JEE MAIN : CHAPTER WISE TEST PAPER-6

SUBJECT :- PHYSICS **DATE.....**
CLASS :- 12th **NAME.....**
CHAPTER :-ALTERNATING CURRENT **SECTION.....**

(SECTION-A)

1. The peak value of an alternating e.m.f E given by $E = E_0 \cos \omega t$ is 10 volt and frequency is 50 Hz. At time t = (1/600) sec, the instantaneous value of e.m.f is :
(A) 10 volt (B) $5\sqrt{3}$ volt
(C) 5 volt (D) 1 volt

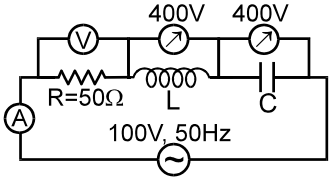
2. An AC voltage of $V = 220\sqrt{2} \sin\left(2\pi 50\, t + \frac{\pi}{2}\right)$ is applied across a DC voltmeter, its reading will be:
(A) $220\sqrt{2}$ V (B) $\sqrt{2}$ V
(C) 220 V (D) zero

3. What is the rms value of an alternating current which when passed through a resistor produces heat, which is thrice that produced by a current of 2 ampere in the same resistor in the same time interval?
(A) 6 ampere (B) 2 ampere
(C) $2\sqrt{3}$ ampere (D) 0.65 ampere

4. A 100 volt AC source of angular frequency 500 rad/s is connected to a LCR circuit with L = 0.8 H, C = 5 μF and R = 10 Ω, all connected in series. The potential difference across the resistance is
(A) $\frac{100}{\sqrt{2}}$ volt (B) 100 volt
(C) 50 volt (D) $50\sqrt{3}$

5. In an AC circuit, a resistance of R ohm is connected in series with an inductance L. If phase angle between voltage and current be 45°, the value of inductive reactance will be.
(A) R/4
(B) R/2
(C) R
(D) cannot be found with the given data

6. In the series LCR circuit as shown in figure, the voltmeter and ammeter readings are :



(A) V = 100 volt, I = 2 amp
(B) V = 100 volt, I = 5 amp
(C) V = 1000 volt, I = 2 amp
(D) V = 300 volt, I = 1 amp

7. A series LCR circuit containing a resistance of 120 ohm has angular resonance frequency 4×10^3 rad s^{-1}. At resonance, the voltage across resistance and inductance are 60V and 40 V respectively. The values of L and C are respectively :
(A) 20 mH, 25/8 μF (B) 2mH, 1/35 μF
(C) 20 mH, 1/40 μF (D) 2mH, 25/8 nF

8. A power (step up) transformer with an 1 : 8 turn ratio has 60 Hz, 120 V across the primary; the load in the secondary is 10^4 Ω. The current in the secondary is
(A) 96 A (B) 0.96 A
(C) 9.6 A (D) 96 mA

9. 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) $\sqrt{\frac{e_1^2 + e_2^2}{2}}$

10. 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
$I = 2 \sin \omega t$ ampere
The power dissipated in the instrument is :
(A) zero (B) 5 watt
(C) 10 watt (D) 2.5 watt

11. A 10 μF capacitor is connected with an ac source $E = 200\sqrt{2}$ sin (100 t) V through an ac ammeter (it reads rms value) . What will be the reading of the ammeter?
(A) 100 mA (B) 300 mA
(C) 500 mA (D) 200 mA

12. If a resistance of 30Ω, a capacitor of reactance 20 Ω, and an inductor of inductive reactance 60Ω are connected in series to a 100 V, 50 Hz power source, then -
(A) A current of 2.0 A flows
(B) A current of 3.33 A flows
(C) Power factor of the circuit is zero
(D) Power factor of the circuit is 2/5

13. **STATEMENT-1 :** Average power consumed in an ac circuit is equal to average power consumed by resistors in the circuit.

STATEMENT-2 : Average power consumed by capacitor and inductor is zero

(A) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True.

