DPP

DAILY PRACTICE PROBLEMS

Class : XIIth

Date :

Solutions

Subject : PHYSICS

DPP No. : 2

Topic :-Alternating current

1 **(b)**

From the relation, $\tan\phi = \frac{\omega L}{R}$

Power factor $\cos\phi = \frac{1}{\sqrt{1+\tan^2\phi}}$

$$= \frac{1}{\sqrt{1+\left(\frac{\omega L}{R}\right)^2}}$$

$$= \frac{R}{\sqrt{R^2+\omega^2 L^2}}$$

2 **(a)**

$$\frac{1}{L_p} = \frac{1}{L} + \frac{1}{L} = \frac{2}{L} \quad or \quad L_P = \frac{L}{2}$$

Where L is inductance of each part

$$= \frac{1.8 \times 10^{-4}}{2} = 0.9 \times 10^{-4}\text{ H}$$

$$\therefore L_P = \frac{L}{2} = \frac{0.9 \times 10^{-4}}{2} = 0.45 \times 10^{-4}\text{H}$$

Resistance of each part, $r = \frac{6}{2} = 3\Omega$

Now, $\frac{1}{r_P} = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$

$\therefore r_P = 3/2\Omega$

Time constant of circuit $= \frac{L_P}{r_P} = \frac{0.45 \times 10^{-4}}{3/2} = 8\text{A}$

3 **(b)**

The applied voltage is given by $V = \sqrt{V_R^2 + V_L^2}$

$V = \sqrt{(200)^2 + (150)^2} = 250\ volt$

4 **(d)**

The voltage across secondary in zero, as transformer does not work on DC supply.

5 **(c)**

From $e = \frac{Ldi}{dt}$, when $\frac{di}{dt} = 1, e = L$

6 **(b)**

$$\frac{L_2}{L_1} = \frac{N_2^2}{N_1^2}$$

$\therefore \; L_2 = L_1 \frac{N_2^2}{N_1^2} = 1.5 \left(\frac{500}{100}\right)^2 = 375$ mH

7 **(b)**

$$\cos\phi = \frac{R}{Z} = \frac{R}{\sqrt{R^2 + \omega^2 L^2}}$$

$$= \frac{12}{\sqrt{(12)^2 + 4 \times \pi^2 \times (60)^2 \times (0.1)^2}} \Rightarrow \cos\phi = 0.30$$

8 **(d)**

Magnetic field intensity at a distance r from the straight wire carrying current is

$B = \frac{\mu_0 i}{2\pi r}$

As area of loop, $A = a^2$

And magnetic flux, $\phi = BA$

$$\therefore \; \phi = \frac{\mu_0 i a^2}{2\pi r}$$

The induced emf in the loop is

$$e = \left|\frac{d\phi}{dt}\right| = \left|\frac{d}{dt} \; \frac{\mu_0 \, i \, a^2 v}{2 \, \pi \, r}\right|$$

$$e = \frac{\mu_0 i a^2 \, dr}{2 \, \pi \, r^2 dt} = \frac{\mu_0 i \, a^2 v}{2 \, \pi \, r^2}$$

Where $v = \frac{dr}{dt}$ is velocity .

9 **(c)**

Phase difference $\Delta\phi = \phi_2 - \phi_1 = \frac{\pi}{6} - \left(\frac{-\pi}{6}\right) = \frac{\pi}{3}$

0 **(b)**

As $L = \frac{\mu_0 N^2 A}{l}$

$\therefore \; A \rightarrow \frac{2 \times 2 \times 4}{2}$ times $= 8$ times

12 **(a)**

$i_P = \frac{n_s}{n_P} i_s = \frac{50}{200} \times 40 = 10$ A

13 **(a)**

Current $i = i_0 \sin(\omega t + \phi)$

$i_p = i_0 \sin \omega t \cos \phi + i_0 \cos \omega t \sin \phi$

Thus, $i_0 \cos \phi = 10$

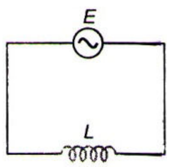
$i_0 \sin \phi = 8$

Hence, $\tan \phi = \frac{4}{5}$

14 **(d)**

In a purely inductive circuit, current is

$$i = i_0 \sin\left(\omega t - \frac{\pi}{2}\right)$$



Which shows that the current lags behind the emf by a phase angle of $\frac{\pi}{2}$ or 90° or the emf leads the current by a phase angle of $\frac{\pi}{2}$ or 90°.

15 **(b)**

$P = \frac{V_{rms}^2}{R} = \frac{(30)^2}{10} = 90\ W$

17 **(c)**

In series LCR, the impedance of the circuit is given by

$Z = \sqrt{R^2 + (X_L - X_C)^2}$

At resonance, $X_L = X_C$

$\therefore Z = R$

At resonance, the phase difference between the current and voltage is 0°. Current is maximum at resonance

19 **(c)**

$e = \frac{E_P i_P}{E_s} = \frac{1100 \times 100}{220} = 500$ A=0.5 kA

20 **(c)**

Impedance $Z = \sqrt{R^2 + X^2} = \sqrt{(8)^2 + (6)^2} = 10\Omega$

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