**DPP**
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

**Solutions**

Subject : PHYSICS
DPP No. : 6

# Topic :-Alternating current

2 **(c)**

As $e = M\frac{di}{dt}$

$\therefore\ 30 \times 10^3 = 3 \times \frac{10}{dt},$

$d = \frac{30}{30 \times 10^3} = 10^{-3}$ s

3 **(b)**

Wheatstone bridge is balanced. Current through $AC$ is zero. Effective resistance R of bridge is

$\frac{1}{R} = \frac{1}{6} + \frac{1}{6} = \frac{1}{3}, R = 3\Omega$

Total resistance $= 1 + 3 = 4\Omega$

Induced emf

$e = iR = Blv$

$\therefore\ v = \frac{iR}{Bl} = \frac{1 \times 10^{-3} \times 4}{2 \times 0.1}$

$= 2 \times 10^{-2}$ ms$^{-1}$

4 **(b)**

Motional emf across $PQ$

$V = Blv = 4(1)\,(2) =$ 8 volt

This is the potential to which the capacitor is charged.

As $q = CV$

$\therefore\ q = (10 \times 10^{-6})8 = 10^{-5}C = 80\mu\,C$

As magnetic force on electron in the conducting rod $PQ$ is towards $Q$, therefore, $A$ is positively charged and $B$ is negatively charged

$ie,\ q_A = +80\mu\,C$ and $q_B = -80\,\mu\,C$

5 **(c)**

The DC generator must be mixed wound to with stand the load variation.

6 **(a)**

For imparting max power

$$X_L = X_C \Rightarrow \omega L = \frac{1}{\omega C}$$

$$C = \frac{1}{\omega^2 L} = \frac{1}{(2\pi f)^2 \times L} = \frac{1}{(100\pi)^2 \times 10} = 1 \times 10^{-6} = 1\mu F$$

8 **(c)**

$$Z = \sqrt{R^2 + \left(\frac{1}{2\pi v C}\right)^2} = \sqrt{(3000)^2 + \frac{1}{\left(2\pi \times 50 \times \frac{2.5}{\pi} \times 10^{-6}\right)^2}}$$

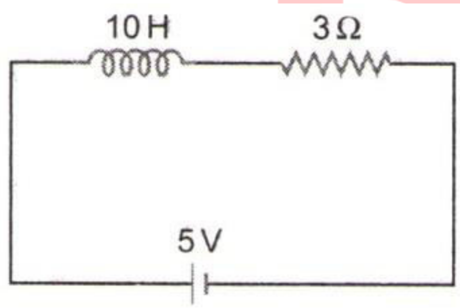
$$\Rightarrow Z = \sqrt{(3000)^2 + (4000)^2} = 5 \times 10^3 \Omega$$

So power factor $\cos\phi = \frac{R}{Z} = \frac{3000}{5 \times 10^3} = 0.6$ and power

$$P = V_{rms} i_{rms} \cos\phi = \frac{V_{rms}^2 \cos\phi}{Z} \Rightarrow P = \frac{(200)^2 \times 0.6}{5 \times 10^3} = 4.8W$$

10 **(d)**

Rise of current in $L - R$ circuit is given by




$$I = I_0(1 - e^{-t/\tau})$$

Where, $I_0 = \frac{E}{R} = \frac{5}{5} = 1$ A

Now, $\tau = \frac{L}{R} = \frac{10}{5} = 2$ s

After 2s, *ie*, at $t = 2$ s

Rise of current $I = (1 - e^{-1})$A

11 **(b)**

As $e = M dI/dt$,

$\therefore \; M = \frac{edt}{dI} = -\frac{15000 \times 0.001}{3} = 5$H

12 **(b)**

At resonance, $LCR$ circuit behaves as purely resistive circuit. For purely resistive circuit power factor $= 1$

13 **(a)**

Voltage across the capacitors will increase from 0 to 10 V exponentially. The voltage at time $t$ will be given by

$V = 10(1 - e^{-t/\tau_C})$

Here $\tau_C = C_{\text{net}}R_{\text{net}} = (1 \times 10^6)(4 \times 10^{-6}) = 4$ s

$\therefore \; V = 10(1 - e^{-t/4})$

Substituting $V = 4$ volt, we have,

$$4 = 10(1 - e^{-t/4})$$

$$e^{-t/4} = 0.6 = \frac{3}{5}$$

Taking log both sides we have,

$$-\frac{t}{4} = \text{In } 3 - \text{In } 5$$

or $\quad t = 4(\text{In } 5 - \text{In } 3) = 2\text{s}.$

14 **(c)**

From $L = \frac{\mu_0 N^2 A}{l} = \frac{\mu_0 \mu_r N^2 A}{l}$,

When $\mu = 1000$ and $N$ becomes $\frac{1}{10}$

$\therefore \; L$ becomes $1000 \times \left(\frac{1}{10}\right)^2 = 10$ times

*ie*, $\; L = 10 \times 0.1 = 1\text{H}$

15 **(b)**

From $R = \frac{E - V}{i}$

$0.5 = \frac{120 - V}{8}$

$V = 116\, V$

17 **(b)**

In non resonant circuits

Impedance $Z = \frac{1}{\sqrt{\frac{1}{R^2} + \left(\omega C - \frac{1}{\omega L}\right)^2}}$, with rise in frequency $Z$ decreases, *i.e.*, current increases so circuit behaves as capacitive circuit

18 **(c)**

Phase difference in $R - L$ circuit,

$$\phi = \tan^{-1}\frac{X_L}{R}$$

or $\quad \tan 45° = \frac{X_L}{R}$

or $\quad X_L = R$

19 **(d)**

At resonant frequency current in series $LCR$ circuit is maximum

20 **(d)**

Magnetic field at the centre of primary coil $B = \mu_0 i_1 / 2R_1$. Considering it to be uniform, magnetic flux passing through secondary coil is

$$\phi = BA = \frac{\mu_0 i_1}{2R_1}\left(\pi R_2^2\right)$$

Now, $M = \frac{\phi_2}{i_1} = \frac{\mu_0 \pi R_2^2}{2R_1}$

$$\therefore \quad M \propto \frac{R_2^2}{R_1}$$

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