BYJU'S Study Planner for Board Term I
(CBSE Grade 12)

Date: 23/11/2021

Subject: Physics

Topic : Alternating current

Class: Standard XII

1. In a $L-C$ circuit, $L=0.75\ \mathrm{H}$ and $C=18\ \mu\mathrm{F}$, at the instant when the current in the inductor is changing at a rate of $3.40\ \mathrm{A/s}$. What is the charge on capacitor ?

   A. $26\ \mu\mathrm{C}$

   B. $36\ \mu\mathrm{C}$

   C. $46\ \mu\mathrm{C}$

   D. $56\ \mu\mathrm{C}$

2. 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.
   $(I=I_0 \sin \omega t)$ and $I_{\mathrm{rms}}=\dfrac{I_0}{\sqrt{2}}$.

   A. Both (A) and (R) are true, and (R) is the correct explanation of (A)

   B. Both (A) and (R) are true, but (R) is not the correct explanation of (A)

   C. (A) is true but (R) is false

   D. (A) is false but (R) is true

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3. Assertion (A): In series LCR circuit resonance can take place.

   Reason (R): Resonance takes place iff inductive reactance and capacitive reactances are equal with phase difference 180°.

   A. Both (A) and (R) are true, and (R) is the correct explanation of (A)

   B. Both (A) and (R) are true, but (R) is not the correct explanation of (A)

   C. (A) is true but (R) is false

   D. (A) is false but (R) is true

4. Assertion (A): In series LCR resonance circuit, the impedance is equal to the ohmic resistance.

   Reason (R): At resonance, the inductive reactance is equal and opposite to the capacitive reactance.

   A. Both (A) and (R) are true, and (R) is the correct explanation of (A)

   B. Both (A) and (R) are true, and (R) is not the correct explanation of (A)

   C. (A) is true but (R) is false

   D. (A) is false but (R) is true

5. Assertion (A): Power loss in an ideal choke coil will be zero.

   Reason (R): Ideal choke coil has zero power factor.

   A. Both (A) and (R) are true, and (R) is the correct explanation of (A)

   B. Both (A) and (R) are true, and (R) is not the correct explanation of (A)

   C. (A) is true but (R) is false

   D. (A) is false but (R) is true

6. Assertion (A): KVL rule can also be applied to an a.c. circuits.

Reason (R): Varying electrostatic field is non-conservative

A. Both (A) and (R) are true, and (R) is the correct explanation of (A)

B. Both (A) and (R) are true, but (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

7. Comprehension :

An alternating voltage of $260\ \mathrm{V}$ and $\omega = 500\ \mathrm{rad\ s^{-1}}$ is applied in series LCR circuit, where $L = 0.01\ \mathrm{H},\ C = 4 \times 10^{-4}\ \mathrm{F}$ and $R = 10\ \Omega$

(i) Find the resonance frequency of the circuit (in Hz)-

A. $\frac{25}{\pi}$

B. $\frac{250}{\pi}$

C. $\frac{40}{\pi}$

D. $\frac{200}{\pi}$

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8. Comprehension :

An alternating voltage of $260 \mathrm{~V}$ and $\omega=500 \mathrm{rad~s}^{-1}$ is applied in an series LCR circuit, where $L=0.01 \mathrm{~H}, C=4 \times 10^{-4} \mathrm{~F}$ and $R=10 \Omega$

(ii) Find the power supplied by the source is- (in W)-

A. 1000

B. 6760

C. 3380

D. 3000

9. Comprehension :

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

(i) Find the expression of circuit current-

A. $0.2 \sin (1000 t) \mathrm{mA}$

B. $2 \sin (100 t) \mathrm{mA}$

C. $2 \sin (1000 t) \mathrm{mA}$

D. $0.2 \sin (100 t) \mathrm{mA}$

10. Comprehension :

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

(ii) Find the inductive reactance-

A. $2 \times 10^3\ \Omega$

B. $3 \times 10^3\ \Omega$

C. $4 \times 10^3\ \Omega$

D. $5 \times 10^3\ \Omega$

11. Comprehension :

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

(iii) Find amplitude of the voltage across the inductor.

A. $40\ \mathrm{V}$

B. $60\ \mathrm{V}$

C. $80\ \mathrm{V}$

D. $90\ \mathrm{V}$

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12. If the voltage of a source in an AC circuit is represented by the equation, $\mathcal{E} = 220\sqrt{2}\sin(314t)$. Calculate the peak value of the current if the net resistance of the circuit is $220\ \Omega$.

