes zero is

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2. An alternating current generator has an internal resistance R_g and an internal reactance X_g. It is used to supply power to a passive load consisting of a resistance R_g and a rectance X_L. For maximum power to be delivered from the generator to the load, the value of X_L is equal to

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3. When a voltage measuring device is connected to a.c. mains the meter shows the steady input voltage of $220V$. This means

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4. To reduce the resonant frequency in an LCR series circuit with a generator

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

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6. A inductor of reactance 1Ω and a resistor of 2Ω are connected in series to the terminals of a 6 V (rms) a.c. source. The power dissipated in the circuit is

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7. The output of a step-down transformer is measured to be $24V$ when connected to a 12 watt light bulb. The value of the peak current is

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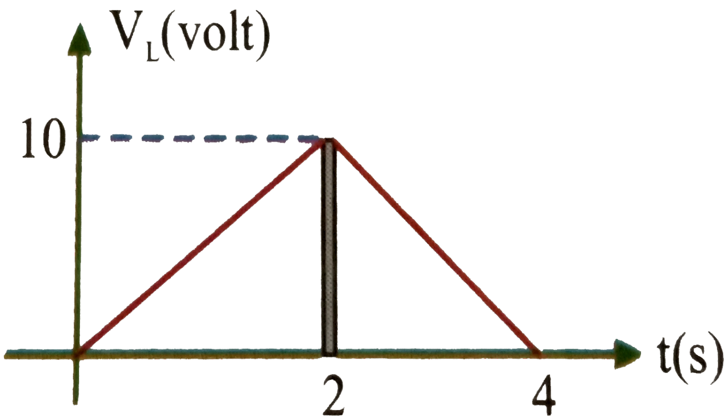
8. The potential difference across a $2H$ inductor as a function of time is shown in figure. At time $t = 0$, current is zero

Current $t = 2$ second is



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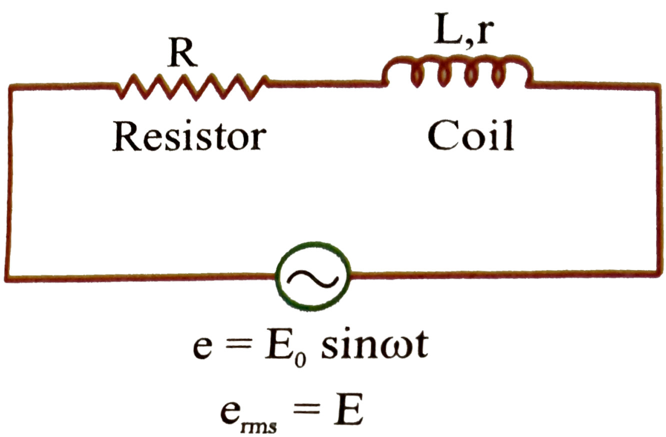
9. For the circuit shown in the figure the rms value of voltage across R and coil are E_1 and E_2 respectively.

The power (thermal) developed across the coil is



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10. 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 $50Hz$.

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11. In LCR circuit current resonant frequency is $600Hz$ and half power points are at 650 and $550Hz$. The quality factor is

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12. A group of electric lamps having a total power rating of 1000 watt is supplied by an AC voltage $E = 200\sin\left(310t + 60^{\circ}\right)$. Then the r.m.s value of the circuit current is

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13. In a L - R circuit, the value of L is $\left(\frac{0.4}{\pi}\right)$ henry and the value of R is 30 ohm. If in the circuit, an alternating e.m.f of 200 vol at 50 cycles per sec is connected, the impendence of the circuit will be

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14. In a transformer the output current and voltage are respectively $4A$ and $20V$. If the ratio of number of turns in the primary to secondary is $2:1$ what is the input current and voltage?

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15. The self inductance of the motor of an electric fan is 10H. In order to impart maximum power at 50 Hz, it should be connected to a capacitance of

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16. A current of 5A is flowing at 220V in the primary coil of a transformer. If the voltage produced in the secondary coil is 2200V and 50% of power is lost, then the current in the secondary coil will be –

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17. The value of L,C and R for a circuit are 1H, 9F and 3Ω . What is the quality factor for the circuit at resonance ?

