DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 6

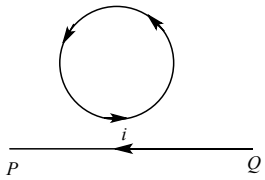
Topic :- Electro Magentic Induction

1 **(d)**

$e = M\frac{di}{dt} = 1.25 \times 80 = 100\ V$

2 **(a)**

From right hand thumb rule, the magnetic field passing through the loop due to the current i will be perpendicular to the plane of the page pointing downwards. The direction of current in the loop will be such as to oppose the increase of this field (Lenz's law), hence direction of induced current in the loop is anticlockwise.



3 **(c)**

$e = NBA\omega;\ \omega = 2\pi f = 2\pi \times \frac{2000}{60}$

$\therefore e = 50 \times 0.05 \times 80 \times 10^{-4} \times 2\pi \times \frac{2000}{60} = \frac{4\pi}{3}$

4 **(a)**

$i = \frac{E - e}{R} = \frac{220 - 210}{2} = \frac{10}{2} = 5A$

5 **(c)**

From formula

$$L = \frac{\phi}{i} = \frac{\mu_0 N^2 A}{2r} = \frac{\mu_0 N^2 \pi r^2}{2} r$$

$\Rightarrow \quad L \propto N^2$

So, if $N$is doubled, self inductance will be four times.

6 **(c)**

Rate of decay of current between $t = 5\ ms$ to $6\ ms = \frac{di}{dt} = -$ (Slope of the line BC)

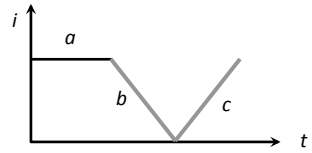
$= -\left(\frac{5}{1 \times 10^{-3}}\right) = -5 \times 10^3 A/s$. Hence induced emf

$e = -L\frac{di}{dt} = -4.6 \times (-5 \times 10^3) = 23 \times 10^3 V$

7 **(c)**

Emf induces during 'a' $= 0$

emf induces during 'b' is constant throughout emf induces during 'c' is constant throughout magnitude of emf induced during 'b' is equal to the magnitude of emf induced during 'c'. But the direction opposite



8 **(b)**

In a constant magnetic field conducting ring oscillates with a frequency of 100 Hz

i.e., $T = \frac{1}{100}s$, in time $\frac{T}{4}$ flux links with coil changes from BA to zero $\Rightarrow$ Induced emf $= \frac{\text{change in flux}}{\text{time}}$

$$= \frac{BA}{T/4} = \frac{4BA}{T} = \frac{4B \times \pi r^2}{T} = \frac{4 \times 0.01 \times \pi \times 1^2}{1/100} = 2\pi V$$

Induced electric field along the circle, using Maxwell equation $\oint E.dl = -\frac{d\phi}{dt} = A\frac{dB}{dt} = e$

$$\Rightarrow E = \frac{1}{2\pi r} \times \left(\pi r^2 \times \frac{dB}{dt}\right) = \frac{e}{2\pi r} = \frac{4\pi}{2\pi r} = 2V/m$$

10 **(b)**

Mutual inductance of the pair of coils depends on distance between two coils and geometry of two coils.

11 **(d)**

$$P = \frac{e^2}{R}; e = -\frac{d}{dt}(BA) = A\frac{d}{dt}\left(B_0 e^{-t}\right) = AB_0 e^{-t}$$

$$\Rightarrow P = \frac{1}{R}\left(AB_0 e^{-t}\right)^2 = \frac{A^2 B_0^2 e^{-2t}}{R}$$

At the time of starting $t = 0$ so $P = \frac{A^2 B_0^2}{R}$

$$\Rightarrow P = \frac{(\pi r^2)^2 B_0^2}{R} = \frac{B_0^2 \pi^2 r^4}{R}$$

12 **(c)**

$L = 40\ m, v = 1080 km\ h^{-1} = 300 m\ sec^{-1}$ and $B = 1.75 \times 10^{-5} T \Rightarrow e = Blv = 1.75 \times 10^{-5} \times 40 \times 300 = 0.21\ V$

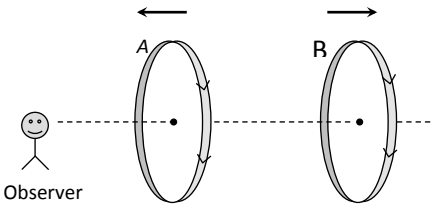
13 **(b)**

The emf developed between the centre and the rim is

$$e = \frac{1}{2}B\omega l^2 = \frac{1}{2} \times 0.05 \times 60[1]^2 = 1.5\ \text{V}$$

14 **(a)**

Induced current in both the coil assists the main current so current through each coil increases



15 **(a)**

Given, $N_P = 20, N_S = 10,\ \ e_p = 220\text{V}$

$\therefore$ Transformation ratio, k

$$\frac{e_s}{e_p} = \frac{N_s}{N_p}$$

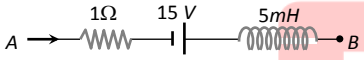
or $e_s = \frac{N_s}{N_p} \times ep$

$$= \frac{10}{20} \times 220 = 110 \text{ V}$$

16 **(c)**

By using Kirchhoff's voltage law

$$V_A - i\,R + E - L\frac{di}{dt} = V_B \Rightarrow V_B - V_A = 15\ volt$$



17 **(b)**

According to Lenz's law of electromagnetic induction, the relative motion between the coil and magnet produces change in magnetic flux.

19 **(c)**

A transformer is a device used to convert alternating current at high voltage into low voltage and $vice - versa$

20 **(a)**

In step-up transformer, number of turns in primary coil is less than the number of turns in secondary coil.

$ie,$ $\frac{N_s}{N_p} > 1$

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