



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



19EET101 / BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING I YEAR / I SEMESTER

UNIT-II: ELECTRICAL MACHINES

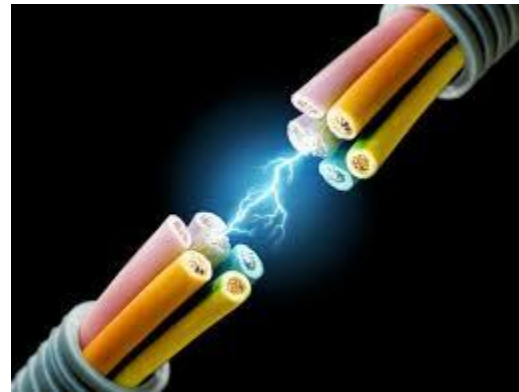
PRINCIPLE OF OPERATION OF DC MOTOR

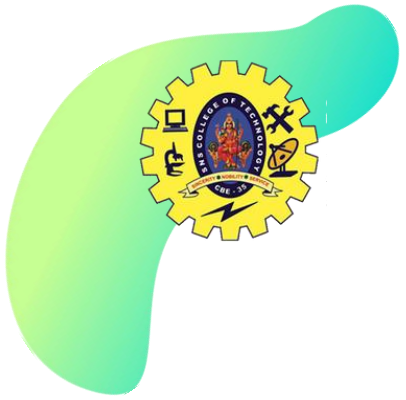


TOPIC OUTLINE



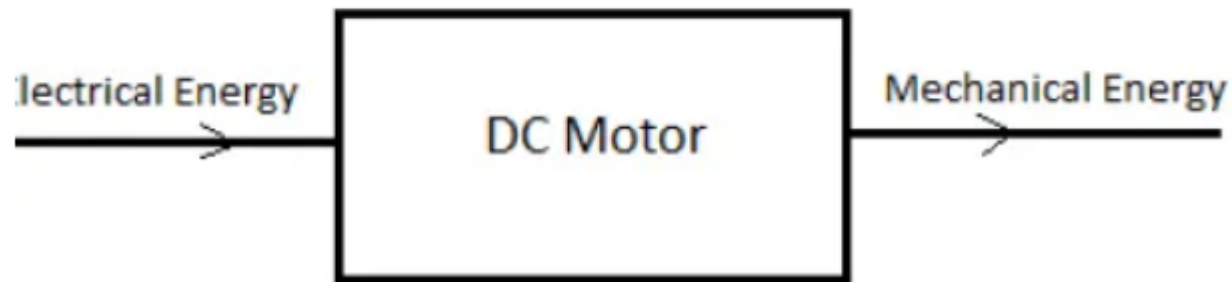
- ✓ Working Principle
- ✓ BACK EMF Equation
- ✓ Applications





DC MOTOR

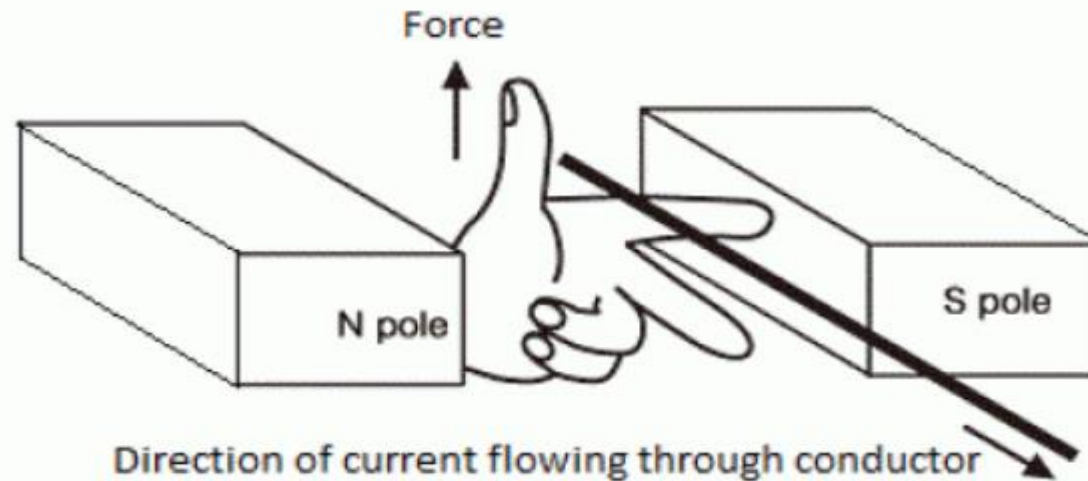
" THE FUNCTION OF DC MOTOR IS CONVERT ELECTRICAL ENERGY IN TO MECHANICAL ENERGY."





