




GANDHI SCHOOL OF
ENGINEERING, BHABANDHA, BERHAMPUR

SUBJECT: ELECTRICAL MACHINE
SEMESTER: 4TH

PREPARED BY: DEBASHRI PATNAIK

1ST CHAPTER- ELECTRICAL MATERIAL

CONDUCTING MATERIAL



- Any material which allows electrical current to pass through it is called conductor.

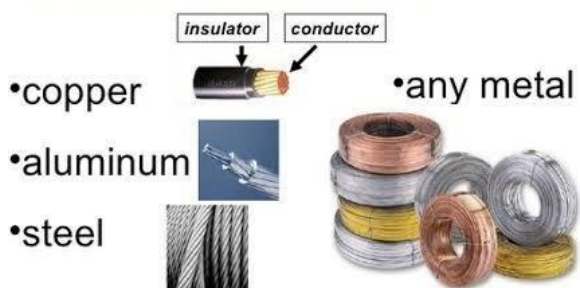
OR

- The material which offers low resistance path to the flow of electrical current. All pure metals are good conductors of electricity
- Conducting material used for making wires or cables that will carry electricity or to making the conducting parts of electrical equipment, machines & Accessories etc.



Conductor –

Any material that allows electric current to pass through it



Insulator –

Any material that does not allow electric current to pass through it

•like the protective coating on wires



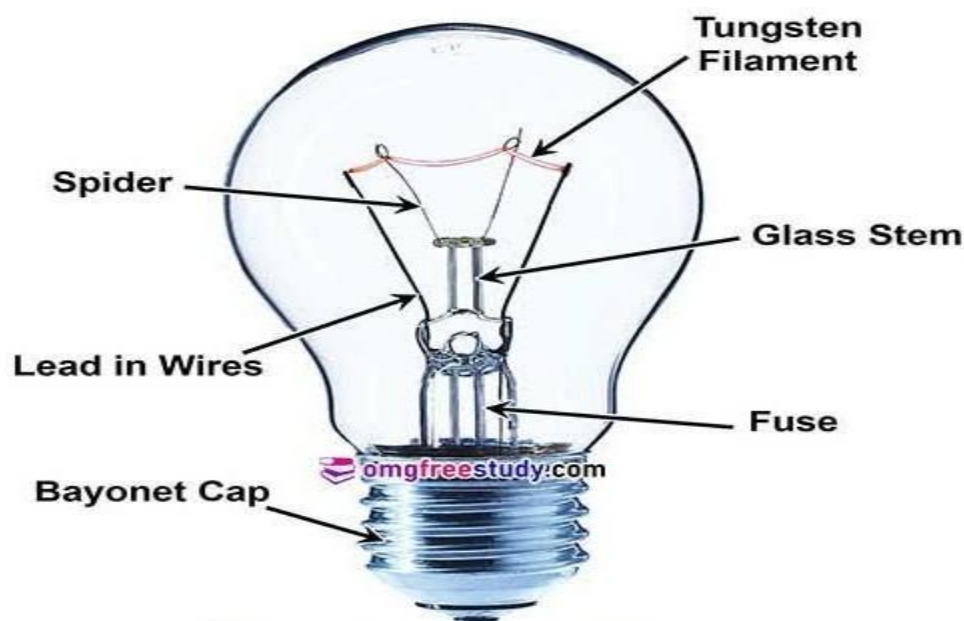
What is conductor ?

Conductor –

Any material that allows electric current to pass through it



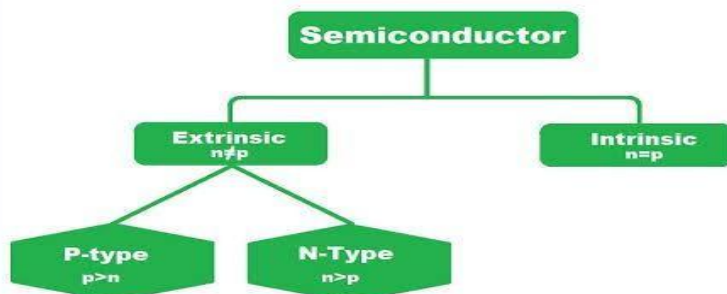
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Tungsten Filament Lamp

What is a Semiconductor?

- ➡ A semiconductor is a material, whose conductivity properties lie between the conductor and insulator.
- ➡ Semiconductor Examples are: Silicon, Germanium, Gallium Arsenide etc.



