



# **SNS COLLEGE OF TECHNOLOGY**

**(An Autonomous Institution)**



**COIMBATORE-35**

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

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS  
ENGINEERING**

**COURSE NAME: 23EET101/BASIC ELECTRICAL AND  
ELECTRONICS ENGINEERING**

**I YEAR / I SEMESTER**

**Unit II – ELECTRICAL MACHINES**

**Topic : Synchronous Generator**



# SYNCHRONOUS GENERATOR

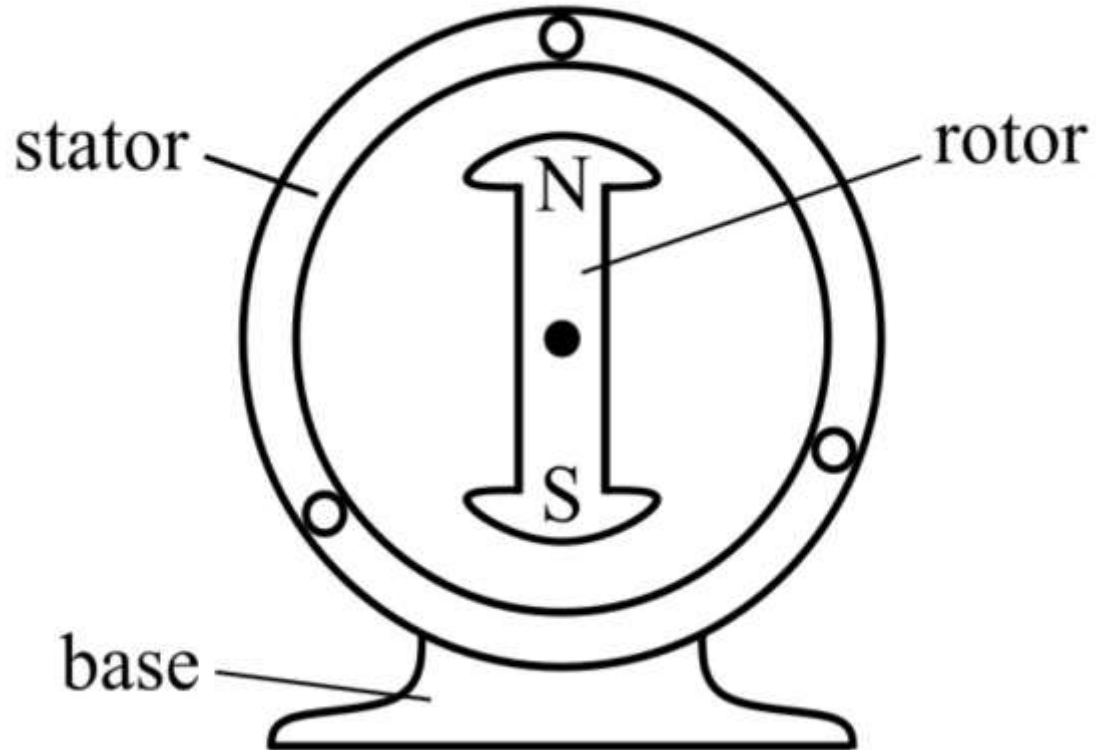
- A *synchronous generator* is a **synchronous machine** which converts mechanical power into AC electric power through the process of electromagnetic induction.
- Synchronous generators - **alternators** or **AC generators**. The term "alternator" is used since it produces AC power.
- It is called a synchronous generator because its rotor must be rotated at a constant speed called **synchronous speed ( $N_s$ )**.





# CONSTRUCTION

- ▶ **Stator** - static or non-moving part of the alternator
- ▶ **Rotor** - rotating or moving part of the alternator





# STATOR

- **outer cover - yoke**, is made up of cast iron - protects the internal parts of the alternator against external mechanical and environmental threats.
- **stator core** - has several slots cut on its inner periphery to hold stator windings and also provides a low reluctance path for the magnetic field.
- **stator winding** - also called **armature winding**, is made up of copper conductors and voltage is generated in this winding when the generator is operated.

