

Dr. machine = Ac machine + commutator.

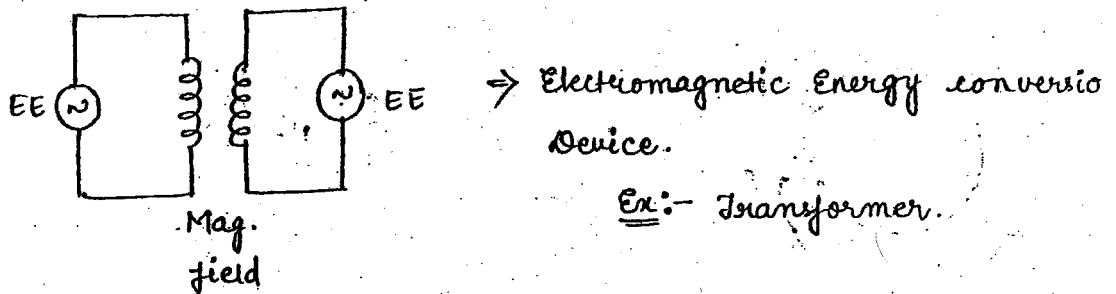
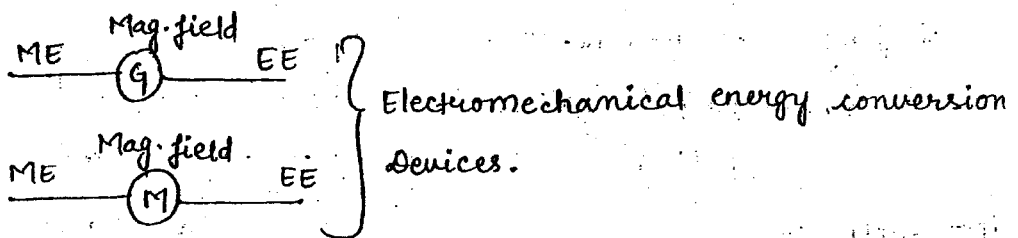
Ac machine → Slipring + Brush.  
(collector ring).

Dc machine → Commutator + Brush.  
(split ring).

For a same rating Ac & Dc machine, weight of Dc machine will be more because of additional commutator.

Dc generator acts as the mechanical amplifier, as the very small amount of dc excitation is given but the o/p of Dc generator will be more. For this only electromagnetic excitation has to be considered not the permanent magnets.

All machinery are etc energy conversion devices only.



Magnetic field is acting as coupling medium.

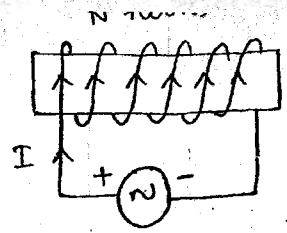
Permanent magnets is not used as the flux because of permanent magnets <sup>flux</sup> cannot be controlled.

Dc generator  $\Rightarrow E_g = k_a \Phi \omega_m$ .

Dc motor  $\Rightarrow T_a = k_a \Phi I_a$ .

In small rating machines permanent magnets will only be used.

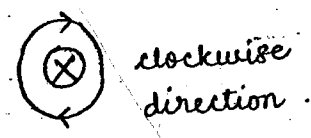
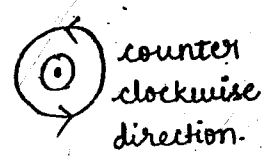
$N I \Rightarrow \text{mmf} \Rightarrow \phi = \frac{\text{MMF}}{S}$   
 (ampere turns)



In magnetic circuits, the flux opposing property is reluctance (s).

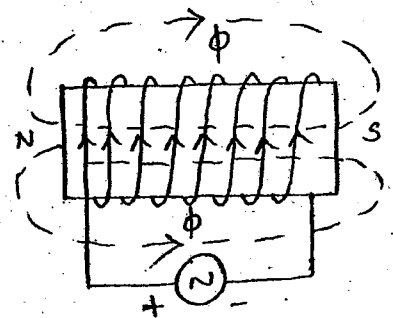
$\phi N \Rightarrow \text{EMF} \Rightarrow I = \frac{\text{EMF}}{R}$   
 (weber turns)

Direction of flux (Electromagnetic flux) can be found by using right hand thumb rule.