- ➡ "n" stands for negative (free electrons)
- ➡ "p" stands for positive (holes)

Semiconductor Components



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SEMICONDUCTOR MATERIALS

<u>Material</u>	<u>Example</u>	<u>ρ (Ω m)</u>
Conductor	Copper	10^{-6}
Semi-conductor	Germanium	0.5
Semi-conductor	Silicon	500
Insulator	Mica	10^{10}

UNITS

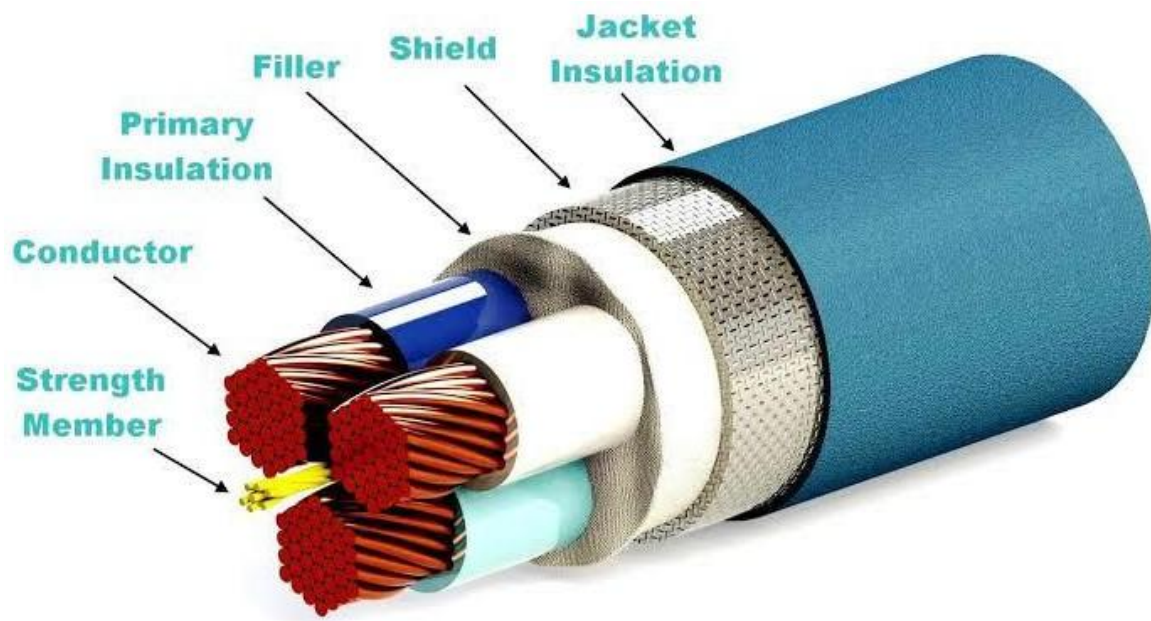
Resistivity, ρ is given by: $\rho = (RA)/L = \Omega \text{ m}^2 / \text{m} = \Omega \text{ m}$

Conductivity, G is given by: $G = 1/\rho = \Omega^{-1}\text{m}^{-1} = \text{S (Siemens)}$

