DPP

DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 8

Topic :- Electro Magentic Induction

11 **(a)**

$\phi = BA = 10 \; weber$

12 **(d)**

Energy stored,

$$U = \frac{1}{2} Li^2$$

$$= \frac{1}{2} \times 50 \times 10^{-3} \times 2 \times 2 = 0.1 \text{ J}$$

13 **(a)**

$$\eta = \frac{V_s I_s}{V_p I_p} = 0.8 \Rightarrow I_P = \frac{(440)(2)}{(0.8)(220)} = 5 \; A$$

14 **(c)**

$$\frac{\Delta i}{\Delta t} = \frac{10}{2} = 5A/\text{sec} \Rightarrow e = L \frac{\Delta i}{\Delta t} = 0.5 \times 5 = 2.5 \; volts$$

15 **(d)**

Magnetic field, $\phi_B = BA \cos\theta$

Where θ is the angle between normal to the plane of the coil and magnetic field

Induced emf, $\varepsilon = BA \sin\theta$

Here, $\theta = 0°$

∴ Magnetic flux is maximum and induced emf is zero

16 **(d)**

Relative velocity $= v - (-v) = 2v = \frac{dl}{dt}$

Now, $e = \frac{d\phi}{dt}$

$$e = \frac{Bldl}{dt} \qquad \left(\frac{dl}{dt} = 2v\right)$$

Induced emf $e = 2 \; Blv$

18 **(b)**

The flux associated with coil of area A and magnetic induction B is

$\phi = BA \cos\theta$

$$= \frac{1}{2} B\pi r^2 \cos \omega t \qquad \left[\because A = \frac{1}{2}\pi r^2\right]$$

$$\therefore e_{\text{induced}} = -\frac{d\phi}{dt}$$

$$= -\frac{d}{dt}\left(\frac{1}{2} B\pi r^2 \cos \omega t\right)$$

$$= \frac{1}{2} B\pi r^2 \omega \sin \omega t$$

$$\therefore \text{power } p = \frac{e_{\text{induced}}^2}{R}$$

$$= \frac{B^2\pi^2 r^4 \omega^2 \sin^2 \omega t}{4R}$$

Hence, $P_{\text{mean}} = < p >$

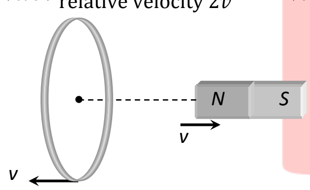
$$= \frac{B^2\pi^2 r^4 \omega^2}{4R} \cdot \frac{1}{2} \qquad \left(\because < \sin \omega t > = \frac{1}{2}\right)$$

$$= \frac{(B\pi r^2 \omega)^2}{8R}$$

10 **(b)**

$$\left(\frac{d\phi}{dtr}\right)_{\text{In first case}} = e$$

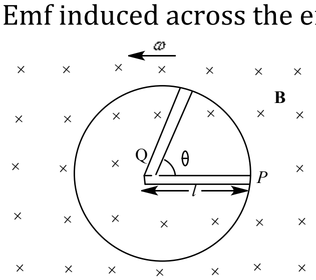
$$\left(\frac{d\phi}{dt}\right)_{\text{relative velocity } 2v} = 2\left(\frac{d\phi}{dt}\right)_{\text{I case}} = 2e$$



11 **(b)**

A conducting rod of length l whose one end is fixed, is rotated about the axis passing through its fixed end and perpendicular to its length with constant angular velocity ω. Magnetic field (B) is perpendicular to the plane of the paper.

Emf induced across the ends of the rod is $e = BAn$



$$= B\pi l^2 n$$

$$= \frac{Bl^2\pi}{T}$$

$$= \frac{1}{2} Bl^2 \omega$$

12 **(a)**

$$v_0 = \frac{1}{2\pi\sqrt{(0.25)\times(0.1\times10^{-6})}} = \frac{10^4}{9.93} = 1007\ Hz$$

13 **(c)**

Eddy currents are set up when a plate swings in a magnetic field. This opposes the motion

14 **(c)**

$$i = \frac{|e|}{R} = \frac{N}{R}\cdot\frac{\Delta B}{\Delta t}A\cos\theta = \frac{20}{100}\times 1000\times\left(25\times10^{-4}\right)\cos 0°$$

$\Rightarrow i = 0.5\ A$

15 **(c)**

$l = 36\text{m}, v = 400\ \text{kmh}^{-1}$

$= \frac{400\times1000}{60\times60} = \frac{100}{9}\ \text{ms}^{-1}$

$= \text{V}= 4\ \times 10^{-5}\text{T}$

$e = Blv = 4\times10^{-5}\times 36\times\frac{1000}{9} = 0.16\text{V}$

16 **(a)**

Given $\frac{di}{dt} = 2A/sec., L = 5\ H\ \therefore e = L\frac{di}{dt} = 5\times 2 = 10\ V$

17 **(c)**

$$i = \frac{V}{R} = \frac{10}{2} = 5A$$

$$U = \frac{1}{2}Li^2 = \frac{1}{2}\times 2\times 25 = 25\ J$$

18 **(b)**

When coil is open, there is no current in it, hence no flux associated with it, $ie, \phi = 0$.

Also, we know that flux linked with the coil is directly proportional to the current in the coil,

$$ie, \qquad \phi \propto i$$

Or $\phi = Li$

Where L is proportionality constant known as self-inductance.

$$\therefore \qquad L = \frac{\phi}{i} = 0$$

Again since i =0, hence $R = \infty$.

19 **(b)**

The magnitude of induced e.m.f. is directly proportional to the rate of change of magnetic flux. Induced charge doesn't depend upon time

20 **(c)**

Motor e.m.f. equation $E_b = V - I_aR_a$

At starting $E_b = 0$, so I_a will be maximum

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