Working Principle

- The Working Principle of DC motor is when current carrying conductor is kept in a Magnetic field a mechanical force acts on the conductor which tends to rotate it in direction of force.
- The direction of force is given by Fleming's left hand rule and the magnitude of this force is given by equation





Working Principle



$$F = BIL \quad \text{N (Newton)}$$

where , B = flux density in wb/m^2

I = current in Ampere

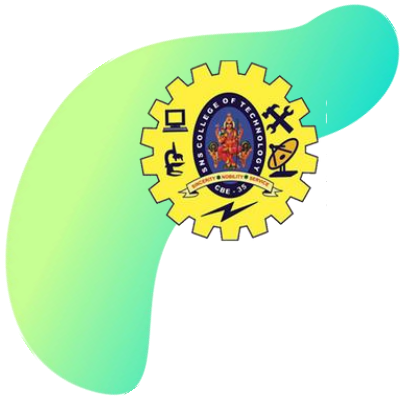
L = length of conductor in meter

- Fleming's left hand rule is use to determine direction of force acting on the armature conductor of DC motor

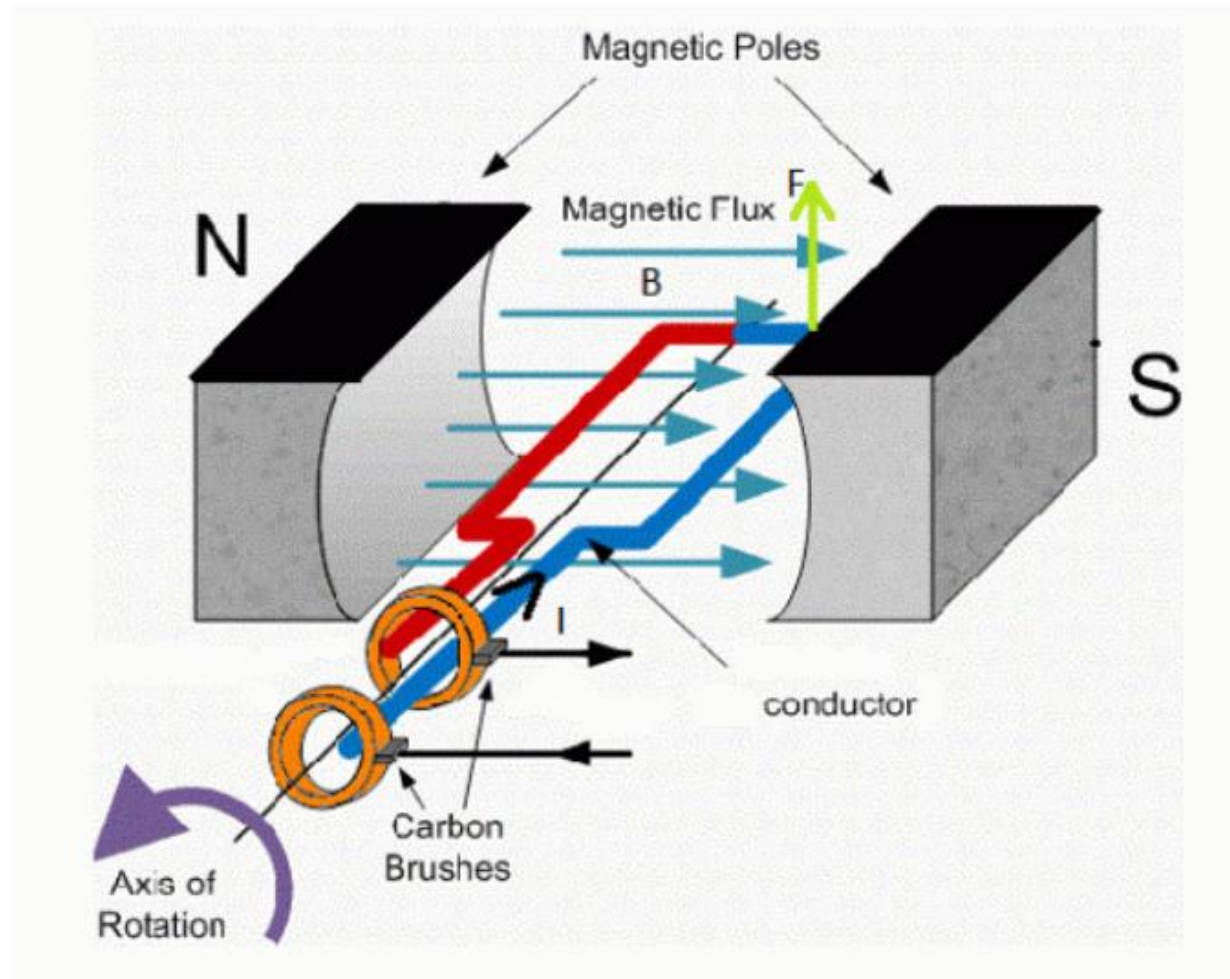
Statement:-

- "If you keep your left hand in a way that the thumb, first finger and middle finger are at right angle to each other" as shown in fig:
- "first finger represent direction of magnetic field , middle finger represent direction of the current in conductor, thumb will represent direction of force act on the conductor."





Working Principle





Working Principle-DC MOTOR



Take two magnets in position of attraction (North to south) that magnet that magnet produce the magnetic field between space of each other now keep the conductor or coil between that two magnets ,When give dc supply to the conductor or coil .

Hence current pass through that conductor and conductor will carrying the current Because of that magnetic field of the magnet mechanical force is produce on the conductor according to Fleming's left hand rule.

The direction of force is upward. conductor are wound on the rotor hence rotor will rotate in direction of force .motor starts working and its Convert electrical energy to mechanical energy.





What is Back EMF :-

When the armature of DC motor rotate in magnetic field its conductor cut by the magnetic field. According Faraday's law of electromagnetic induction EMF will be induced in armature winding the direction of EMF is reverse to the direction of armature current , its called **Back EMF**.

$$\text{Back EMF: } E_b = \frac{\phi ZNP}{60A}$$

Where,

- Z= No of conductor
- P = No of pole
- N =Speed of armature
- ϕ = Flux
- A = Parallel conductor for (Lap winding A=P)
(Wave winding A=2)