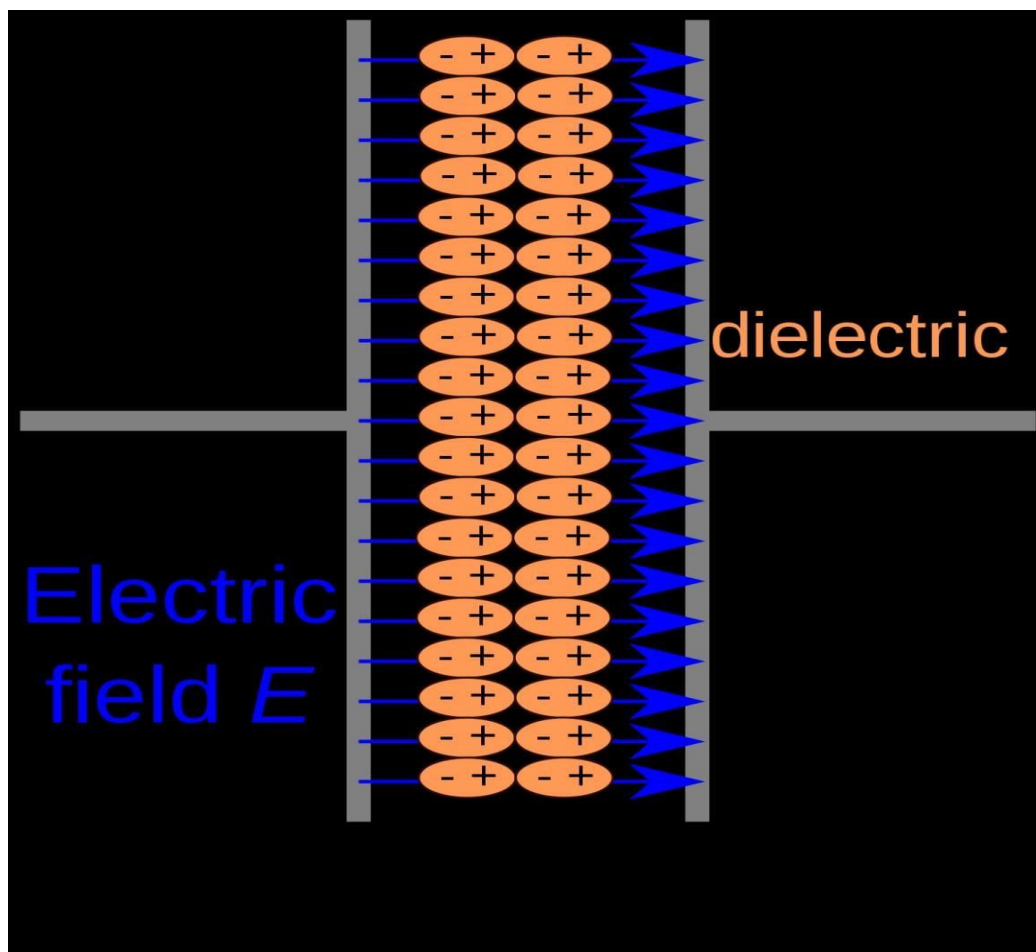
Insulating material

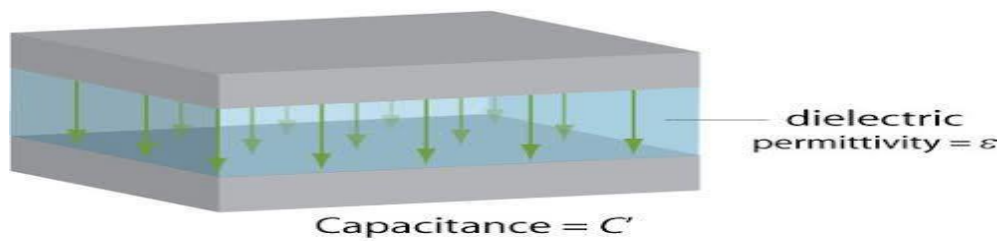
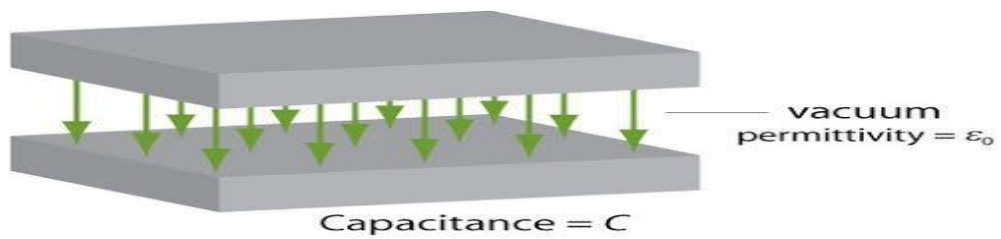


