DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 8

Topic :-Alternating current

1 **(b)**

The coil has inductance L besides the resistance R. Hence for ac it's effective resistance $\sqrt{R^2 + X_L^2}$ will be larger than it's resistance R for dc

2 **(a)**

In R-C circuit current increases exponentially with time, so correct graph will be (a)

3 **(d)**

$Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{(11)^2 + (25 - 18)^2} = 13\ \Omega$

Current $i = \frac{260}{13} = 20\ A$

4 **(c)**

Given $X_L = X_C = 5\Omega$, this is the condition of resonance. So $V_L = V_C$, so net voltage across L and C combination will be zero

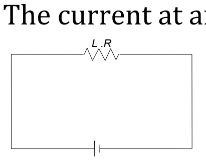
5 **(c)**

$$\frac{n_s}{n_P} = \frac{E_s}{E_P} = \frac{2400}{120} = 20$$

$n_s = 20\ n_P = 20 \times 75 = 1500.$

6 **(b)**

The current at any instant is given by



$$I = I_0(1 - e^{-Rt/L})$$

$$\frac{I_0}{2} = I_0(1 - e^{-Rt/L})$$
$$\frac{1}{2} = (1 - e^{-Rt/L})$$
$$e^{-Rt/L} = \frac{1}{2}$$
$$\frac{Rt}{L} = 1\text{n}\,2$$
$$\therefore \quad t = \frac{L}{2}\, 1\,n\,2 = \frac{3\ 00 \times 1\ \ 0^{-3}}{2} \times 0.6\ \ 93$$
$$= 1\,50 \times 0.6\ \ 93 \times 1\ \ 0^{-3}$$
$$= 0.10395\text{s} = 0.1\text{ s}$$

7 **(d)**

The instantaneous values of emf and current in inductive circuit are given by $E = E_0 \sin \omega t$ and $i = i_0 \sin\left(\omega t - \frac{\pi}{2}\right)$ respectively

So, $P_{\text{inst}} = Ei = E_0 \sin \omega t \times i_0 \sin\left(\omega t - \frac{\pi}{2}\right)$

$$= E_0 i_0 \sin \omega t \left(\sin \omega t \cos \frac{\pi}{2} - \cos \omega t \sin \frac{\pi}{2}\right)$$
$$= E_0 i_0 \sin \omega t \cos \omega t$$
$$= \frac{1}{2} E_0 i_0 \sin 2\omega t \quad (\sin 2\omega t = 2 \sin \omega t \cos \omega t)$$

Hence, angular frequency of instantaneous power is 2ω

8 **(c)**

Resonance frequency $= \frac{1}{2\pi\sqrt{LC}}$ does not depend on resistance

9 **(c)**

$$\cos\phi = \frac{R}{Z} = \frac{R}{\sqrt{R^2 + \omega^2 L^2}} = \frac{5}{\sqrt{25 + (50)^2 \times (0.1)^2}}$$
$$= \frac{5}{\sqrt{25 + 25}} = \frac{1}{\sqrt{2}} \Rightarrow \phi = \pi/4$$

11 **(c)**

Amplitude of $ac = i_0 = \frac{V_0}{R} = \frac{\omega NBA}{R} = \frac{(2\pi v)NB(\pi r^2)}{R}$

$$\Rightarrow i_0 = \frac{2\pi \times \frac{200}{60} \times 1 \times 10^{-2} \times \pi \times (0.3)^2}{\pi^2} = 6\,mA$$

12 **(c)**

In the condition of resonance

$$X_L = X_C$$

or $\quad \omega L = \frac{1}{\omega C} \quad$ ...(i)

Since, resonant frequency remains unchanged,

So, $\sqrt{LC} = \text{constant}$

or $LC = \text{constant}$

$\therefore \quad L_1C_1 = L_2C_2$

$\Rightarrow \quad L \times C = L_2 \times 2\,C$

$\Rightarrow \quad L_2 = \dfrac{L}{2}$

13 **(b)**

This is because, when frequency v is increased, the capacitive reactance $X_C = \frac{1}{2\pi v C}$ decreases and hence the current through the bulb increases

15 **(a)**

In the rotation of magnet, N pole moves closer to coil CD and S pole moves closer to coil AB. As per Lenz's law, N pole should develop at the end corresponding to C. Induced current flows from C to D. Again S pole should develop at the end corresponding to B. Therefore, induced current in the coil flows from A to B.

16 **(d)**

As a given pole (N or S) of suspended magnet goes into the coil and comes out of its, current is induced in the coil in two opposite directions. Therefore, galvanometer deflection goes to left and right both. As amplitude of oscillation of magnet goes on decreasing, so does the amplitude of deflection.

17 **(b)**

As is for Fig. (i), steady state current for t = both the circuits is same. Therefore,

$\frac{V}{R_1} = \frac{V}{R_2}$

Or $R_1 = R_2$

Again, from the same figure, we observe that

$\tau_1 < \tau_2 \quad \therefore \dfrac{L_1}{R_1} < \dfrac{L_2}{R_2}$

As $R_1 = R_2$, therefore, $L_1 < L_2$.

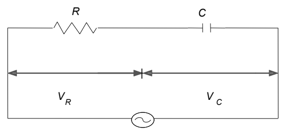
18 **(b)**

$P = VI$

$I = \dfrac{550}{220} = 2.5\ A$

19 **(a)**

Let the applied voltage be V volt.



Here, $V_R = 12\ V, V_C = 5\ V$

$$\therefore \quad V = \sqrt{V_R^2 + V_C^2} = \sqrt{(12)^2 + (5)^2}$$

$$= \sqrt{144 + 25} = \sqrt{169} = 13\text{V}$$

20 **(c)**

$$i = i_0\left(1 - e^{-\frac{Rt}{L}}\right)$$

$$\Rightarrow \quad \frac{di}{dt} = \frac{d}{dt}\ i_0 - \frac{d}{dt}\left(i_0 e^{-\frac{Rt}{L}}\right) = 0 + \frac{i_0 R}{L}\ e^{-\frac{Rt}{L}}$$

Initially, $t = 0$

$$\Rightarrow \quad \frac{di}{dt} = \frac{i_0 \times R}{L} = \frac{E}{L} = \frac{5}{2} = 2.5\ \text{A}s^{-1}$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	A	D	C	C	B	D	C	C	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	C	B	A	A	D	B	B	A	C

PE