

Ques-5:- Faraday's law of EMI:-

Faraday summed up the above facts into two laws known as Faraday's laws of electromagnetic induction.

FIRST LAW:- It states:

'When the magnetic flux linked with a circuit changes, an e.m.f is always induced in it.'

OR

'Whenever a conductor cuts across magnetic lines of flux, an e.m.f is induced in that conductor.'

SECOND LAW: It states:

'The magnitude of the induced e.m.f is equal to the rate of change of flux linkages.'

Explanation

Suppose a coil has N turns and flux through it changes from an initial value of ϕ_1 W_b to the final value of ϕ_2 W_b in time t second. Then remembering that by flux linkages is meant the product of number of turns by the flux linked with coil, we have

Initial flux linkages = $N\phi_1$

Final flux linkages = $N\phi_2$

∴ Induced e.m.f $e = \frac{N\phi_2 - N\phi_1}{t}$ volt

or $e = N \frac{\phi_2 - \phi_1}{t}$ volt

Putting the above expression in its differential form, we get

$$e = \frac{d(N\phi)}{dt} \quad \text{or} \quad e = N \frac{d\phi}{dt} \text{ volt}$$

Usually, a minus sign is given to the right-hand side expression to signify the fact that the induced e.m.f sets up current in such a direction that magnetic effect produced by it, opposes the very cause of producing

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