Insulating Materials



Dielectric material

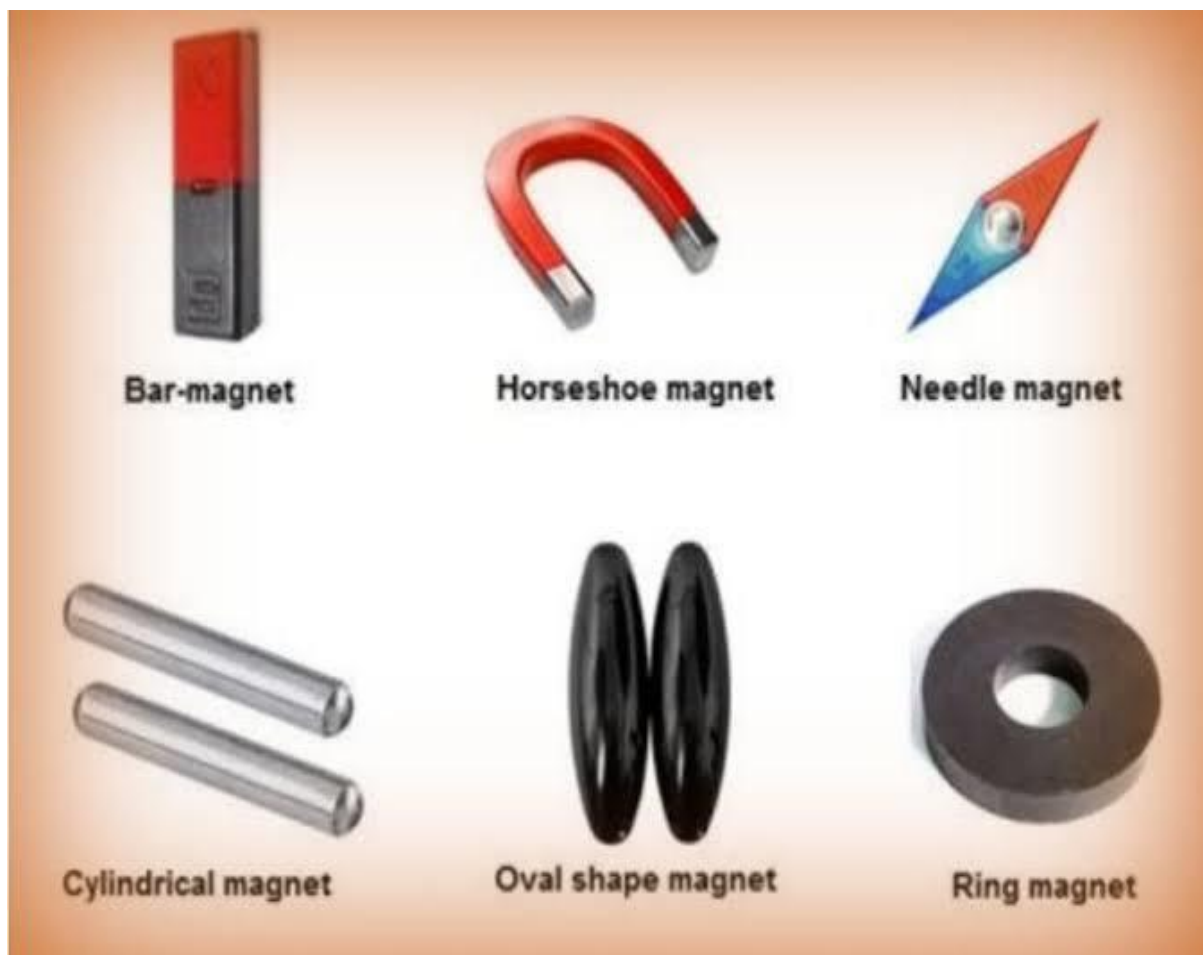




$$\kappa = C'/C$$

$$\kappa = \epsilon/\epsilon_0$$

Magnetic material





S14

K460K1

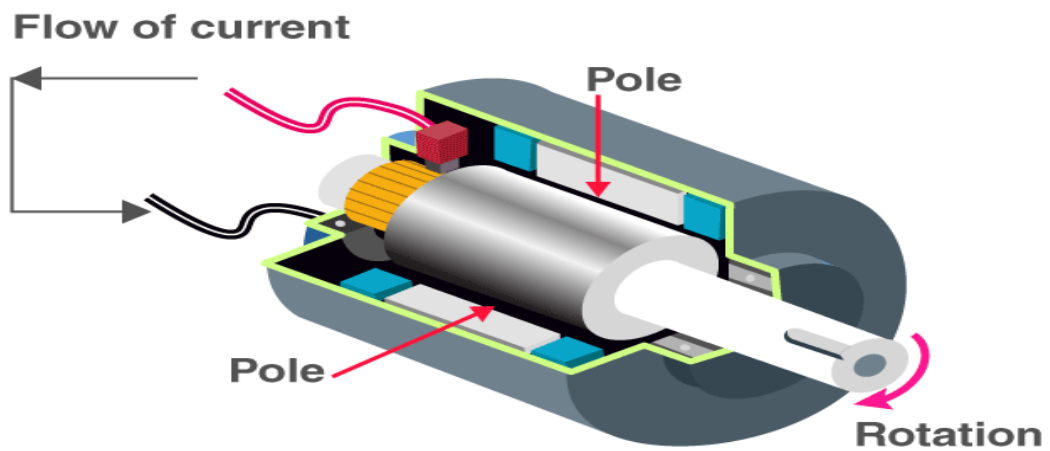
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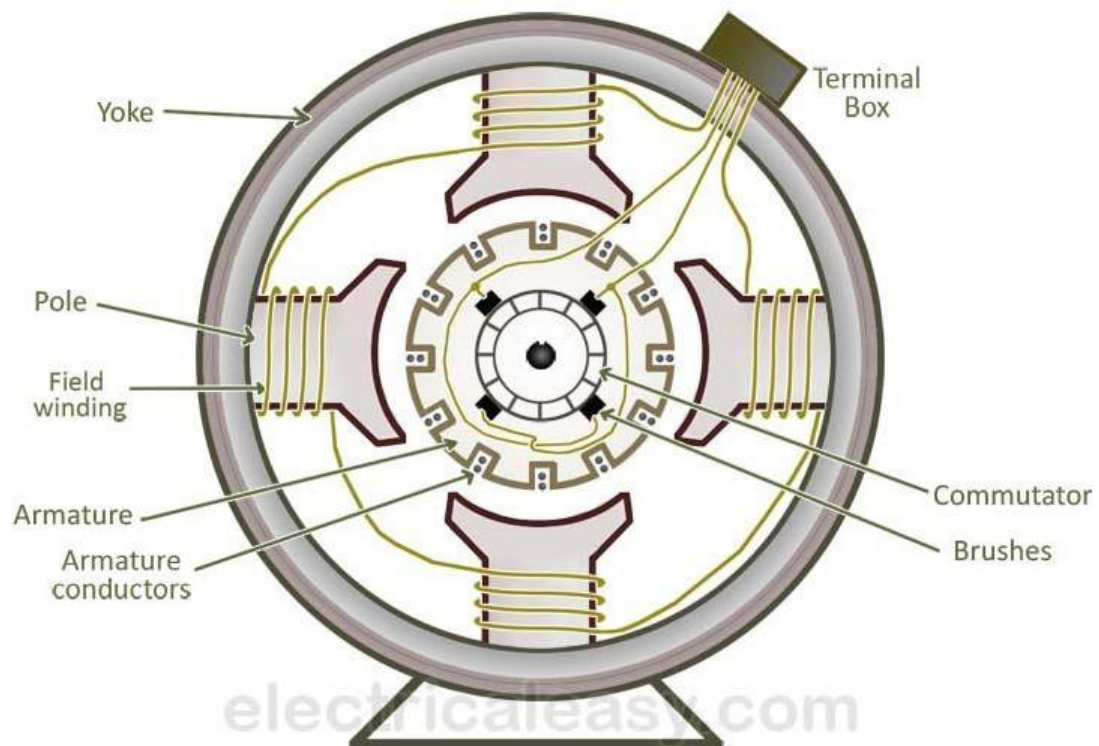
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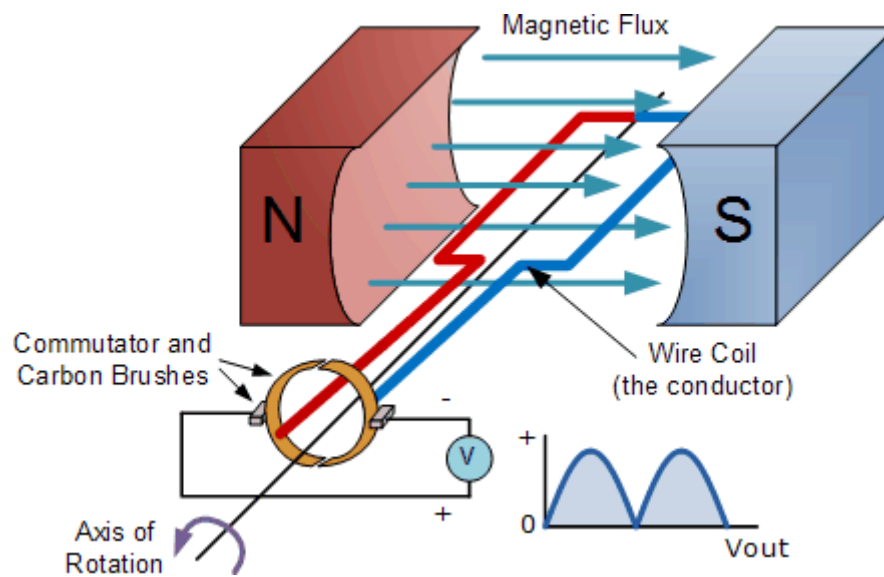
2ND CHAPTER-D.C GENERATOR

