DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 2

Topic :- Electro Magentic Induction

1 **(d)**

$$\eta = \frac{V_s i_s}{V_p i_p} \times 100 = \frac{11 \times 90}{220 \times 5} \times 100 = 90\ \%$$

2 **(c)**

In the construction of mouth piece of a telephone, we use the phenomenon of change of resistance with pressure (of sound waves).

3 **(d)**

$$e = M\frac{di}{dt} = 0.09 \times \frac{20}{0.006} = 300\ V$$

4 **(b)**

Betatron uses the phenomenon of electromagnetic induction.

5 **(b)**

Induced potential difference between two ends $= Blv = B_H lv$

$= 3 \times 10^{-5} \times 2 \times 50 = 30 \times 10^{-3} volt = 3\ millivolt$

By Fleming's right hand rule, end A becomes positively charged

6 **(d)**

$e_0 = \omega NBA = (2\pi v)NBA$

$= 2 \times 3.14 \times 1000 \times 5000 \times 0.2 \times 0.25 = 157\ kV$

7 **(a)**

Here, $A = 10 \times 5 = 50\text{cm}^2 = 50 \times 10^{-4}\text{m}^2$

$\frac{dB}{dt} = 0.2\ \text{Ts}^{-1}$

$R = 2\Omega$

$$E = \frac{d\phi}{dt} = A.\frac{dB}{dt} = 50 \times 10^{-4} \times 0.02 = 10^{-4}\text{V}$$

Power dissipated in the form of heat

$$= \frac{E^2}{R} = \frac{10^{-4} \times 10 - 4}{2} = 0.5 \times 10^{-8}\text{W}$$

$= 5 \times 10^{-9}\text{W} = 5\text{nW}$

8 **(a)**

While moving due north, the truck intercepts vertical component of earth's field.

$\therefore \; e = Blv = (90 \times 10^{-6})2.5 \times 30$

$= 6.75 \times 10^{-23}\text{V} = 6.75 \text{ mV}$

According to Lenz's law, west end of the axle will be positive.

9 **(a)**

$$e = \frac{d\phi}{dt} = \frac{BdA}{dt} = \frac{2(\pi r^2 - L^2)}{dt} = 6.6 \times 10^{-3}\, V$$

11 **(c)**

Inductors obey the laws of parallel and series combination of resistors

12 **(a)**

$H = \frac{V^2 t}{R}$ and $V = \frac{N(B_2 - B_1)A\cos\theta}{t}$

$$V = \frac{1 \times (1 - 2) \times 0.01 \times \cos 0°}{10^{-3}} = 10\, V$$

So, $H = \frac{(10)^2 \times 10^{-3}}{0.01} = 10\, J$

13 **(b)**

$N = 1000, \qquad A = 500\text{cm}^2 = 500 \times 10^{-4}$

$= 5 \times 10^{-2}\text{m}^2$

$B = 2 \times 10^{-5}\text{ Wb} - \text{m}^{-2}, \theta_1 = 0°,$

$\theta_2 = 180°, \Delta t = 0.2\text{ s}$

Initial flux linked with coil

$\phi_1 = NBA\cos\theta_1$

$= NBA\cos 0°$

$= NBA$

Final flux $\phi_2 = NBA\cos 180^0$

$= NBA(-1) = -NBA$

Change in flux $\phi = \phi_2 - \phi_1$

$= \; -NBA - (NBA) = -2NBA$

$\therefore$ Induced emf

$e = \frac{-\Delta\phi}{\Delta t} = -\frac{(-2NBA)}{\Delta t} = \frac{2NBA}{\Delta t}$

$$= \frac{2 \times 1000 \times 2 \times 10^{-5} \times 5 \times 10^{-2}}{0.2}$$

$= 10 \times 10^{-3}\text{V} = 10\text{ mV}$

14 **(d)**

The magnetic flux through area A placed in magnetic field B is
$\phi = BA\cos\theta$
given, $\theta = 0°, B = 1\ \text{Ts}^{-1}$,

$$A = (10)^2\text{cm}^2 = 10^{-2}\text{m}^2$$

$\therefore \quad \phi = 1 \times 10^{-2}$

By Faraday's law, induced emf is

$$e = -N\frac{\Delta\phi}{\Delta t}$$
$$= -500 \times 10^{-2} = -5\ \text{V}$$

15 **(b)**

We know that $i = i_0\left[1 - e^{\frac{-Rt}{L}}\right]$ or $\frac{3}{4}i_o = i_o\left[1 - e^{-t/\tau}\right]$

[where $\tau = \frac{L}{R} =$ time constant]

$\frac{3}{4} = 1 - e^{-t}$ or $e^{-t/\tau} = 1 - \frac{3}{4} = \frac{1}{4}$

$e^{t/\tau} = 4$ or $\frac{t}{\tau} = \ln 4$

$\Rightarrow \tau = \frac{t}{\ln 4} = \frac{4}{2\ln 2} \Rightarrow \tau = \frac{2}{\ln 2} sec$

16 **(a)**

The current flows through the coil 1 is $I_1 = I_0 \sin\omega t$

Where I_0 is the peak value of current

Magnetic flux linked with the coil 2 is

$\phi_2 = MI_1 = MI_0 \sin\omega t$

Where M is the mutual inductance between the two coils

The magnitude of induced emf in coil 2 is

$|\varepsilon_2| = \frac{d\phi_2}{dt} = \frac{d}{dt}(MI_0 \sin\omega t) = MI_0\omega\cos\omega t$

$\therefore$ Peak value of voltage induced in the coil 2 is

$= MI_0\omega = 150 \times 10^{-3} \times 2 \times 2\pi \times 50 = 30\pi\ V$

17 **(c)**

$L = \frac{\mu_0 N^2 A}{l} = \frac{4\pi \times 10^{-7} \times (1000)^2 \times 10 \times 10^{-4}}{1}$

$= 1.256\ mH$

18 **(b)**

$e = Bvl \Rightarrow e = 0.7 \times 2 \times (10 \times 10^{-2}) = 0.14\ V$

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