PRINCIPLE OF OPERATION OF DC Motor

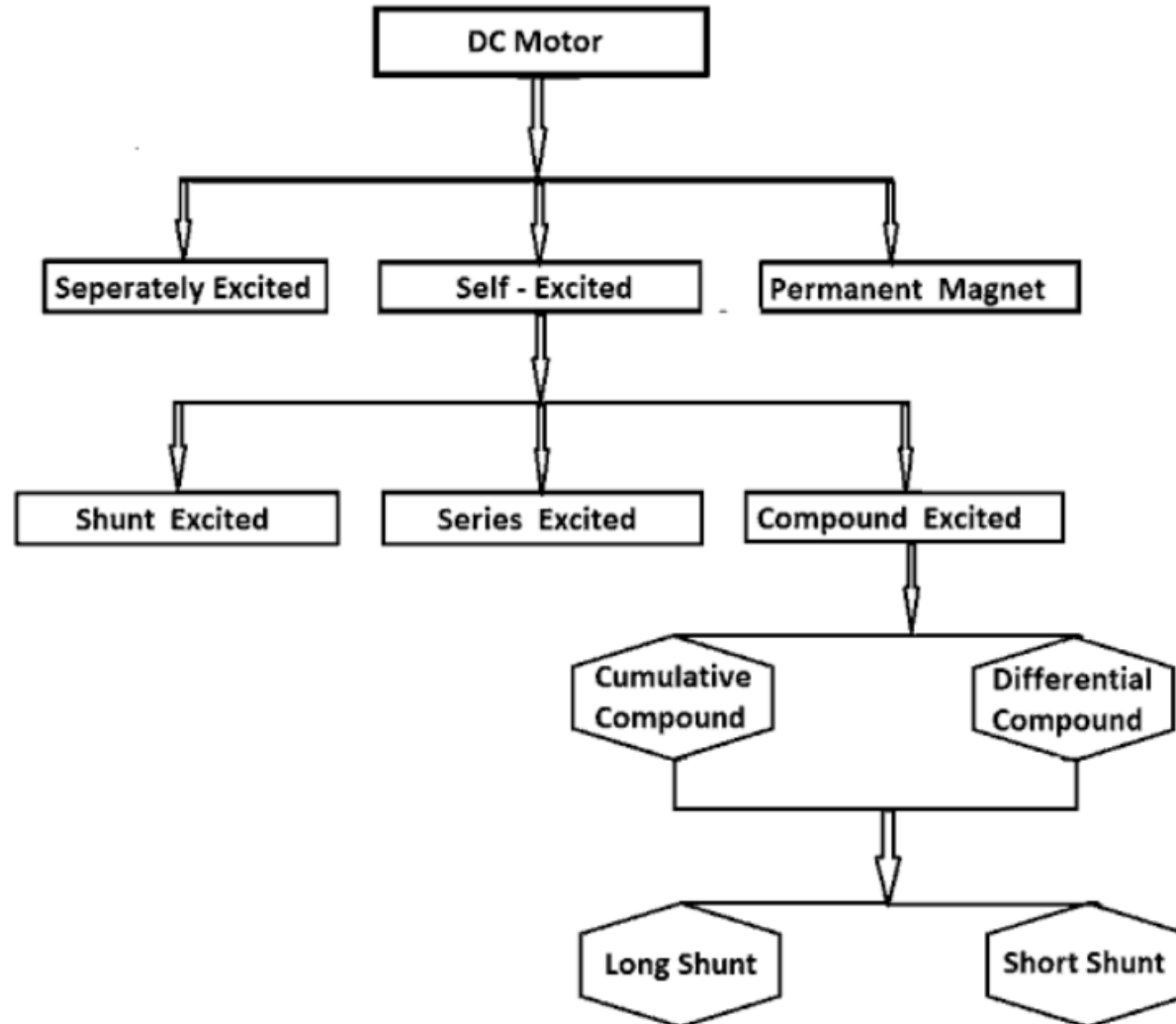


Video

https://www.youtube.com/watch?v=j_F4limaHYI



Types of DC Motor





Applications



Series Motors

The series DC motors are used where high starting torque is required and variations in speed are possible. For example – the series motors are used in the traction system, cranes, air compressors, Vacuum Cleaner, Sewing machine, etc.

Shunt Motors