DC GENERATOR



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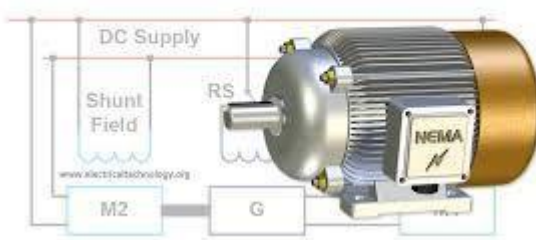
3RD CHAPTER-D. C. MOTORS

Types of DC Motor

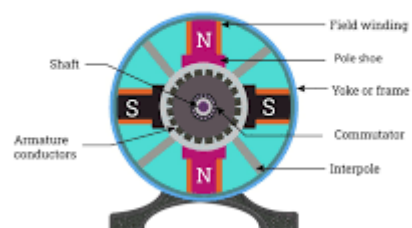


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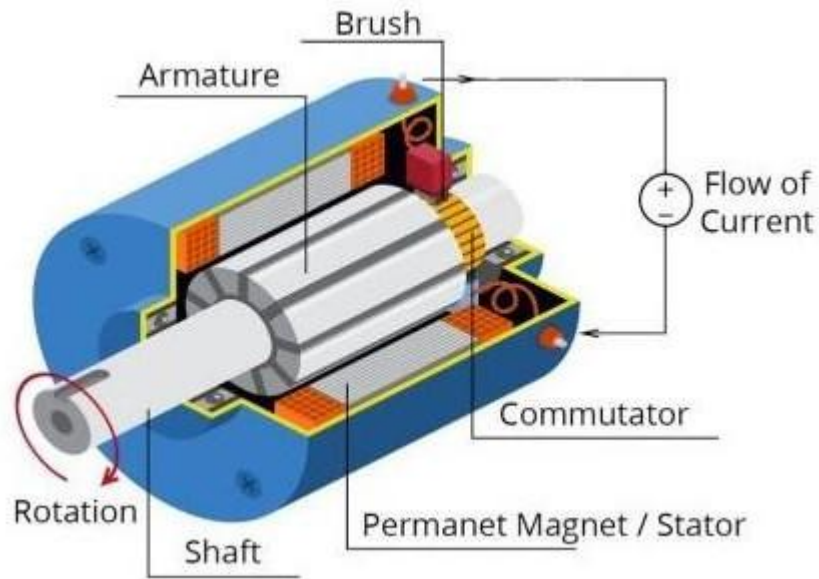
Speed Control Methods of DC Motor



