# DPP
DAILY PRACTICE PROBLEMS

**Class : XIIth** **Solutions** **Subject : PHYSICS**
**Date :** **DPP No. : 7**

# Topic :- Electro Magentic Induction

1 **(d)**
The inductance of a coil of wire of $N$ turns is given by

$$L = N\frac{\phi}{i}$$

Where $i$ is current and $\phi$ the magnetic flux.
Given, $N = 100$, $i = 5\text{A}, \phi = 10^{-5}\text{Tm}^2(\text{turn})^{-1}$

$$\therefore \quad L = 100 \times \frac{10^{-5}}{5} = 0.20 \text{ mH}$$

5 **(c)**
The DC generator must be mixed wound to withstand the load variation.

6 **(b)**
$|e| = L\frac{di}{dt} \Rightarrow |e| = 10 \times 10^{-6} \times \frac{1}{10} = 1\mu V$

7 **(a)**
As the north pole approaches, a north pole is developed at the face, *i.e.*, the current flows anticlockwise. Finally when it completes the oscillation, no emf is present. Now south pole approaches the other side, *i.e.*, RHS, the current flows clockwise to repel the south pole. This means the current is anticlockwise at the LHS a before. The break occurs when the pendulum is at the extreme and momentarily stationary

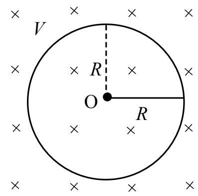
8 **(d)**
$t = \tau = \frac{L}{R} = \frac{2.5}{0.5} = 5 \text{ sec}$

9 **(b)**
$|e| = \frac{d\phi}{dt} = \frac{BdA}{dt}$
Now, as the square loop and rectangular loop move out of magnetic field, $\frac{dA}{dt}$ is constant, therefore $|e|$ is constant. But in case of circular and elliptical loops, $\frac{dA}{dt}$ changes. Therefore, $|e|$ does not remain constant

10 **(a)**
Energy stored $= \frac{1}{2}Li^2$, where $Li$ is magnetic flux

11 **(d)**

From Faraday's law of electromagnetic induction, the emf induced between center and rim is equal to rate of change of magnetic flux.




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

Where, $d\phi = B\ dA$,where $B$ is magnetic field and $dA$ the area.

$$\therefore \qquad e = -\frac{B\int_0^R dA}{T}$$

$$e = -\frac{B \times \pi R^2}{T}$$

Also, $\omega = \frac{2\pi}{T}$, where $T$ is periodic time,

$$e = -\frac{B\pi R^2}{2\pi/\omega}$$

$$= -\frac{BR^2\omega}{2}$$

12 **(a)**

$l = 1$ m, $v = 100$ kmh$^{-1}$

$= \frac{100 \times 1000}{60 \times 60} = \frac{250}{9}$ms$^{-1}$

$e = Blv = 0.18 \times 10^{-4} \times 1 \times \frac{250}{9} = 5 \times 10^{-4}$ V

$= 0.5$ mV

13 **(b)**

Magnetic flux through the loop is upward and its is increasing due to increasing current along $AB$. Current induced in the loop should have magnetic flux in the downward direction so at to oppose the increase in flux. Therefore, current induced in the loop is clockwise.

15 **(a)**

$$e = L\frac{di}{dt} \Rightarrow 100 = L \times \frac{4}{0.01} \Rightarrow L = 2.5\ H$$

16 **(b)**

$e \propto \frac{d\phi}{dt}$; if $\phi \rightarrow$ maximum then $e \rightarrow$ minimum

17 **(d)**

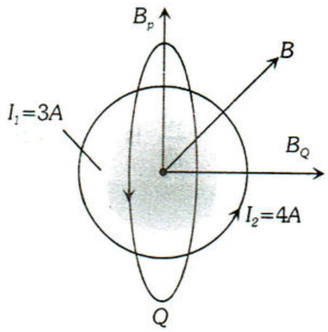
$i = i_0\left(1 - e^{\frac{-Rt}{L}}\right) \Rightarrow$ For $i = \frac{i_0}{2}$, $t = 0.693\frac{L}{R}$

$$\Rightarrow t = 0.693 \times \frac{300 \times 10^{-3}}{2} = 0.1\ sec$$

18 **(c)**

$B_p = \frac{\mu_0 I_2}{2R}$

$= \frac{4\pi \times 10^{-7} \times 4}{2 \times 0.02\pi} = 4 \times 10^{-5} Wb/m^2$




$B_Q = \frac{\mu_0 I_1}{2R}$

$= \frac{4\pi \times 10^{-7} \times 3}{2 \times 0.02\pi} = 3 \times 10^{-5} Wb/m^2$

$\therefore B = \sqrt{B_p^2 + B_Q^2}$

$= \sqrt{(4 \times 10^{-5})^2 + (3 \times 10^{-5})^2} = 5 \times 10^{-5} Wb/m^2$

19 **(d)**

$q = Q_0 \cos \omega t$

$I = \frac{dq}{dt} = -Q_0 \omega. \sin \omega t$

$I_{\max} = C\omega V = V\sqrt{\frac{C}{L}} = 20\sqrt{\frac{16 \times 10^{-6}}{40 \times 10^{-3}}} = 0.4A$

20 **(d)**

Induced charge doesn't depend upon the speed of magnet

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