B.Sc. I (H) Paper II

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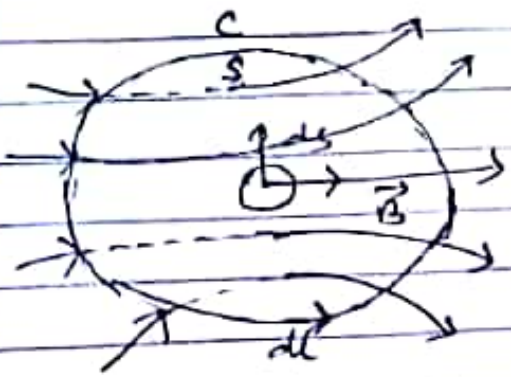
Faraday's Law of Electromagnetic Induction.

Faraday's law of electromagnetic induction states:- whenever the magnetic flux linked with a circuit changes, an induced electromotive force is set up in the circuit, the magnitude of the e.m.f is proportional to the rate of change of magnetic flux and its direction is such as to oppose the cause producing a change in magnetic flux.

Integral form of Faraday's law:-

Let us consider a circuit C placed in a magnetic field $\vec{B}$. If $\vec{S}$ is the surface bounded by the current circuit, then the magnetic flux ϕ linked with the circuit is given by



$$\phi = \iint_S \vec{B} \cdot d\vec{s}$$

If the magnetic field changes and $\frac{\partial B}{\partial t}$ is the time rate of the change of the field, the

$$\frac{d\phi}{dt} = \iint_S \frac{\partial \vec{B}}{\partial t} \cdot \vec{ds}$$

The e.m.f. induced in the circuit due to the changing magnetic flux is given by

$$e = -\frac{d\phi}{dt} = -\iint_S \frac{\partial \vec{B}}{\partial t} \cdot \vec{ds} \quad -(1)$$

This is integral form of Faraday's law.