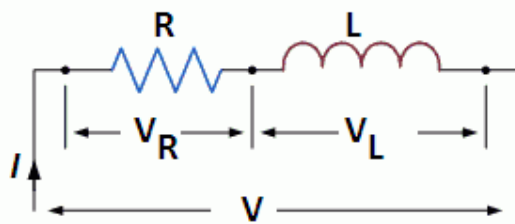
DC Motor Construction Parts



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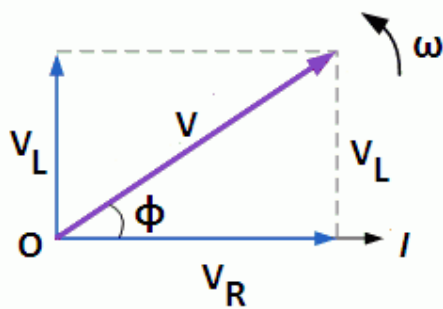


4TH CHAPTER-AC CIRCUITS



$$V = \sqrt{(IR)^2 + (IX_L)^2}$$

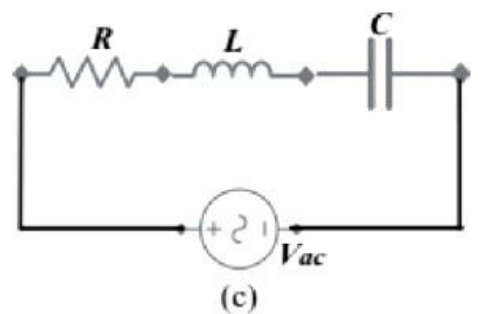
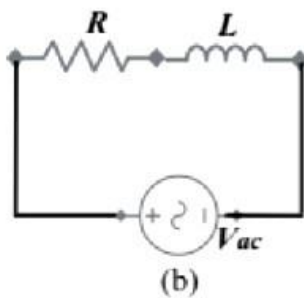
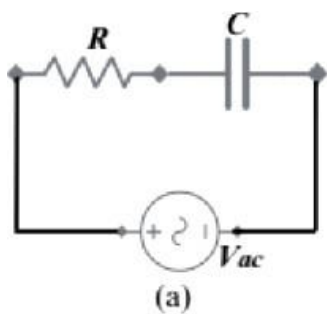
$$I = \frac{V}{\sqrt{(R)^2 + (X_L)^2}} = \frac{V}{Z}$$



$$\text{where } Z = \sqrt{(R)^2 + (X_L)^2}$$

is called impedance

$$\phi = \tan^{-1} \frac{X_L}{R} \quad \text{Power, } P = VI \cos \phi$$



5TH CHAPTER-SINGLE PHASE TRANSFORMER



6TH CHAPTER- THREE PHASE INDUCTION MOTORS

Construction of Three Phase Induction Motor

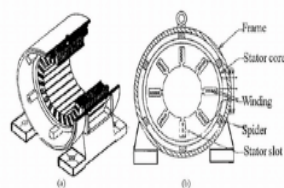
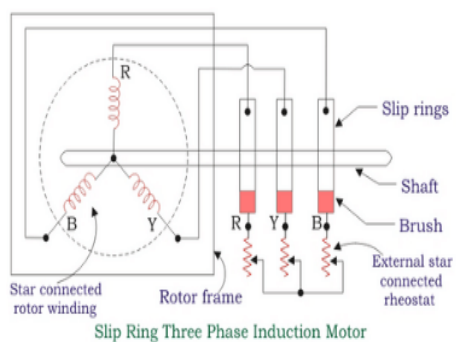


