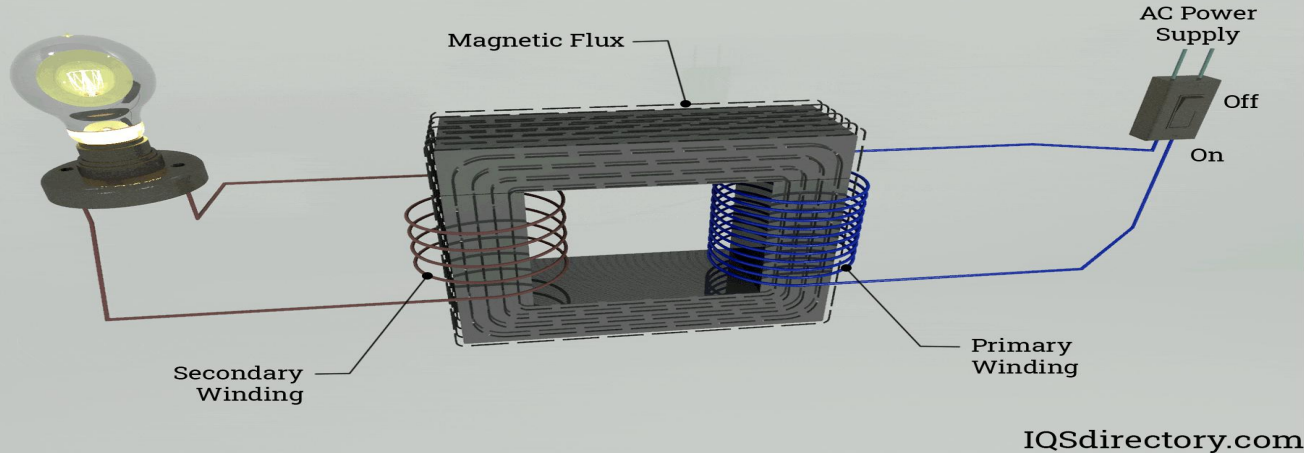


Understanding Transformers in Electrical Systems



Electric Transformers



Transformer



Introduction

1. Definition
2. Components of a Transformer
3. Working Principle of Transformer
4. Types of Transformers
5. Applications of Transformer
6. Efficiency and Losses
7. Maintenance and Safety



Introduction to transformers



A transformer is an electrical device that is used to transfer electrical energy between two or more electric circuits by means of electromagnetic induction. It is primarily designed to change the voltage level of alternating current (AC) electricity, either increasing it (step-up transformer) or decreasing it (step-down transformer), while maintaining the frequency of the electrical energy. Transformers are essential in power distribution systems, allowing for efficient transmission of electricity over long distances and adaptation of voltage for various applications



Components of Transformer

primary and secondary windings

The coil of wire connected to the input and output voltage source

Core

The magnetic core, typically made of iron or another ferromagnetic material, that links the primary and secondary windings, facilitating the transfer of energy through electromagnetic induction.

Insulation

Insulating materials that separate and protect the windings from each other and the core.

