SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF COMPUTER SCIENCE AND DESIGN

COURSE NAME : 19EE01 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

I YEAR /II SEMESTER - COMPUTER SCIENCE AND DESIGN

Unit 2 – ELECTRICAL MACHINES

Topic 1 : Introduction to ELECTRICAL MACHINES

Electrical Machines are electromagnetic devices designed to convert electrical energy into mechanical energy and vice-versa. Electrical machines are studied as a core subject in the electrical engineering discipline. It is included in the syllabus of electrical engineering to understand the design, principle, operation, and applications of various electrical machines like generators, motors, transformers, etc. which are very important for electrical engineers.

What are Electrical Machine?

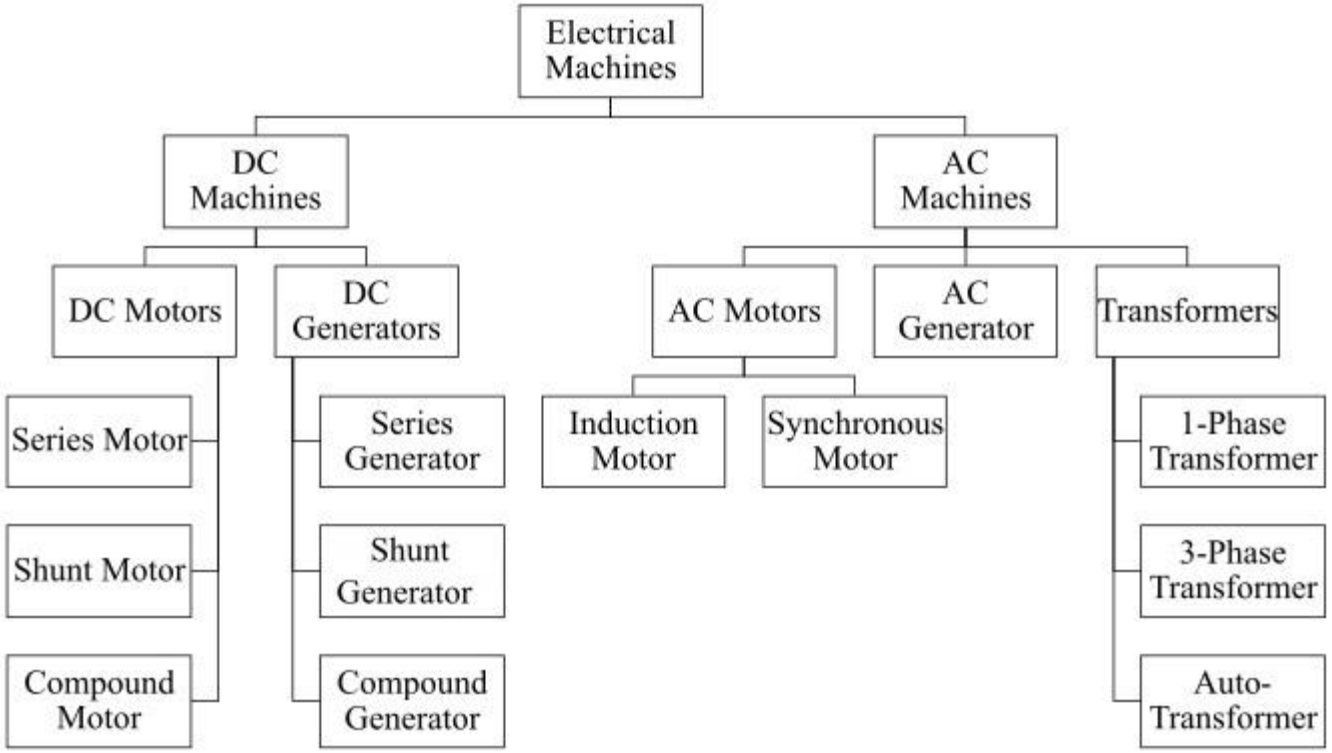
An electrical machine is an electromagnetic device that either converts electrical energy into mechanical energy (electric motor) or converts mechanical energy into electrical energy (electric generator).

A transformer is a special electrical machine that does not covert electrical energy into mechanical energy and vice-versa, instead it transforms the voltage levels of electrical energy. The operations of all electrical machines are based on the mutual interaction of electric and magnetic fields. Hence, they are called electromagnetic machines.