Fig. 31

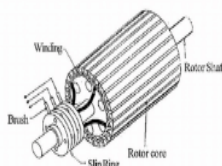


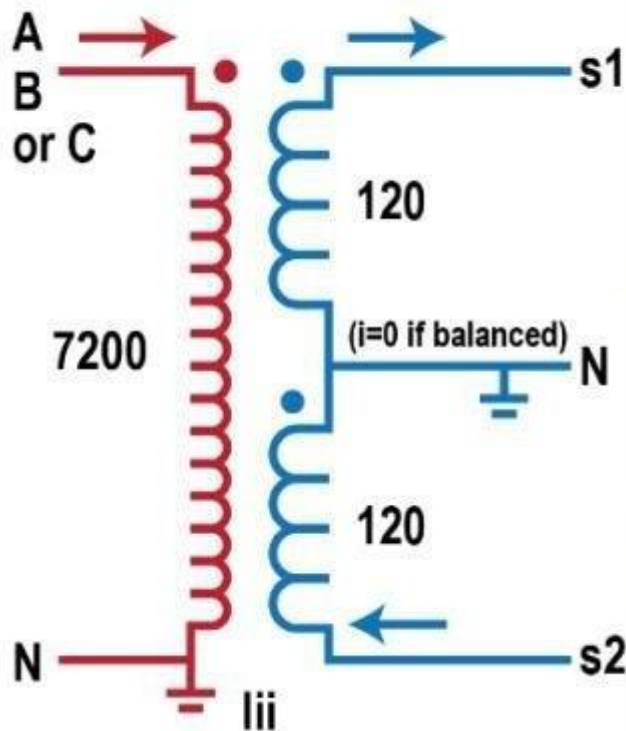
Fig. 32



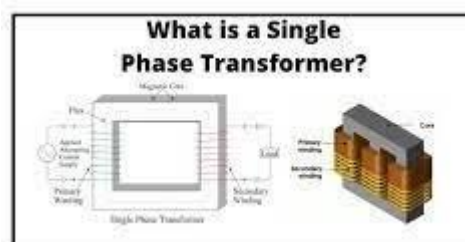
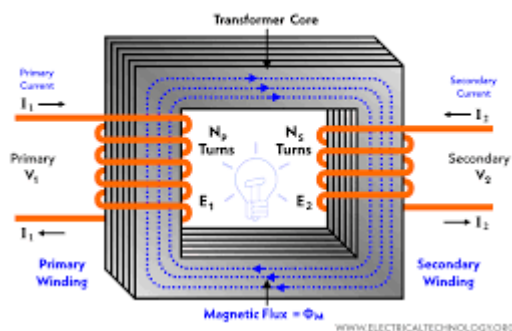
Electrical 4 U

7TH CHAPTER-SINGLE PHASE INDUCTION MOTORS

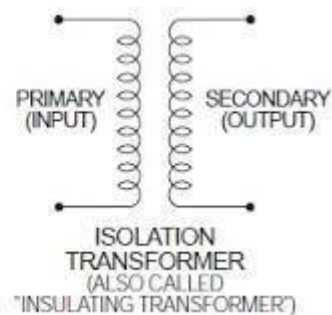
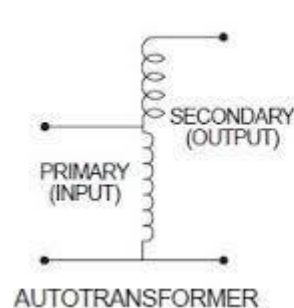
Single-phase Service Transformer



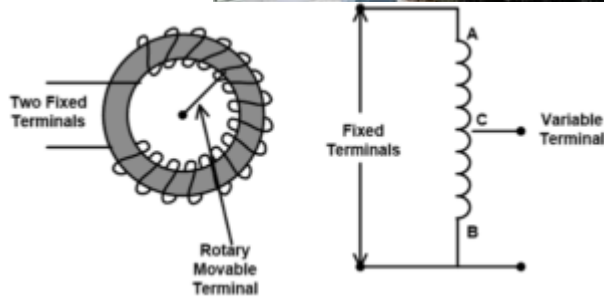
Single Phase Transformer



AUTO TRANSFORMER

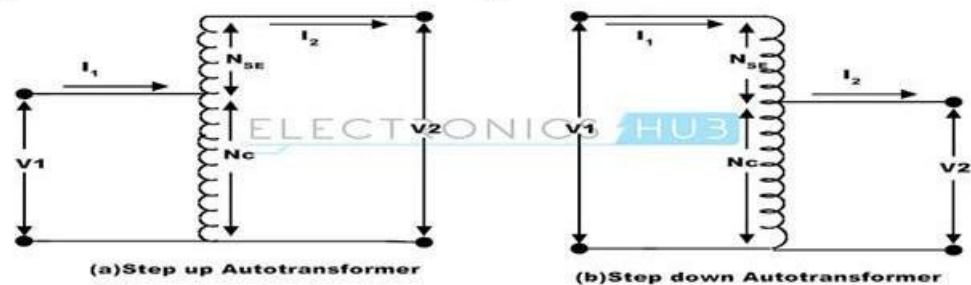


3a-single-phase-variable-autotransform

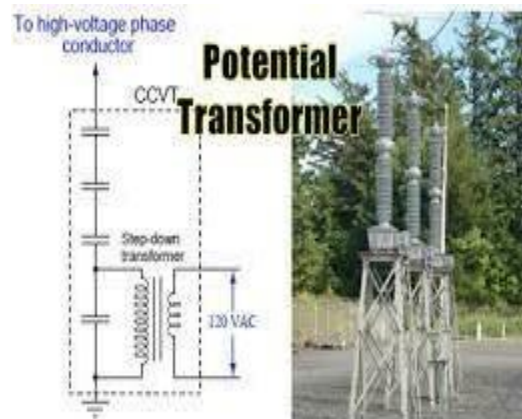


WHAT IS AUTOTRANSFORMER?