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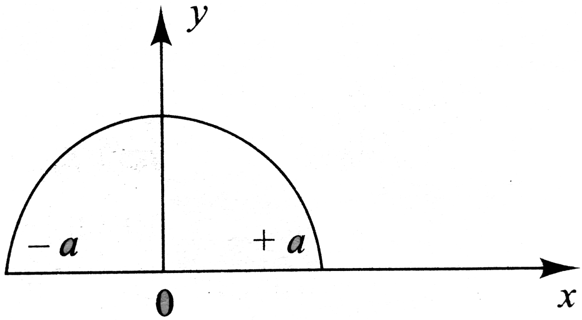
18. Determine the rms value of a semi-circular current wave which has a maximum value of a.



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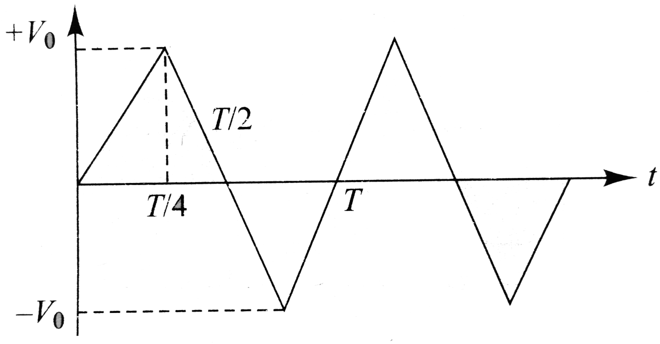
19. The voltage time (V-t) graoh for triangular wave having peak value (V_0) is as shown in fig.



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20. Two series resonant circuits with component values L_1C_1 and L_2C_2 , respectively have the same resonant frequency, They are then connected in series, so that the combination has the same resonant frequency

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21. A circuit containining resistance R_1, Inductance L_1 and capacitance C_1 connected in series resonates at the same frequency $'n'$ as a second combination of R_2, L_2 and C_2 . If the two are connected in series. Then the circuit will resonates at

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22. An AC source of variable frequency is applied across a series L - C - R circuit. At a frequency double the resonace frequency. The impedance is $\sqrt{10}$ times the minimum impedance. . The inductive reactance is

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23. An LCR circuit has $L = 10mL, R = 3\Omega$, and $C = 1\mu F$ connected in series to a source of $15\cos\omega t$ volt. The current amplitude at a frequency that is 10% lower then the resonant frequency is

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24. A $100V$ a.c. source of frequency $500Hz$ is connected to a LCR circuit with $L = 8.1$ millihenry, $C = 12.5\mu F$ and $R = 10$ ohm, all connected in series. What is the potential difference across the resistance?

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25. If the rms current in a 50 Hz ac circuit is 5 A, the value of the current $1/300$ second after its value becomes zero is

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26. An alternating current generator has an internal resistance R_g and an internal reactance X_g. It is used to supply power to a passive load consisting of a resistance R_g and a rectance X_L. For maximum power to be delivered from the generator to the load, the value of X_L is equal to

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27. When a voltage measuring device is connected to a.c. mains the meter shows the steady input voltage of $220V$. This means

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28. To reduce the resonant frequency in an LCR series circuit with a generator

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

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30. A inductor of reactance 1Ω and a resistor of 2Ω are connected in series to the terminals of a 6 V (rms) a.c. source. The power dissipated in the circuit is

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31. The output of a step-down transformer is measured to be $24V$ when connected to a 12 watt light bulb. The value of the peak current is

