<u>ASSIGNMENT 04 [Final-TERM]</u>

American International University- Bangladesh (AIUB)

Submitted by:
Name: Nokibul Arfin Siam.
Student ID: 21-44793-1.
Section: K.

Question-01:-

(a) First Law:- An induced emf is established in a conductor or circuit whenever the magnetic filed linking that conductor or circuit is changed.

Second Law:- The magnitude of induced emf is equal to the rate of change of flux linkage ($d\phi/dt$) with the coil.

(b) Lenz's Law:- The diraction of an induced emf produced by the electromagnetic induction is such that is sets up a current which always opposes the cause that is responsible for inducting the emf,

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

(c) Right-Hand Thumb rule:- Suppose that a current carrying coil or solenoid is griped such that the curled fingers in the direction of current flow. Then the thumb finger reepresents the direction of ~~the~~ flux or the north of vagnet.

(d) Fleming's Right-Hand Rule:- Stretch the first (fore) finger, the second (middle) finger and the thumb finger of right hand in mutually prependicular direction to each other, Arrange the wright hand so that the first finger point in the direction of flux line (north pole to south pole) and thumb in the dircaction of motion of conduction the middle finger will point in the direction of current.

(e) Fleming Left-Hand Rule:- The first (force) the second (middle) finger and the themb finger of left hand in mutually perpandicular direction to each other. Arranger the right hand so that first finger point in the direction of current then thumb will point in the direction of force of conductor.

Problem-1

Here,

$V = 25\ m/s$

length, $l = 5\ cm = 0.05\ m$

area, $A = 5 \times 5 = 25\ cm^2$
$= 25 \times 10^{-4}\ m^2$

Flux, $\phi = 10 \times 10^{-6}\ wb$

(a) $E_{90^\circ} = B l v \sin 90^\circ$

$= \left(\frac{\phi}{A}\right) l v \sin(90^\circ)$

$= \left(\frac{10 \times 10^{-6}}{25 \times 10^{-4}}\right)(0.05)(25) \cdot 1$

$= 5\ mV.$

(b) $E_{60^\circ} = Blv \sin 60^\circ$

$= \left(\frac{\phi}{A}\right) lv \sin 60^\circ$

$= \left(\frac{10\times10^{-6}}{25\times10^{-4}}\right)\times(0.05)\times25\times0.87$

$= 4.35\,mv.$

(c) $E_{45^\circ} = Blv \sin 45^\circ$

$= \left(\frac{\phi}{A}\right) lv \sin 45$

$= \left(\frac{10\times10^{-6}}{25\times10^{-4}}\right)\times(0.05)\times25\times\sin 45$

$= 5\times\sin 45^\circ = 3.53\,mv.$

(d) $E_{30^\circ} = Blv \sin 30^\circ$

$= 5\times\sin 30^\circ$

$= 2.5\,mv.$

Problem-2

(a) $$\frac{N_1}{N_2} = \frac{20}{5}$$

$$V_1 = 3000 \text{ V.}$$

as,
$$\frac{N_1}{N_2} = \frac{V_1}{V_2}$$

$$\Rightarrow V_2 = \frac{V_1 \times N_2}{N_1}$$

$$\Rightarrow V_2 = \frac{3000 \times 5}{20}$$

$$\therefore V_2 = 750 \text{ V.}$$

$\therefore$ The transformer rating $= V_2 I_2$

$$\Rightarrow 10 \text{ KVA} = V_2 I_2$$

$$\Rightarrow 10{,}000 = 750 \times I_2$$

$$\therefore I_2 = 13.33 \text{ A.}$$

(b) Minimum value of load resistance,

$$R_L = \frac{V_2}{I_2} = \frac{750}{13.33}\,\Omega$$

$$= 56.26\,\Omega$$

(c) Now,

Primary current at full load,

$$\Rightarrow \frac{N_1}{N_2} = \frac{I_2}{I_1}$$

$$\Rightarrow I_1 = \frac{I_2 N_2}{N_1}$$

$$\Rightarrow I_1 = 13.33 \times \left(\frac{5}{20}\right)$$

$$\therefore I_1 = 3.33\text{ A.}$$

Problem -3

Here,

$$I_{sh} = \frac{V}{R_{sh}}$$

$$= \frac{500}{250}$$

$$\therefore I_{sh} = 2A$$

$\therefore$ Current through Armature and the series winding is,

$$I_{se} = I_a = I_{sh} + I$$

$$= 2 + 50$$

$$= 52$$

$\therefore$ Voltage drop on series winding,

$$\Rightarrow I_a R_{se} = 52 \times (0.03)$$

$$\Rightarrow I_a R_{se} = 1.56V$$

6

Now, the Aramture voltage drop,

$$I_a R_a = 52 \times 0.05$$

$$= 2.6 V$$

Finally, Generated voltage,

$$E_g = V + I_a R_a + \text{Series drop}$$

$$= 500 + 2.6 + 1.56$$

$$= 504.16 V.$$