Tank

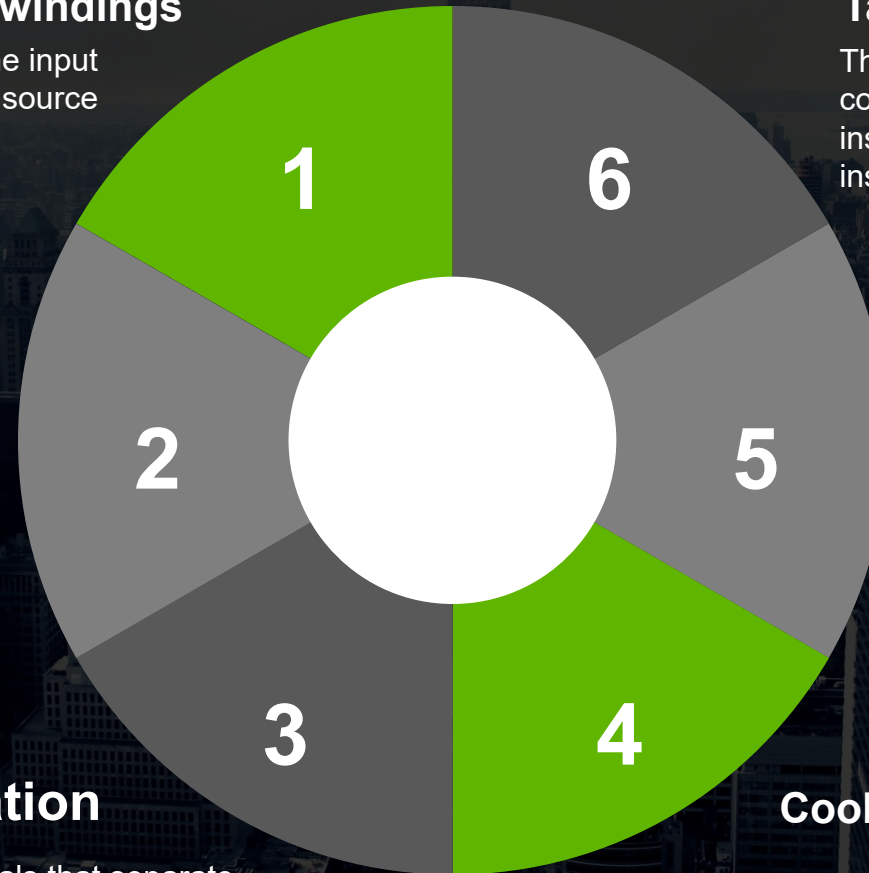
The outer casing that encloses the core and windings, filled with insulating oil for cooling and insulation in larger transformers.

Tap Changer

In some transformers, a tap changer is used to vary the turns ratio and adjust the output voltage.