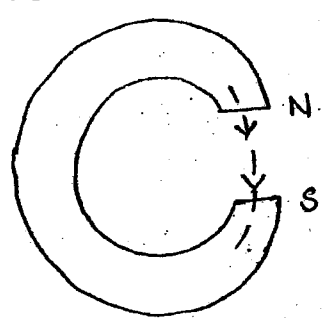


CIRCULAR COIL :-

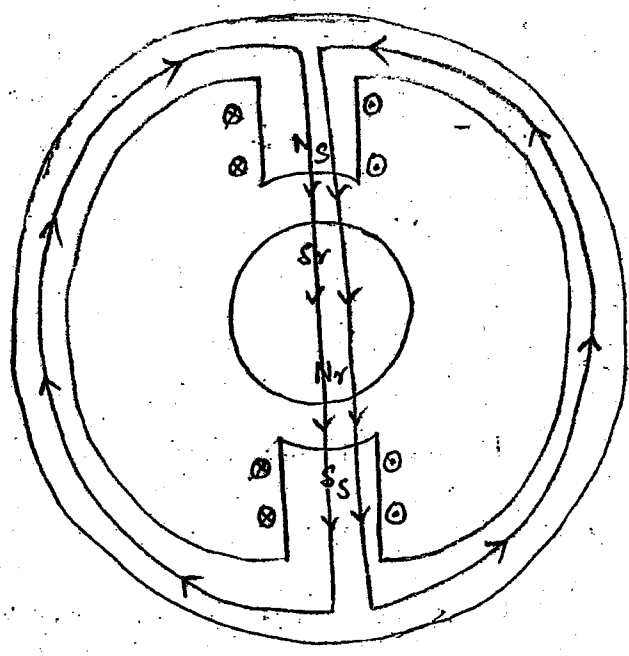
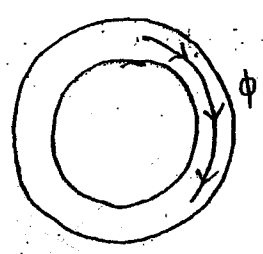
If fingers  $\Rightarrow$  current, then thumb  $\Rightarrow$  flux (or) north pole.



Heteropolar :-



Homopolar :-



In this we cannot find which is north pole and south

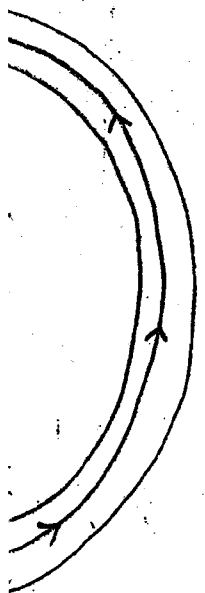
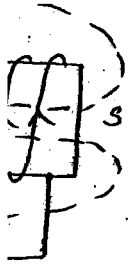
Note.



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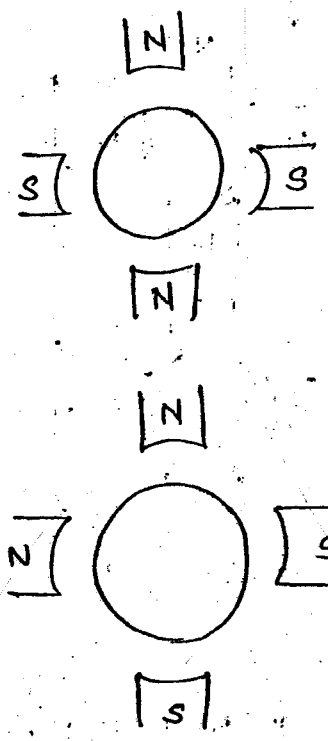
found by using

clockwise direction.



