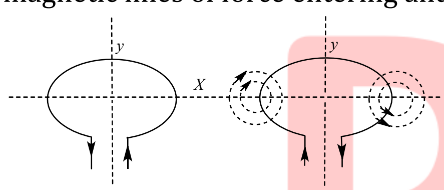
DPP
DAILY PRACTICE PROBLEMS

Class : XIIth | **Solutions** | **Subject : PHYSICS**
Date : | | **DPP No. : 10**

Topic :- Electro Magentic Induction

1 **(d)**
Whenever the flux of magnetic field through the area bounded by a closed conducting loop changes, an emf is produced in the loop in this case the magnetic flux *ie*.,number of magnetic lines of force entering and leaving the loop is same hence magnetic flux is zero.



3 **(c)**
Mutual inductance of the pair of coils depends on distance between two coils and geometry of two coils.

4 **(b)**
The emf induced is directly proportional to rate at which flux is intercepted which varies directly as the speed of rotation of the generator.

New, speed$=\frac{120}{100}\times 1500$ rpm $= 1800$ rpm

5 **(c)**
E.m.f. or current induces only when flux linked with the coil changes

6 **(c)**
The efficiency of transformer

$$=\frac{\text{Energy obtained from the secondary coil}}{\text{Energy given to the primary coil}}$$

or $\quad \eta=\frac{\text{Output power}}{\text{input power}}$

or $\quad \eta=\frac{V_sI_s}{V_pI_p}$

Given, $V_sI_s = 100$ W, $V_p =$ V,$I_p = 0.5$ A

Hence, $\eta=\frac{100}{220\times 0.5}=0.90=90\%$

7 **(c)**

$$\frac{V_s}{V_p} = \frac{N_s}{N_p} \Rightarrow V_s = \frac{N_s}{N_p} \times V_p = \frac{10}{200} \times 240 = 12\ volts$$

8 **(d)**

Whenever a magnet is moved either towards or away from a conducting coil, the magnetic flux linked with the coil changes and therefore, an emf is induced in the coil. The magnitude of induced emf

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

$$e = -N\ \frac{d(BA)}{dt}$$

Time interval dt, depends on the speed with which the magnet is moved.
Therefore, the induced emf is independent of the resistance of the coil.

9 **(c)**

In case of motional emf, the motion of the conductor in the field exerts a force on the free charge in the conductor , so that one end of the conductor becomes positive, while the other negative resulting in a potential difference across its ends due to which a non-conservative electric field is set up in the conductor. In steady state the magnetic force on the free charge is balanced by the electric force due to induced field.

$$qE = qvB$$

or $q\left(\frac{V}{l}\right) = qvB$

ie, $V = Bvl$

So, the induced emf between tip of nose and tail of helicopter is given by

$$e = Bvl$$

$$= 5 \times 10^{-3} \times 10 \times 100 = 5\text{V}$$

10 **(a)**

$$\because L \propto N^2 r; \frac{L_1}{L_2} = \left(\frac{N_1}{N_2}\right)^2 \times \frac{r_1}{r_2}$$

$$\Rightarrow \frac{L}{L_2} = \left(\frac{1}{2}\right)^2 \times \left(\frac{r}{r/2}\right) = \frac{1}{2}; L_2 = 2L$$

11 **(a)**

According to Gauss's theorem in magnetism, surface integral of magnetic field intensity over a surface (closed or open) is always zero, *ie*,

$$\oint \mathbf{B\,.dA} = 0$$

12 **(a)**

Induced e.m.f. $\varepsilon = \frac{d\phi}{dt} = -(100t)$

Induced current i at $t = 2\ sec$

$$= \left|\frac{\varepsilon}{R}\right| = +\frac{100 \times 2}{400} = +0.5\ Amp$$

13 **(a)**

$$|e| = M\frac{di}{dt} \Rightarrow 8 \times 10^{-3} = M \times 3 \Rightarrow M = 2.66mH$$

14 **(a)**

In a transformer

$$\therefore \quad \frac{N_P}{N_S} = \frac{I_S}{I_P}$$

$$\frac{50}{200} = \frac{I_S}{4}$$

$\Rightarrow \quad I_s = 1\text{A}$

15 **(b)**

$$e_0 = \omega NBA = (2\pi v)NB(\pi r^2) = 2 \times \pi^2 v\ NBr^2$$

$$= 2 \times (3.14)^2 \times \frac{1800}{60} \times 4000 \times 0.5 \times 10^{-4} \times (7 \times 10^{-2})^2$$

$$= 0.58\ V$$

16 **(b)**

The electric field induced by changing magnetic field depends upon the rate of change of magnetic flux, hence it is non-conservative.

18 **(b)**

$$L = \frac{\mu_0 N^2 A}{l} = \frac{4\pi \times 10^{-7} \times (500)^2 \times 20 \times 10^{-4}}{0.5}$$

$$= 1.25\ mH$$

19 **(d)**

$$U = \frac{1}{2}Li^2 \Rightarrow U = \frac{1}{2} \times 5 \times \left(\frac{100}{10}\right)^2 = 250\ J$$

20 **(d)**

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

$$= \frac{8 \times 10^{-4}}{0.4} = 2 \times 10^{-3}\text{V}$$

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