    Take $\sqrt{2} = 1.4$

    A. 1.8 A

    B. 1.6 A

    C. 1.4 A

    D. 1.2 A

13. Two alternating currents having the value $I_1 = 3\sin\omega t$ and $I_2 = 4\sin(\pi/2 - \omega t)$ are superimposed and passed through a hot wire ammeter. Then the reading of the ammeter will be

    A. 5 A

    B. $5/\sqrt{2}\text{ A}$

    C. $7/\sqrt{2}\text{ A}$

    D. 7 A

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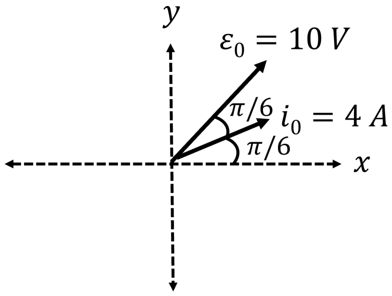
14. The phasor diagram for a component (other than a resistor) connected to an AC source, at an instant, is shown below. The value of voltage across the component and current flowing through the circuit, at this instant, respectively is -



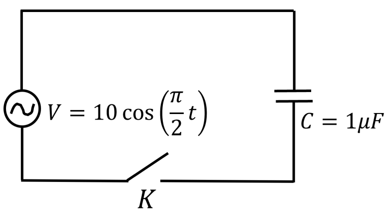
A. $5\sqrt{3}\ \mathrm{V}, 2\sqrt{3}\ \mathrm{A}$

B. $5\ \mathrm{V}, 2\sqrt{3}\ \mathrm{A}$

C. $2\sqrt{3}\ \mathrm{V}, 2\ \mathrm{A}$

D. $5\sqrt{3}\ \mathrm{V}, 2\ \mathrm{A}$

15. An AC voltage source described by $V = 10\cos\left(\frac{\pi}{2}t\right)$ is connected to a $1\ \mu\mathrm{F}$ capacitor as shown in the figure. The key K is closed at $t = 0$. The time $t > 0$ after which the magnitude of current reaches its maximum value for the first time is -



A. $1\ \mathrm{s}$

B. $2\ \mathrm{s}$

C. $3\ \mathrm{s}$

D. $4\ \mathrm{s}$

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16. Applied AC voltage is given as, $V = V_0 \sin(\omega t)$. Corresponding to this voltage, match the following two columns.

Column I	Column II
$a.\ I = I_0 \sin(\omega t)$ $b.\ I = -I_0 \cos(\omega t)$ $c.\ I = I_0 \sin(\omega t + \pi/6)$	$p.$ only R circuit $q.$ only L circuit $r.$ may be RC circuit

A. $a \rightarrow p;\ b \rightarrow q;\ c \rightarrow r$

B. $a \rightarrow q;\ b \rightarrow p;\ c \rightarrow r$

C. $a \rightarrow p;\ b \rightarrow r;\ c \rightarrow q$

D. $a \rightarrow r;\ b \rightarrow q;\ c \rightarrow p$

17. An AC source rated $100\ \mathrm{V}\ (rms)$ supplies a current of $10\ \mathrm{A}\ (rms)$ to a circuit. The average power delivered by the source is

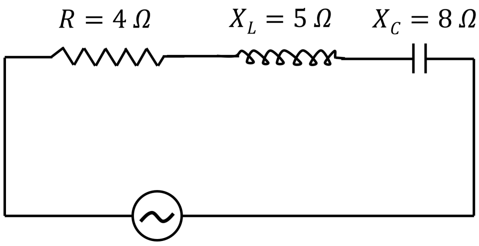
A. may be $1000\ \mathrm{W}$

B. may be less than $1000\ \mathrm{W}$

C. Both options (A) and (B)

D. may be greater than $1000\ \mathrm{W}$

18. For the given AC RLC circuit, at a particular frequency of the AC source, the current -



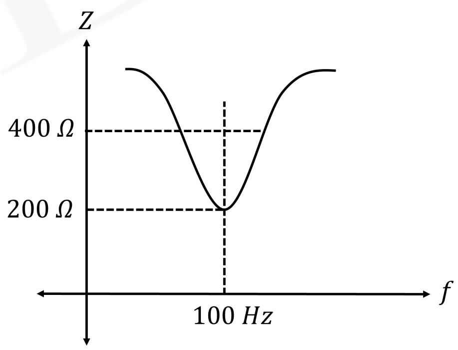
A. Lead the voltage by $\tan^{-1}(3/4)$

B. Lead the voltage by $\tan^{-1}(5/8)$

C. Lag the voltage by $\tan^{-1}(3/4)$

D. Lag the voltage by $\tan^{-1}(5/8)$

19. For the given curve between impedance (Z) and frequency (f) of a series LCR circuit, the value of resistance is -



A. $100\ \Omega$

B. $200\ \Omega$

C. $300\ \Omega$

D. $400\ \Omega$

20. In an ideal transformer, number of turns in the primary coil are 140 and those in the secondary coil are 280. If current in the primary coil is $4 \mathrm{~A}$, then that in the secondary coil is -

A. $4 \mathrm{~A}$

B. $2 \mathrm{~A}$

C. $6 \mathrm{~A}$

D. $8 \mathrm{~A}$