DPP

DAILY PRACTICE PROBLEMS

Class : XIIth **Subject : PHYSICS**

Date : **DPP No. :1**

Topic :-Alternating Current

1. A resistor 30 Ω, inductor of reactance 10 Ω and capacitor of reactance 10 Ω are connected in series to an AC voltage source $e = 300\sqrt{2}\sin(\omega t)$. The current in the circuit is

   a) $10\sqrt{2}$ A b) 10 A c) $30\sqrt{11}$ A d) $30/\sqrt{11}$ A

2. The natural frequency (ω_0) of oscillations in L - C circuit is given by

   a) $\frac{1}{2\pi}\frac{1}{\sqrt{LC}}$ b) $\frac{1}{2\pi}\sqrt{LC}$ c) $\frac{1}{\sqrt{LC}}$ d) $\sqrt{LC}$

3. An ac source of angular frequency ω is fed across a resistor r and a capctior C in series. The current registered is I. If the frequency of source is changed to $\omega/3$ (maintaining the same voltage), the current in the circuit is found to be halved. Calculate the ratio of reactance to resistance at the original frequency ω

   a) $\sqrt{\frac{3}{5}}$ b) $\sqrt{\frac{2}{5}}$ c) $\sqrt{\frac{1}{5}}$ d) $\sqrt{\frac{4}{5}}$

4. When a DC voltage of 200 V is applied to a coil of self-inductance $\left(\frac{2\sqrt{3}}{\pi}\right)$H, a current of 1 A flows through it. But by replacing DC source with AC source of 200 V, the current in the coil is reduced to 0.5 A. Then the frequency of AC supply is

   a) 100 Hz b) 75 Hz c) 60 Hz d) 50 Hz

5. The power factor of good choke coil is

   a) Nearly zero b) Exactly zero c) Nearly one d) Exactly one

6. A resistor of $R = 6\Omega$, an inductor of L = 1 H and a capacitor of $C = 17.36$ μF are connected in series with an AC source. Find the Q- factor.

   a) 3.72 b) 40 c) 2.37 d) 80

7. Power dissipated in an LCR series circuit connected to an a.c. source of emf E is

a) $E^2R/\left[R^2+\left(L\omega-\frac{1}{C\omega}\right)^2\right]$

b) $\frac{E^2\sqrt{R^2+\left(L\omega-\frac{1}{C\omega}\right)^2}}{R}$

c) $\frac{E^2\left[R^2+\left(L\omega-\frac{1}{C\omega}\right)^2\right]}{R}$

d) $\frac{E^2R}{\sqrt{R^2+\left(L\omega-\frac{1}{C\omega}\right)^2}}$

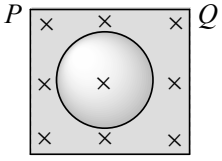
8. A virtual current of $4A$ and $50\ Hz$ flows in an ac circuit containing a coil. The power consumed in the coil is $240\ W$. If the virtual voltage across the coil is $100\ V$ its inductance will be

a) $\frac{1}{3\pi}H$ b) $\frac{1}{5\pi}H$ c) $\frac{1}{7\pi}H$ d) $\frac{1}{9\pi}H$

9. 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) $\frac{\pi}{2}$

10. A vertical ring of radius r and resistance R falls vertically. It is in contact with two vertical rails which are joined at the top, figure. The rails are without friction and resistance. There is a horizontal uniform magnetic field of magnitude B perpendicular to the plane of the ring and the rails. When the speed of the ring is v, the current is the section PQ is



a) Zero b) $\frac{2\,Rrv}{R}$ c) $\frac{4\,Rrv}{R}$ d) $\frac{8\,Brv}{R}$

11. Voltage V and current i in AC circuit are given by

$$V=50\sin(50t)\text{volt}$$

$i=50\sin\left(50t+\frac{\pi}{3}\right)\text{mA}$

The power dissipated in circuit is

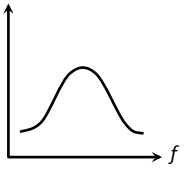
a) 5.0 W b) 2.5 W c) 1.25 W d) Zero

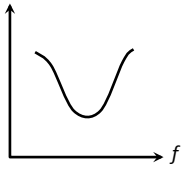
12. In an LCR series resonant circuit which one of the following cannot be the expression for the Q-factor

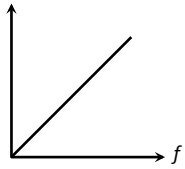
a) $\frac{\omega L}{R}$ b) $\frac{1}{\omega CR}$ c) $\sqrt{\frac{L}{C}}\frac{1}{R}$ d) $\frac{R}{LC}$

13. Which one of the following curves represents the variation of impedance (Z) with frequency f in series LCR circuit

a) 

b) 

c) 

d) 

14. The frequency for which a 5 μF capacitor has a reactance of $\frac{1}{1000} ohm$ is given by

a) $\frac{100}{\pi} MHz$ b) $\frac{1000}{\pi} Hz$ c) $\frac{1}{1000} Hz$ d) $1000\ Hz$

15. The peak value of an alternating current is 5 A and its frequency is 60 Hz. Find its rms value and time taken to reach the peak value of current starting from zero.

a) 3.536A; 4.167 ms b) 3.536 A;15 ms c) 6.07 A; 10 ms d) 2.536 A; 4.167 ms

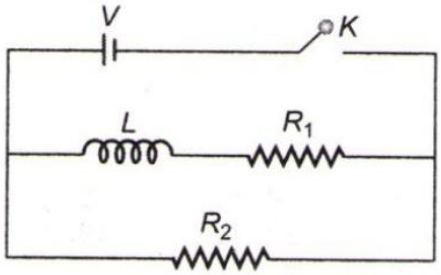
16. The resistance of an R-L circuit is 10 Ω. An emf E_0 applied across the circuit at $\omega = 20$ rad s^{-1}. If the current in the circuit is $\frac{i_0}{\sqrt{2}}$, what is the value of L?

a) 0.5 H b) 2.25 H c) 3.9 H d) 1.0 H

17. In a circuit, the current lags behind the voltage by a phase difference of $\pi/2$, the circuit will contain which of the following?

a) Only R b) Only C c) R and C d) Only L

18. In the circuit shown below, the key K is closed at $t = 0$. The current through the battery is



a) $\frac{VR_1R_2}{\sqrt{R_1^2 + R_2^2}}$ at $t = 0$ and $\frac{V}{R_2}$ at $t = \infty$

b) $\frac{V}{R_2}$ at $t = 0$ and $\frac{V(R_1 + R_2)}{R_1R_2}$ at $t = \infty$

c) $\frac{V}{R_2}$ at $t = 0$ and $\frac{VR_1R_2}{\sqrt{R_1^2 + R_2^2}}$ at $t = \infty$

d) $\frac{V(R_1+R_2)}{R_1R_2}$ at $t = 0$ and $\frac{V}{R_2}$ at $t = \infty$

19. In a circuit, the value of the alternating current is measured by hot wire ammeter as $10\ ampere$. Its peak value will be

a) $10\ A$ b) $20\ A$ c) $14.14\ A$ d) $7.07\ A$

20. In an electrical circuit R, L, C and an a.c. 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, the phase difference is again $\pi/3$. The power factor of the circuit is

a) $1/2$ b) $1/\sqrt{2}$ c) 1 d) $\sqrt{3}/2$