

- ✓ Ideal Transformer
 - There is NO power loss (100% efficiency)
 - Power in primary = power in secondary

$$\begin{aligned} V_p I_p &= V_s I_s \\ \frac{I_p}{I_s} &= \frac{V_s}{V_p} \end{aligned}$$

- Relation with number of coil turn

$$\frac{N_p}{N_s} = \frac{V_p}{V_s}$$

- ✓ Sources of energy loss in a practical transformer

- Loss of magnetic flux between the primary and secondary coils.
 - The core is designed for maximum flux linkage. The iron core forms a closed loop and the primary and secondary coils are wound on each other.
- Resistive heating in the primary and secondary coils.
 - The coils are made of a low resistivity metal.
- Heating of the core due to eddy currents.
- Heating of the core due to repeated magnetization and demagnetization.

- ✓ Laws & Transformer

Faraday's Law : the emf induced is proportional to the rate of change of magnetic flux linkage

- Changing current in primary coil will give rises to changing flux in core
- Flux links with the secondary coil.
- Change in flux linkage, induce the emf
- Lenz's Law : Induced emf is in a direction so as to produce effects which oppose the change producing it.
 - Induced current in secondary produces magnetic field which oppose field produced in primary
 - Thus, the input p.d and the output p.d are NOT in phase

Example Questions :

Q1: State why the iron core is laminated? [2]

- to reduce power loss in the core
- due to eddy currents/induced currents

Q2: State why the primary and secondary coils are wound on a core made of iron [1]

- e.g. prevent flux losses / improve flux linkage

Q3: Suggest why thermal energy is generated in the core when the transformer is in use [3]

- flux in core is changing
- e.m.f. / current (induced) in core
- induced current in core causes heating