Electrical machines can be classified into various types depending on their functions, supply used, for example, induction motor, synchronous motor, transformer, dc motor, dc generator, alternator, etc.

Types of Electrical Machines

Electrical machines can be classified into various types. The detailed main **types of electrical machines** is shown in the following figure.

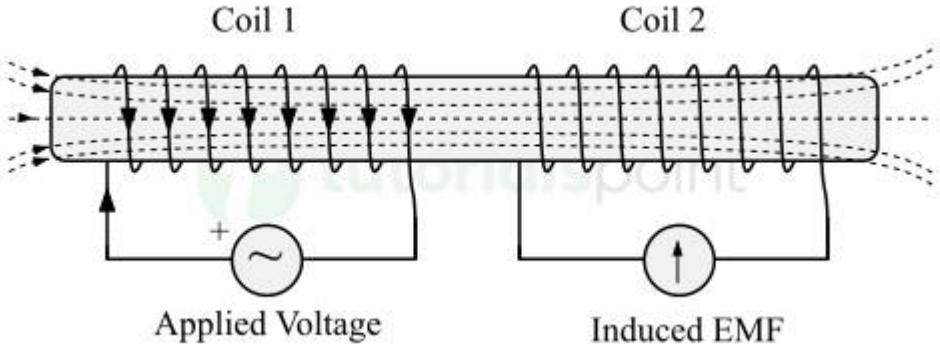


What does an Electrical Transformer Do?

An electrical transformer increases or decreases the voltage levels in an electrical power system. A transformer that increases the voltage level (i.e., output voltage is greater than input voltage) is known as a step-up transformer. A transformer that decreases the voltage level (i.e., output voltage is less than input voltage) is known as a step-down transformer.

Working Principle of a Transformer

An electrical transformer works on the principle of mutual inductance. The principle of mutual inductance states that when two electromagnetic coils are brought near to each other such the magnetic field produced by one coil links with the other. If this linked magnetic field produced by first coil changes, then it induces an EMF in the second coil. This principle is highlighted in the following figure.



Are transformers AC or DC?

Transformers are AC devices. An electrical transformer cannot operate on DC supply because transformer requires changing magnetic flux for its operation which can be only produced by AC supply.

Types of Electrical Motor

An electric motor is an electromechanical energy conversion device that converts electrical energy into mechanical energy. Electric motors can be classified into various types as follows –

1. DC Motors

Those electric motors that convert direct current electricity into mechanical energy are known as DC motors. DC motors are further classified into the following types –

•**DC Series Motor** – A DC motor in which armature winding and magnetic field winding are connected in series with each other is called a DC series motor.
•**DC Shunt Motor** – A DC motor in which armature and field windings are connected in parallel with each other is called a DC shunt motor.
•**DC Compound Motor** – A DC compound motor is one which consists of both series and shunt field winding is called a compound DC motor. There are two types of compound DC motors, which are –

- **Cumulatively Compound DC Motor** – When shunt and series fields assist each other, then the motor is called a cumulatively compound dc motor.
- **Differentially Compound DC Motor** – When the shunt and series fields oppose each other, then the motor is called a differentially compound dc motor.

2. AC Motors

Those electric motors that require alternating current supply to produce mechanical energy are called AC motors. There are two main types of AC motors namely,

- **Induction Motor** – An induction motor is a type of AC electric motor that operates on the principle of continuous electromagnetic induction. Induction motors can be classified as single-phase induction motors and three-phase induction motors.

- **Synchronous Motor** – A synchronous motor is also a type of AC motor that operates on the principle of magnetic locking, where the rotor is locked with the stator's rotating magnetic field and rotates at the synchronous speed (i.e., speed of rotating magnetic field).

REFERENCES

1. Bhattacharya. S.K, “Basic Electrical and Electronics Engineering”, Pearson Education , (2017)
2. Muthu Subramanian R, Salivahanan S,“ Basic Electrical and Electronics Engineering”, Tata McGraw Hill Publishers, (2009)
3. V.Mittle“ Basic Electrical Engineering”, Tata McGraw Hill Publishers, (2017)
4. Nagrath. I.J, “Electronics: Analog and Digital”, Prentice Hall India Pvt. Ltd., (2013)

THANK YOU