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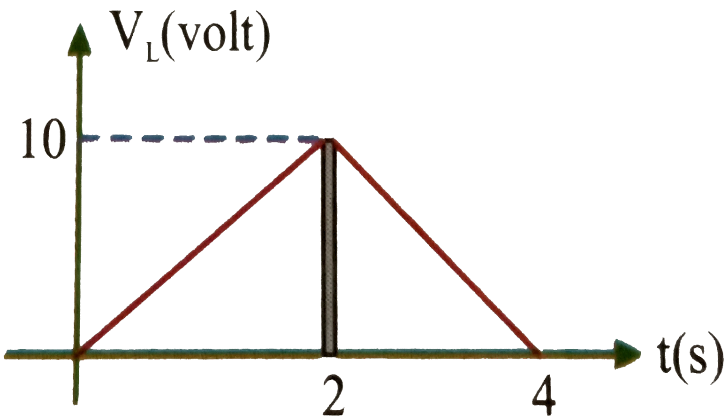
32. The potential difference across a $2H$ inductor as a function of time is shown in figure. At time $t = 0$, current is zero

Current $t = 2$ second is



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33. For the circuit shown in the figure the rms value of voltage across R and coil are E_1 and E_2 respectively.

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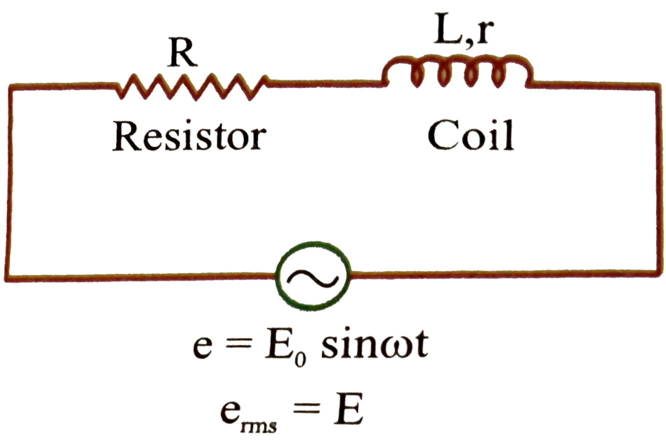

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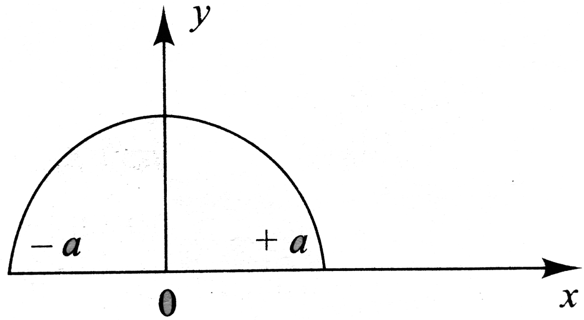

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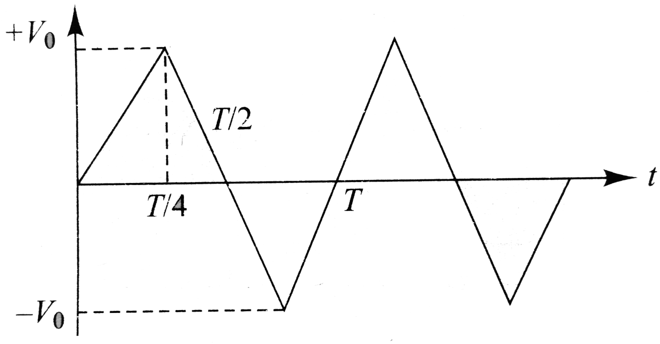
43. The voltage time (V-t) graoh for triangular wave having peak value $\left(V_0\right)$ is as shown in fig.



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44. A circuit containing resistance R_1 inductance L_1 and capacitance C_1 connected in series gives resonance at the same frequency v as a second similar combination of R_2, L_2 and C_2. If the two circuits are connected in series, shown that the whole circuit will resonate with the same frequency.

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45. A circuit containing resistance R_1, Inductance L_1 and capacitance C_1 connected in series resonates at the same frequency$'n'$ as a second combination of R_2, L_2 and C_2 . If the two are connected in series. Then the circuit will resonates at

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