Transformer:

- Transformer is a device which is used to convert low alternating voltage at high current to high alternating voltage at low current and vice versa.
- It works on the principle of mutual induction i.e. when a changing current is passed through a coil, an emf is induced across a neighboring coil.

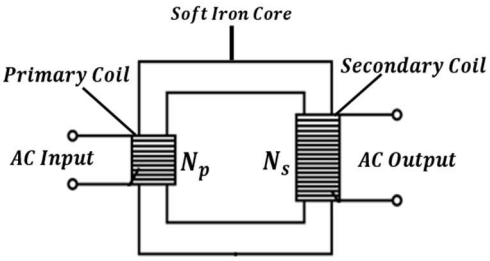

fig: Step Up Transformer

Construction:

A transformer consists of two coils wound on a common laminated sheet of the soft iron core. The coil which is connected to the source is called the primary coil and the coil through which output is taken is called the secondary coil.

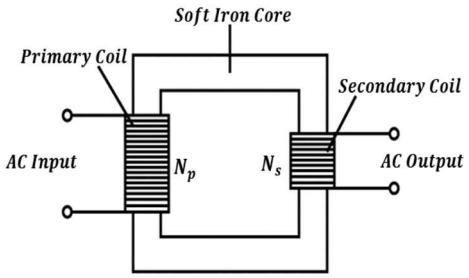

fig: Step Down Transformer

Working:

When terminals of the primary coil are connected to the source of alternating current, the varying current in the primary coil changes the magnetic flux through the core and so the flux linked with the secondary coil changes. The change of magnetic flux through the secondary coil creates an induced emf in the secondary coil.

If $\frac{d\phi}{dt}$ is the rate of change of magnetic flux at any instant through the primary coil, then according to Faraday's law of electromagnetic induction, the induced emf in the primary coil having a number of turns N_p is given by,

$$E_p = -N_p \frac{d\phi}{dt} - - - - - - - - (1)$$

Similarly, if there is no leakage of flux, the same flux passes through the secondary coil, then induced emf in the secondary coil having a number of turns N_s is,

$$E_s = -N_s \frac{d\phi}{dt} - - - - - - - - (2)$$

Dividing $eq.(2)$ by $eq.(1)$, we get

$$\frac{E_s}{E_p} = -\frac{N_s \frac{d\phi}{dt}}{-N_p \frac{d\phi}{dt}}$$

$$or, \frac{E_s}{E_p} = \frac{N_s}{N_p} - - - - - (3)$$

This relation is called the transformer equation. Here, the ratio $\frac{N_s}{N_p}$ is called the transformer ratio (k).

- If $\mathbf{k > 1}$, **Then** $\mathbf{E_s > E_p}$, transformer is ***Step Up.***