ind south

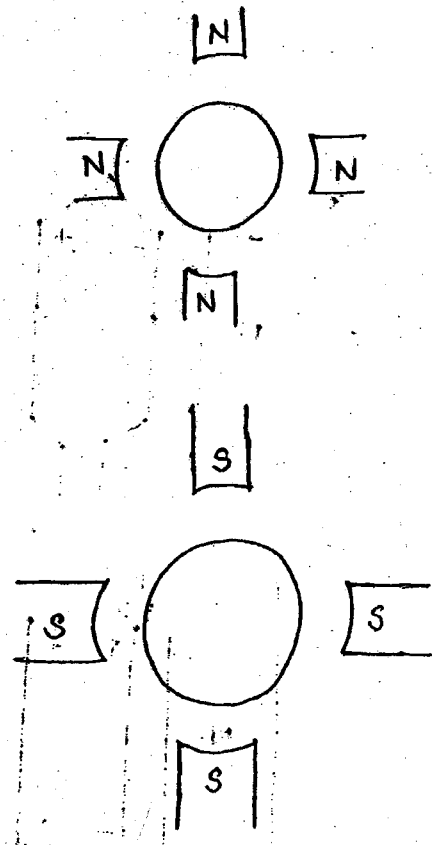
In Heteropolar system,



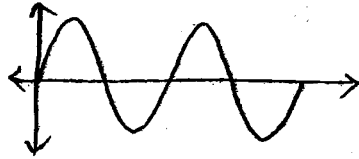
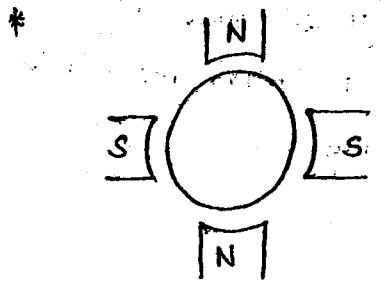
All DC machines are heteropolar machines only.

In Homopolar system,

All poles are south or all poles are north.

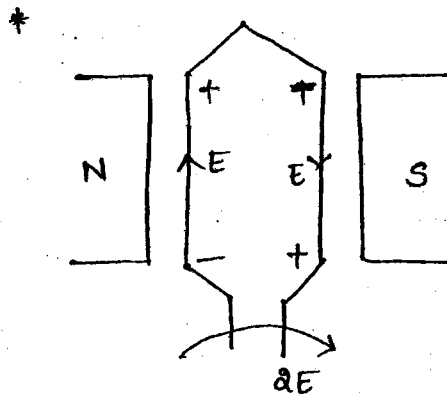


## Heteropolar DC generator

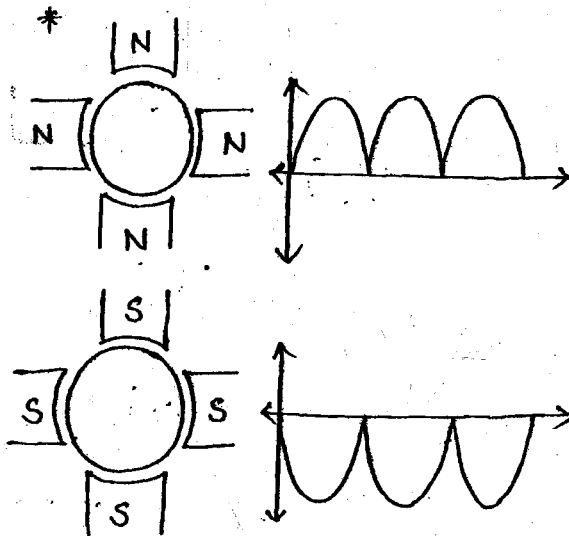


\* Commutator is required to get dc in o/p.

\* Magnetic reversals are present, so hysteresis losses are present. To reduce the hysteresis losses core is made of silicon steel only.