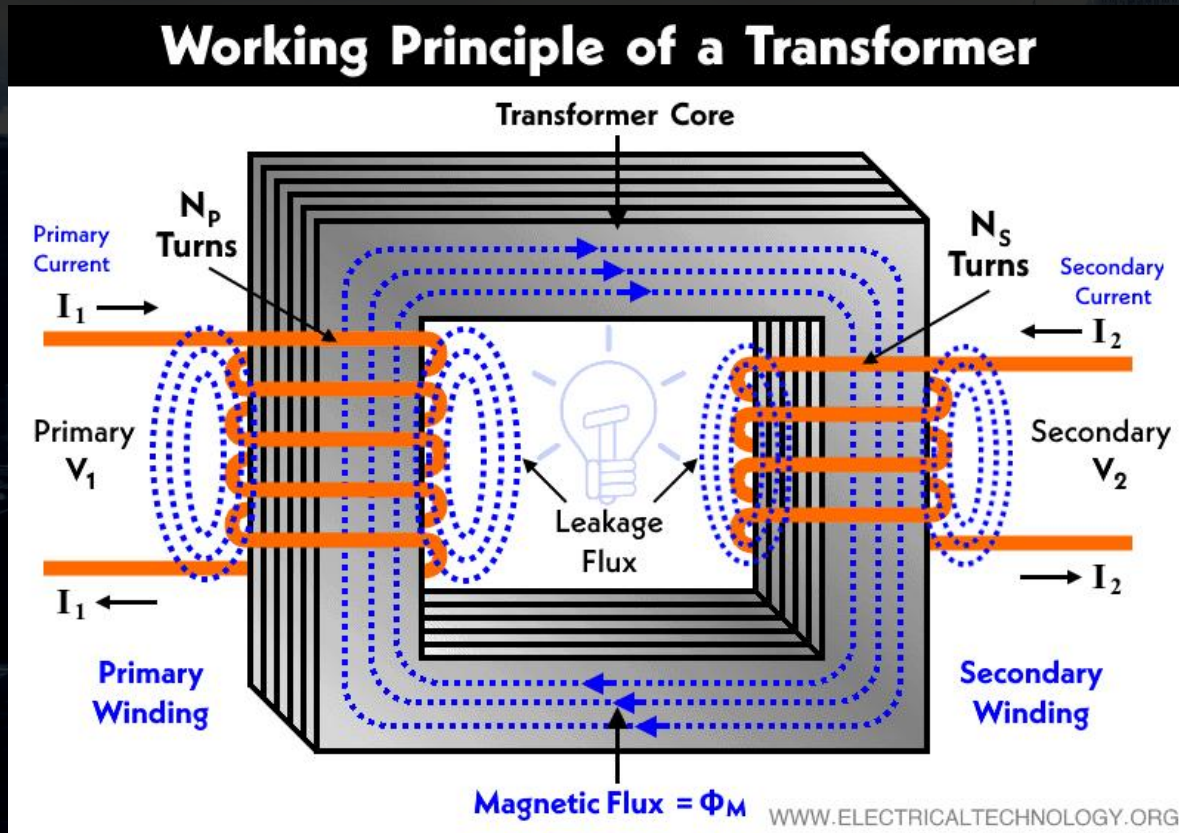
Cooling system

Many larger transformers have cooling systems, which can include radiators, fans, or oil circulation, to dissipate heat generated during operation.





Working principal of Transformer



The working principle of a transformer is to transfer electrical energy between two or more electric circuits by using the phenomenon of electromagnetic induction. It achieves this by changing the voltage level of alternating current (AC) electricity while maintaining the frequency. The primary winding generates a changing magnetic field, which induces voltage in the secondary winding, resulting in voltage transformation.



Types of Transformer

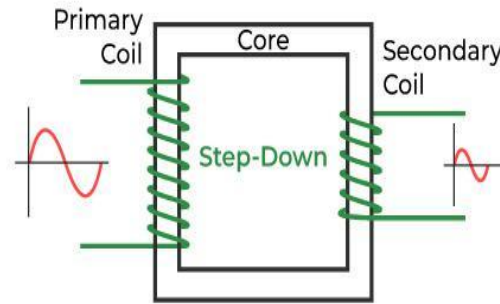
Step up Transformer

Increases the voltage from the primary winding to the secondary winding, typically used in power transmission to reduce energy losses.

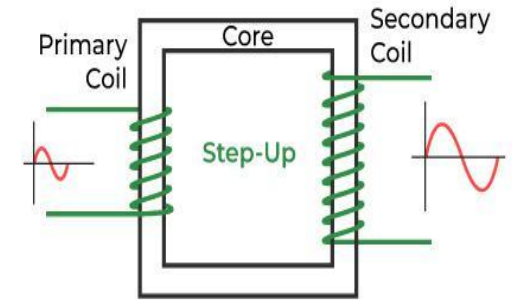
Step Down Transformer

Decreases the voltage from the primary winding to the secondary winding, commonly used for safely supplying power to homes, industries, and electrical appliances.