The shunt motors are used where constant speed is required and starting conditions are not severe. The various applications of DC shunt motor are in Lathe Machines, Centrifugal Pumps, Fans, Blowers, Conveyors, Lifts, Weaving Machine, Spinning machines, etc.

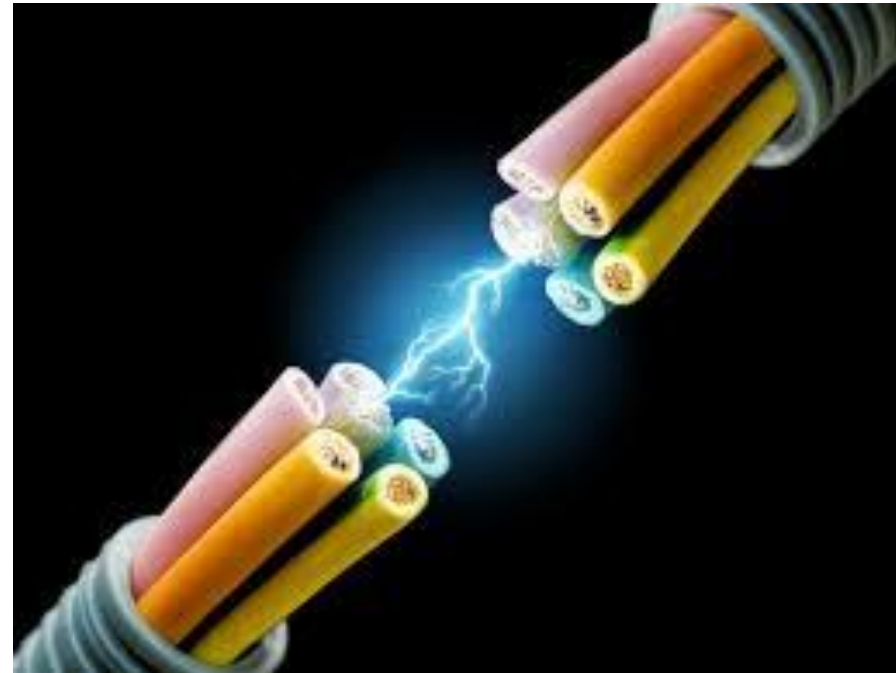
Compound Motors

The compound motors are used where higher starting torque and fairly constant speed is required. The examples of usage of compound motors are in Presses, Shears, Conveyors, Elevators, Rolling Mills, Heavy Planers, etc.





RECAP...



...THANK YOU