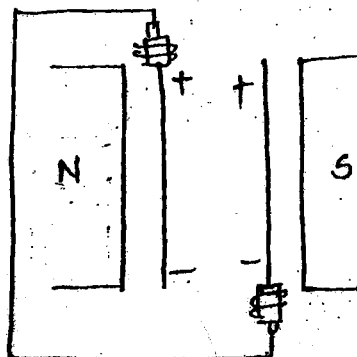
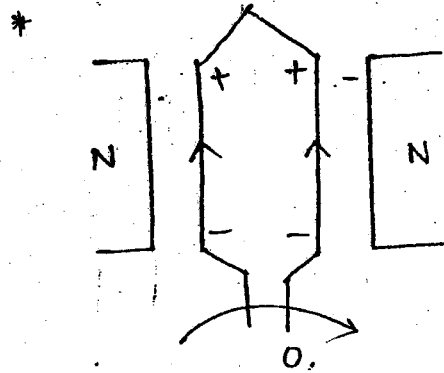


## Homopolar DC generator



\* Commutator is not required.

\* No hysteresis losses on armature core as there are no magnetic reversals.



## TYPES OF

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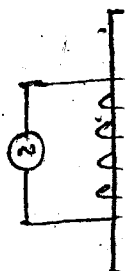
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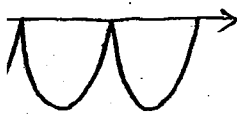
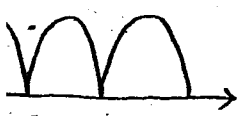
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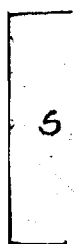
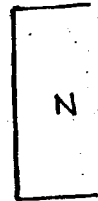
generator



not required.

uses on armature

no magnetic



TYPES OF ELECTRO-MAGNETIC FIELDS :-

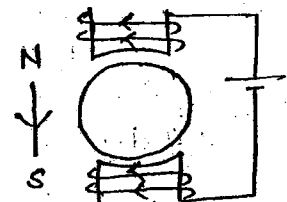
There are three types of electromagnetic fields :

- (i) Steady magnetic field  $\rightarrow$  DC magnetic field  $\leftrightarrow$  Time Invariant magnetic field.
- (ii) Alternating magnetic field (or) pulsating magnetic field (or) Time Variant magnetic field.
- (iii) Rotating magnetic field (or) revolving magnetic field.

By giving DC supply to stationary concentrated winding then steady magnetic flux is produced.

Ex:- DC machine  
field winding on stator  $\rightarrow$  concentrated winding.

Steady magnetic flux characteristics are similar to permanent magnetic flux characteristics.



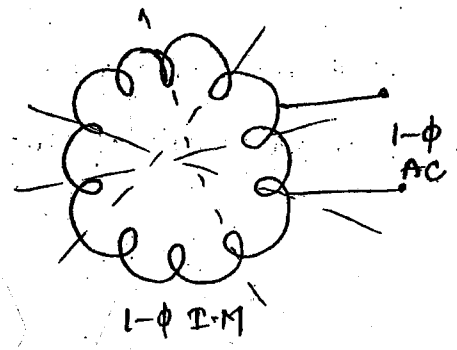
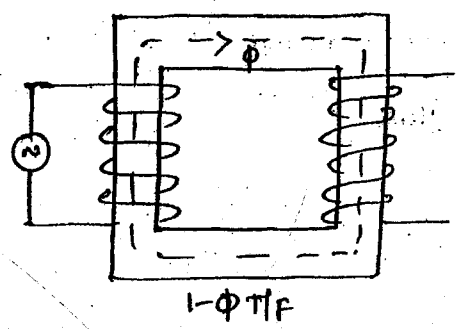
(i) Alternating magnetic field :-

It can be obtained by giving 1- $\phi$  AC supply to stationary concentrated winding.

Ex:- (i) 1- $\phi$  Transformer.

(ii) By giving 1- $\phi$  supply to stationary distributed winding.

Ex:- 1- $\phi$  Induction motor.



Alternating magnetic flux is required for transformer action