DPP
DAILY PRACTICE PRODUCTS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 1

Topic :- Electro Magentic Induction

1 **(a)**

$$\frac{80}{100}=\frac{120\times 20}{1000\times I_p}$$

$$I_p=\frac{120\times 20}{1000\times 0.8}=3\text{ A}$$

2 **(a)**

If bar magnet is falling vertically through the hollow region of long vertical copper tube then the magnetic flux linked with the copper tube (due to 'non-uniform' magnetic field of magnet) changes and eddy currents are generated in the body of the tube by Lenz's law. The eddy currents oppose the falling of the magnet which therefore experience a retarding force. The retarding force increases with increasing velocity of the magnet and finally equals the weight of the magnet. The magnet then attains a constant final terminal velocity $i.e.$, magnet ultimately falls with zero acceleration in the tube

3 **(c)**

$\frac{N_p}{N_s}=\frac{V_p}{V_s}=\frac{i_s}{i_p}$. The transformer is step-down type, so primary coil will have more turns. Hence

$$\frac{5000}{500}=\frac{2200}{V_s}=\frac{i_s}{4}\Rightarrow V_s=220\,V.\,i_s=40\,amp$$

4 **(c)**

Efficiency of transformer,

$$\eta=\frac{\text{Output power}}{\text{Input power}}$$

$$\Rightarrow \quad \frac{88}{100}=\frac{880}{P_i}$$

$$\Rightarrow \quad P_i=1000\text{ W}$$

Input current , $I_p=\frac{P_i}{V_i}$

$$=\frac{1000}{2200}=0.45\text{ A}$$

5 **(a)**

For 100% efficient transformer

$$V_s i_s=V_p i_p\Rightarrow\frac{V_s}{V_p}=\frac{i_p}{i_s}=\frac{N_s}{N_p}\Rightarrow\frac{i_p}{4}=\frac{25}{100}\Rightarrow i_p=1\,A$$

6 **(a)**

Crosses (×) linked with the loop are decreasing, so induced current in it is clockwise, $i.e.$, from $B\to A$. Hence electrons flow from plate A and B so plate A becomes positively charged

7 **(c)**

$$M=\frac{\mu_0 N_1 N_2 A}{l}$$

8 **(a)**

$\frac{di}{dt}=$ slope of $i-t$ graph; slope of graph (2) < slope of graph (1) so $\left(\frac{di}{dt}\right)_2<\left(\frac{di}{dt}\right)_1$; Also $L\propto$

$\frac{1}{(di/dt)} \Rightarrow L_2 > L_1$

9 **(b)**

The emf induced will be

$$e = vBl = 1 \times 0.5 \times 2 = 1 \text{ V}$$

10 **(b)**

Induced emf is given by

$$e = -\frac{d\phi}{dt}$$

If the radius of loop is r at a time t, then the instantaneous magnetic flux is given by

$$\phi = \pi r^2 B$$

$$\therefore \quad e = -\frac{d}{dt}(\pi r^2 B)$$

$$e = -\pi B\left(\frac{2r\, dr}{dt}\right)$$

$$e = -2\pi\, Br\frac{dr}{dt}$$

Numerically, $e = 2\pi Br\left(\frac{dr}{dt}\right)$

11 **(b)**

$$e = \frac{-d\phi}{dt} = \frac{-NBA(\cos 0° - \cos 180°)}{dt}$$

$$= \frac{2\,NBA}{dt} = \frac{2 \times 1000 \times 0.6 \times 10^{-4} \times 0.05}{0.1}$$

$$= 0.06 \text{ V}$$

14 **(b)**

Self inductance of coil is

$$L = \frac{\mu_0 n^2 \pi r}{2}$$

$$= \frac{4\pi \times 10^{-7}}{2} \times (500)^2 \times \pi \times (5 \times 10^{-2})$$

$$= 25 \times 10^{-3} \text{H} = 25 \text{ mH}$$

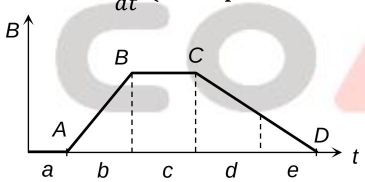
15 **(c)**

Since the rod is moving in transverse magnetic field, so it will cut no flux passing through the field and hence no induced emf is produced. So, no current will flow through the rod.

16 **(b)**

Induced emf $e = A\frac{dB}{dt}$

$i.e., e \propto \frac{dB}{dt}$ (= slope of $B - t$ graph)



In the given graph slope of $AB >$ slope of CD, slope in the $'a'$ region = slope in the $'c'$ region = 0, slope in the $'d'$ region = slope in the $'e'$ region $\neq 0$. That's why $b > (d = e) > (a = c)$

17 **(b)**

In steady state current passing through solenoid

$$i = \frac{E}{R} = \frac{10}{10} = 1\ A$$

18 **(b)**

Induced emf

$$e = B_H l v$$

$$= 0.30 \times 10^{-4} \times 20 \times 5.0 = 3\text{mV}$$

19 **(b)**

The induced emf e in the secondary is given by

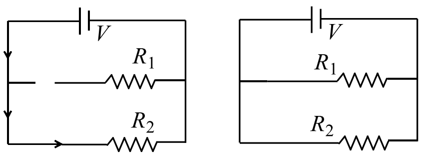
$$e = -\frac{d\phi}{dt} = -M\frac{dl}{dt}$$

or $\quad |e| = M\frac{dI}{dt}$

$\therefore \quad |e| = 5 \times \frac{10}{5 \times 10^{-4}} = 1 \times 10^5 \mathrm{V}$

20 **(c)**

At $t = 0$ inductor behaves as broken wire then $i = \frac{V}{R_2}$



At $t = \infty$ Inductor behaves as conducting wire

$$i = \frac{V}{R_2R_2/(R_1 + R_2)} = \frac{V(R_1 + R_2)}{R_1R_2}$$

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