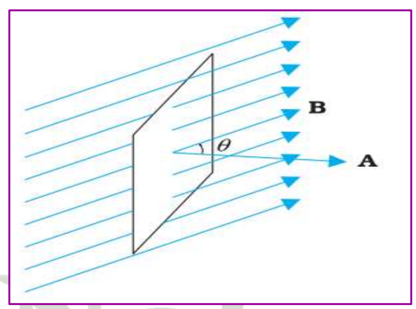
Electromagnetic Induction:

- State and show understanding of Faraday’s law of electromagnetic induction
- State and show understanding of Lenz’s law
- Discuss construction and working of A.C. generators
- Define eddy currents, explain how they arise and give a few examples where eddy currents are useful and where they are nuisance
- Describe self-inductance and mutual inductance and understand their uses
- State the expression for energy stored in an inductor and use it wherever needed
- Discuss the construction, working principle and importance of transformer
- Discuss the sources of energy loss in practical transformer

- *Michael Faraday demonstrated the reverse effect of Orested’s experiment. He explained the possibility of producing emf across the ends of a conductor when the magnetic flux linked with the conductor changes. This was termed as electromagnetic induction. The discovery of this phenomenon brought about a revolution in the field of power generation.*
- ***The phenomenon in which electric current is generated by varying magnetic fields.***
- ***Whenever the magnetic flux link to a conductor or a coil changes, an emf is induces in it. This phenomenon is called electromagnetic induction. The emf, thus produced is called induced emf and current due to this emf is called induced current.***
- *If the magnetic flux through a circuit changes, an emf and a current are induced.*

Magnetic flux (∅):

The magnetic flux (∅) linked with a surface held in a magnetic field $'B'$ is defined as the number of magnetic lines of force crossing a closed area $'A'$ as shown in figure.



The magnetic flux through a surface of area A when placed in magnetic field B is given by,

$$\emptyset = \vec{B}.\vec{A}$$
$$or, \emptyset = BA\cos\theta$$

Where, θ is angle between magnetic field vector $\vec{B}$ and area vector $\vec{A}$ on the surface.

The direction of area vector $\vec{A}$ is given by the normal to the plane of the surface.

Magnetic flux is a scalar quantity, its SI unit is Tesla square meter (Tm^2) or $weber$ (wb).

If magnetic field is non-uniform then, magnetic field is calculated as,

$$\emptyset = \int \vec{B}.\overrightarrow{dA}$$
$$or, \emptyset = \int BA\cos\theta$$

Case 1: If $\theta = 0^0$, $\emptyset = BA\cos 0 = BA\ (Maximum)$

If the direction of magnetic field is parallel to direction of area vector i.e., when surface lies perpendicular to direction of field, magnetic flux crossing the surface is maximum.