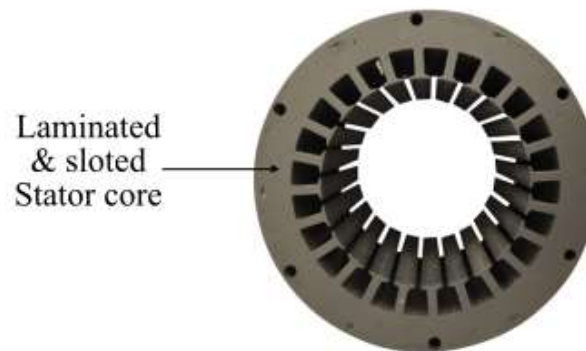


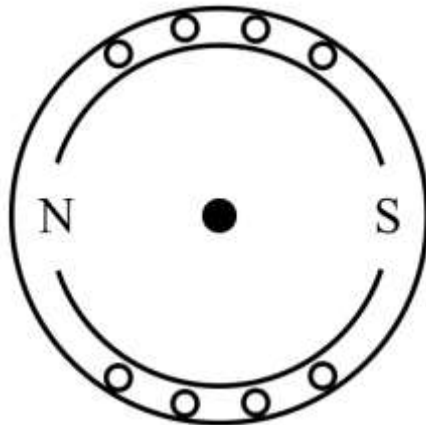
Fig. - Stator of Alternator



# ROTOR

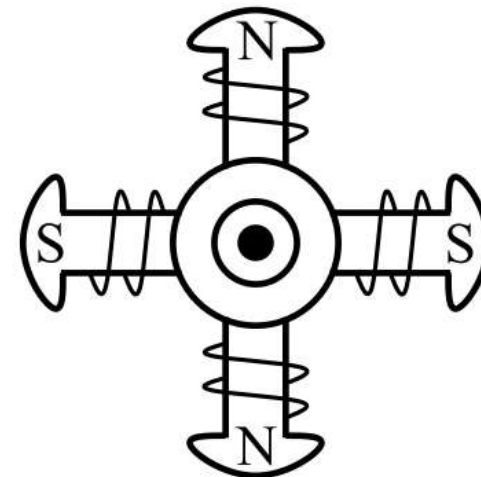
## Cylindrical Rotor

- field winding or rotor winding is uniformly distributed in rotor slots.
- The rotor core is mounted on a rotor shaft .
- Also, the electrical connection between the exciter and rotor winding is provided through an assembly of slip rings.



## Salient-Pole Rotor

- rotor core with project pole faces mounted on a rotor shaft.
- The field windings are placed on the salient-pole cores. These field windings are excited from an external exciter through an arrangement of slip-rings and carbon brushes.





# WORKING PRINCIPLE AND OPERATION



- works on the **principle of electromagnetic induction**, i.e., when the flux linking a conductor changes, an EMF is induced in the conductor.
- When the armature winding of alternator subjected to the rotating magnetic field, the voltage will be generated in the armature winding.
- When the rotor field winding of the alternator is energised, the alternate N and S poles are developed on the rotor.
- When the rotor is rotated in the anticlockwise direction by a prime mover, the armature conductors placed on the stator are cut by the magnetic field of the rotor poles.



## WORKING PRINCIPLE AND OPERATION

- As a result, the EMF is induced in the armature conductors due to electromagnetic induction. This induced EMF is alternating one because the N and S poles of the rotor pass the armature conductors alternatively.
- The direction of the generated EMF can be determined by the Fleming's right rule and the frequency of it is given by,

$$f = \frac{N_s P}{120}$$

- $N_s$  is the synchronous speed in RP
- $P$  is the number of rotor poles.



# APPLICATION



- For electric power generators at power generating stations because of stable frequency..
- These are also used in automotive charge batteries.
- They are also used as portable generators.
- It is used in the systems wherever stable speed is necessary.
- It is used to preserve the power factor (PF) of the system.





# VIDEOS



Working—

<https://www.youtube.com/watch?v=1tyBWqVSUfI>

Principle of Operation-

[https://www.youtube.com/watch?v=bftlqMh1b\\_g](https://www.youtube.com/watch?v=bftlqMh1b_g)