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Paper DC Machine and Transformers

Q1(b) why a transformer is considered as static electrical machine while motors and generators are considered as dynamic electrical machine?

Ans/ A transformer is a stationary electrical machine which does not have any moving parts. it is a machine because there is a conversion between electrical ~~Machine~~ and magnetic energy between the winding of the transformer. it convert electrical energy into magnetic energy and again into electrical energy. ~~with it~~ it has two winding. primary and secondary winding. Both winding are wounded around a stationary iron core.
So that's why it is called a static machine.

Electrical Motor:
A motor is a type of dynamic machine which converts electrical energy into mechanical energy. Electrical motor having a moving part called rotor and stationary part called rotor.

Because it is dynamic to make change in electrical energy into mechanical energy.

Electrical Generator:
generator are type of electrical machine. its operation is exactly opposite to the electric motor when it generates electricity. so do some part in rotate. So that's why it is called a dynamic machine.

Q1 a/ How can a machine multiply the effect of human effort? Explain briefly.

Ans/ machine make work easier by increasing the amount of force that is applied, increasing the distance over which the force is applied. A machine must apply the force over a shorter distance.

Q2 a/ How can permeability and relative permeability be differentiated from each other? explain briefly

Ans/ ~~The~~ Permeability:
The ability of a substance to conduct the magnetic lines is called magnetic permeability of material

permeability is the measure of resistance offered against the formation of the magnetic lines. permeability is the relative increase or decreases in the resultant magnetic field in side a material compared with the magnetizing in which the given material is located.

Relative permeability:

material is the ratio between the flux density produced in that material and the flux density produce in a vacuum by the same magnetizing force.

ans) when a material is placed near a magnet it will be attracted toward this magnet. explain the phenomena which is responsible for this attraction.

And when a material is placed near this magnet, it will be attracted towards this magnet due to some force. This force is represented by magnetic lines.
magnetic lines are imaginary lines which ~~originate~~

originates from north pole
and terminates in south pole
and again from south
to North pole.
It should be noted that
from North to South pole
its path is air while
from North to South pole
its path is inside the
material.
Number of magnetic lines
are defined as magnetic flux"
it is denoted by Phi(Φ)
it unit is weber (wb)

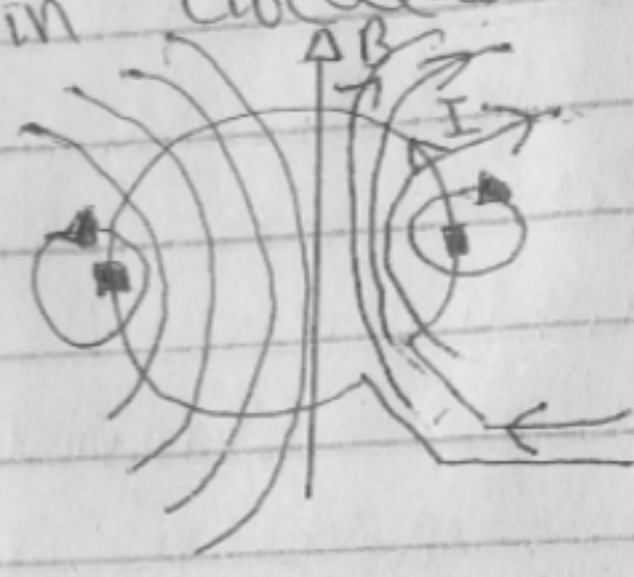
Q2B| if we have a circle wire, then
explain with the help of digram
the direction of current and
magnetic flux for both cases.

Let us consider two diametrically
opposite small current elements
on the circle wire. The magnetic
flux are compressed inside the
circle as it accommodates all
the circular closed lined draw
out side. The compression of
magnetic field lines is
maximum at the center.
in the figure here, we
consider the circle

coil in horizontal plane. The magnetic field lines perpendicular to current elements are in the plane of drawing

Magnetic field due to current in circular wire

Figure 1




Such in the case with any other pair of current element as well. This means that the magnetic field line passing through axis is reinforced by all such diametrically opposite pair of current element. The magnetic field due to current ~~element~~ in circular wise these force, is nearly axial.

The observation as above are the basis of Right hand thumb rule for current in circular wise. if we have orient right hand such that curl of finger follows the direction of current in the circular wise. then extended thumb point

in the direction of magnetic field at center.

Right hand thumb rule.