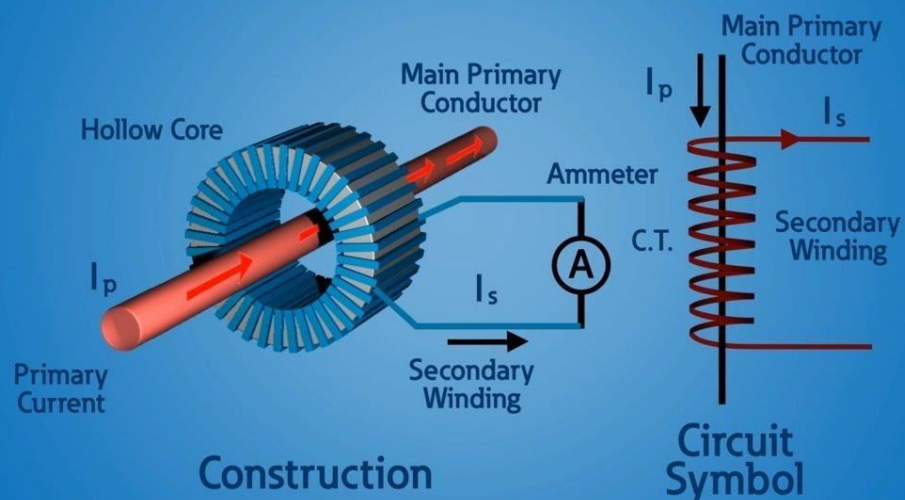
Types, Starting, Efficiency, Applications



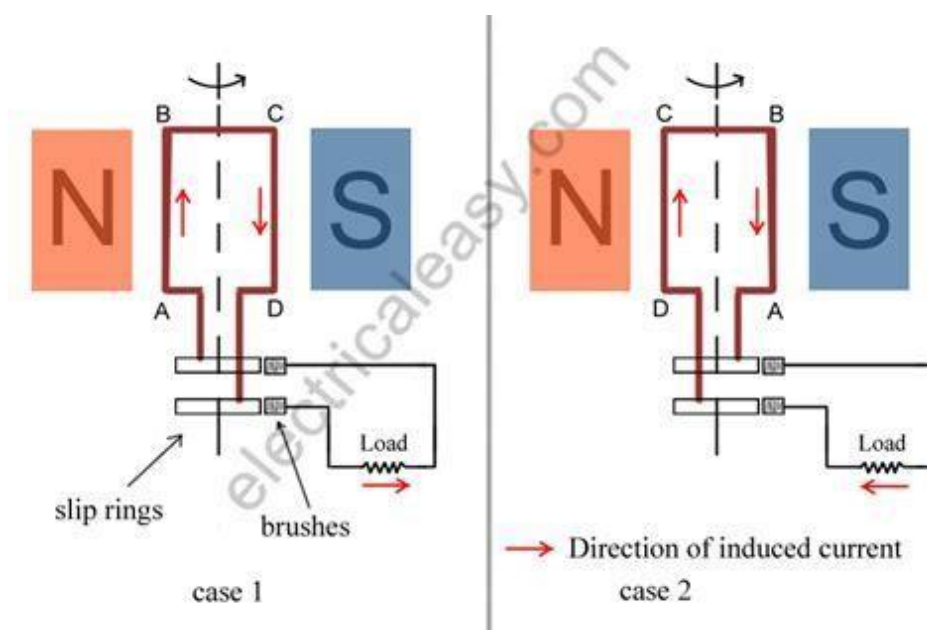
INSTRUMENT TRANSFORMERS



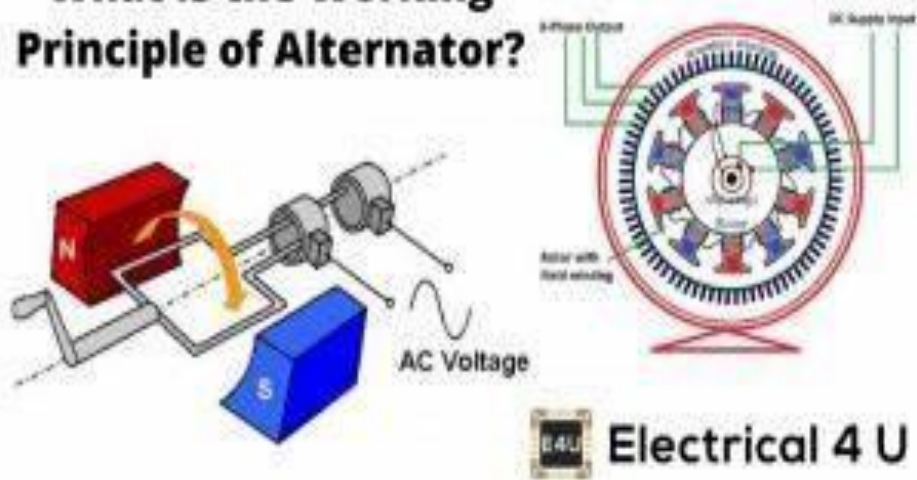
How a CT Works



8TH CHAPTER-A L T E R N A T O R



What is the Working Principle of Alternator?



Electrical 4 U