Types of Transformer



Step-Down Transformer



Step-Up Transformer

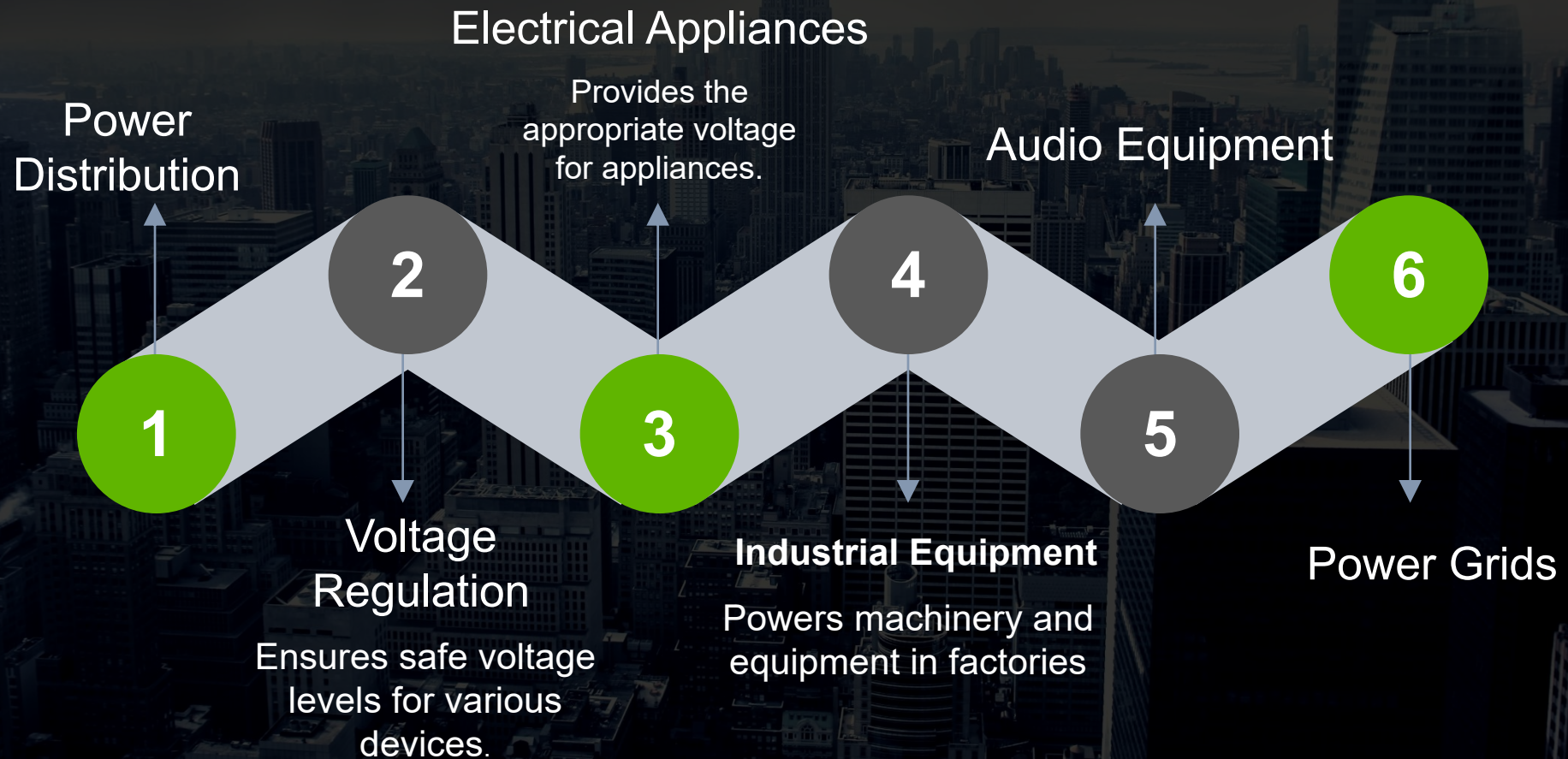


Types of Transformer





Application of Transformer





Efficiency and Losses

Core Losses (Iron Losses)

Energy lost in the transformer core due to hysteresis and eddy currents.

Copper Losses (I^2R Losses)

Energy dissipated as heat in the resistance of the winding wires.

Load Losses

Combination of core losses and copper losses, occurring when the transformer is under load

Efficiency

The ratio of output power to input power, indicating how effectively a transformer transfers energy. Higher efficiency means lower losses.



Conclusion

electrical transformers are the unsung heroes of our modern electrical infrastructure. These devices facilitate the efficient transmission and distribution of electrical power, ensuring that electricity can be harnessed and utilized safely and effectively in our homes, industries, and businesses. From voltage transformation to power distribution, transformers play a vital role in our daily lives, underpinning the reliability and accessibility of electricity.

THANKS

project by

Name ...Rahul kumar Agarwal

Roll no. 23ECF056

(23BEC153]