14. The self inductance of the motor of an electric fan is 10 H. In order to impart maximum power at 50 Hz, it should be connected to a capacitance of :

(A) 4μF (B) 8μF (C) 1μF (D) 2μF

15. An AC voltage source of variable angular frequency ω and fixed amplitude V 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 impedence of the circuit is unchanged

(D) total impedence of the circuit increases

16. A series 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) None of these

17. The output of an AC generator is given by : $E = E_m \sin(\omega t - \pi/4)$ and current is given by $i = i_m \sin(\omega t - 3\pi/4)$. The circuit contains a single element other than the generator. It is :

(A) a capacitor.

(B) a resistor.

(C) an inductor.

(D) not possible to decide due to lack of information.

18. In an LRC series circuit at resonance current in the circuit is $10\sqrt{2}$ A. If now frequency of the source is changed such that now current lags by 45° than applied voltage in the circuit. Which of the following is correct :

(A) Frequency must be increased and current after the change is 10 A

(B) Frequency must be decreased and current after the change is 10 A

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

(D) The given information is insufficient to conclude anything

19. A coil has an inductance of $\frac{2.2}{\pi}$ H and is joined in series with a resistance of 220 Ω. When an alternating e.m.f. of 220 V at 50 cps is applied to it, then the wattless component of the rms current in the circuit is

(A) 5 ampere (B) 0.5 ampere

(C) 0.7 ampere (D) 7 ampere

20. **Statement I :** Maximum power is dissipated in a circuit containing an inductor, a capacitor and a resistor connected in series with an AC source, when resonance occurs.

Statement II : Maximum power is dissipated in a cirult containing pure resistor due to zero phase difference between current and voltage.

In the light of the above statements, choose the correct answer from the options given below:

(A) Both statement I and Statement II are false.

(B) Statement I is false but Statement II is true.

(C) Both Statement I and Statement II are true.

(D) Statement I is true but Statement II is false.

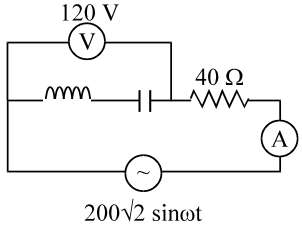
(SECTION-B)

21. A circuit draws a power of 550 watt from a source of 220 volt, 50 Hz. 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, what capacitor (in μF) will have to be connected with it. Round off to nearest integer.

22. A 200 km long telegraph wire has capacity of 0.014 μF per km. If it carries an alternating current of frequency 5 kHz, what should be the value of an inductance (in mH) required to be connected in series so that the impedance is minimum?

23. An LCR series circuit with 100 Ω resistance is connected to an AC source of 200 V and angular 300 radians/sec. 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 60°. Calculate the current and the power (in watt) dissipated in the LCR circuit.

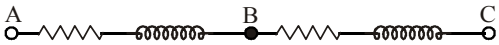
24. In the given LCR series circuit find the reading (in A) of the hot wire ammeter.



25. A coil is connected to an alternating emf of voltage 24 V and of frequency 50 Hz. The reading on the ammeter connected to the coil in series is 10 mA. If a 1μF capacitor is connected to the coil in series the ammeter shows 10 mA again. What would be the approx reading on a dc ammeter (in A) if the coil was connected to a 180 V dc voltage supply? (Take $\pi^2 = 10$)

26. If an AC voltage 100 V is applied between points A and B, then current of 1 A and phase difference between current and voltage will be $\Delta\phi = 37°$. If the same voltage is applied between points B and C, then current of 5 A and $\Delta\phi = 53°$.

What will be the impedance (in Ω) in the chain, if the same voltage is applied between points A and C? Round off to nearest integer.



27. If voltage amplitude across L and R in a L-R series AC circuit is 6 volt and 8 volt respectively, then find voltage across the inductor L at the instant when voltage across R is $4\sqrt{3}$ volt.

28. A series LCR circuit of R = 5 Ω, L = 20 mH and C = 0.5 μF is connected across an AC supply of 250 V, having variable frequency. The power dissipated at resonance condition is _____ $\times 10^2$ W.

29. In an LCR series circuit, an inductor 30 mH and a resistor 1 Ω are connected to an AC source of angular frequency 300 rad/s. The value of capacitance for which, the current leads the voltage by $45°$ is $\frac{1}{x} \times 10^{-3}$ F. Then the value of x is____.

30. A series LCR circuit consists of R = 80 Ω, X_L = 100Ω, and X_C = 40 Ω. The input voltage is 2500 cos (100πt) V. The amplitude of current, in the circuit, is _____A.