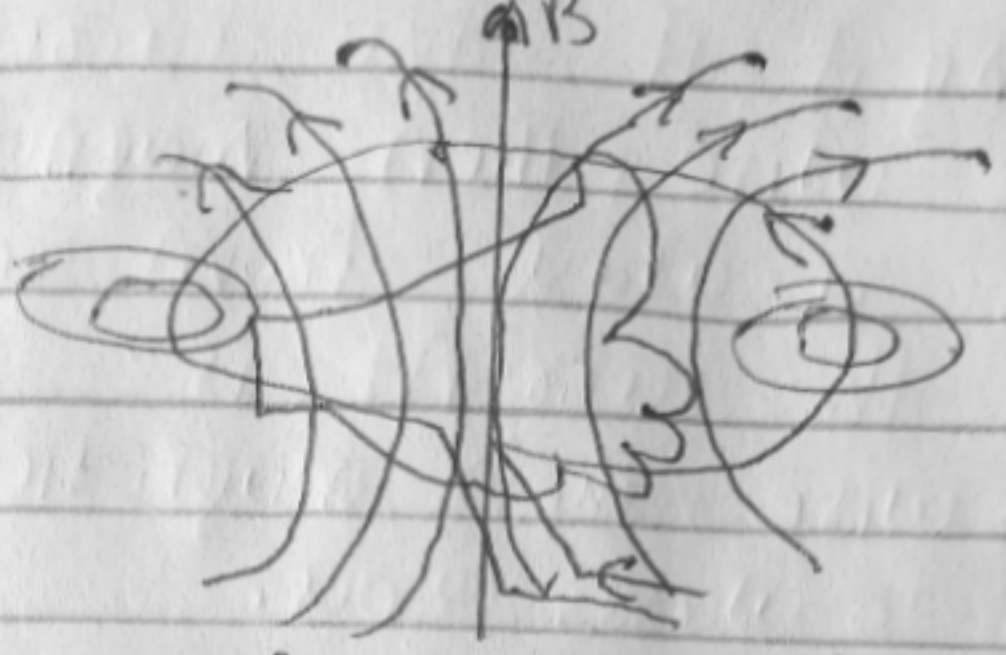



Figure 2

Figure 2. if we orient right hand such that curl of fingers follows the direction of current in the circular wire, then extended thumb point in the direction of Magnetic field at center

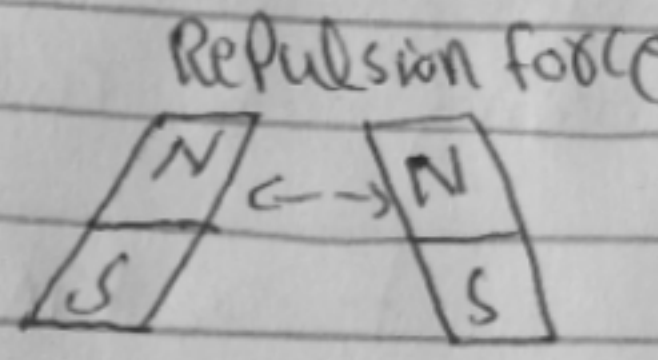
Right hand thumb rules for straight wire and circular wire are opposite in the notations. The curl of hand represents magnetic field in this case of straight wire, where as it represents current in the case of circular wire. Similarly. the extended thumb represents current in the case of straight wire, whereas it represents magnetic field in the case of circular wire.

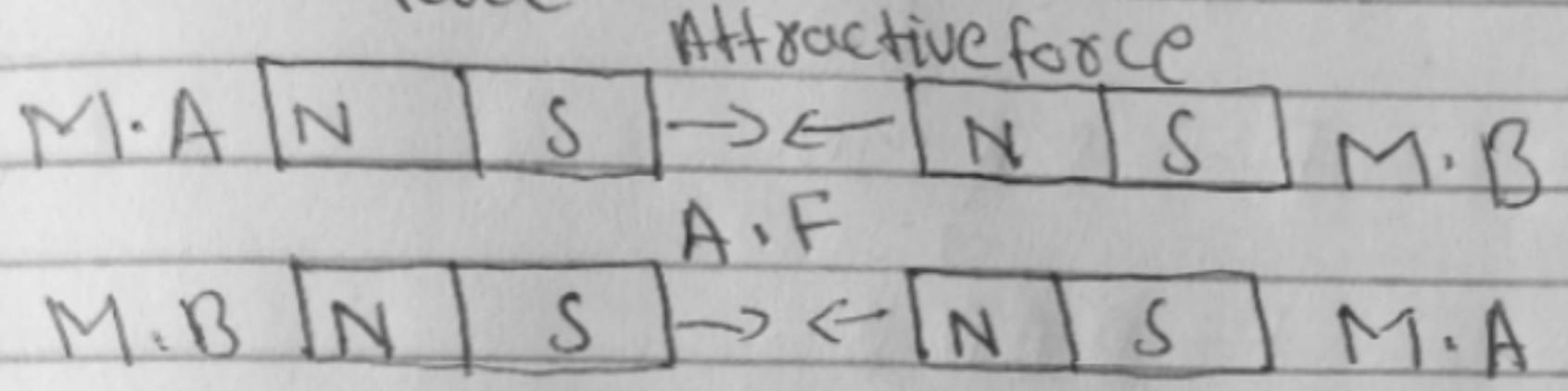
There is yet another simple way to find the direction of axial magnetic field at the center. Just look at the circular loop facing it. if the current is clock wise, then magnetic field is a way from you and if the current is anticlockwise, then magnetic field is towards you.

Q3a) The force produce between two pole of a magnet is inversly proportional to the square of the distance between the pole. justify this statement with the help of laws or mathematical relation.

(Ans) Consider two bar magnets A and B as figure 1. when the north pole of magnet A and the north pole of magnet B or the south pole of magnet A and the south pole of magnet B are brought closer, they repel each other. on the other hand when the north pole of magnet A and the ~~north~~ South pole of B.

of the south pole of magnet A and the north pole of magnet B are brought closer, their poles attract each other

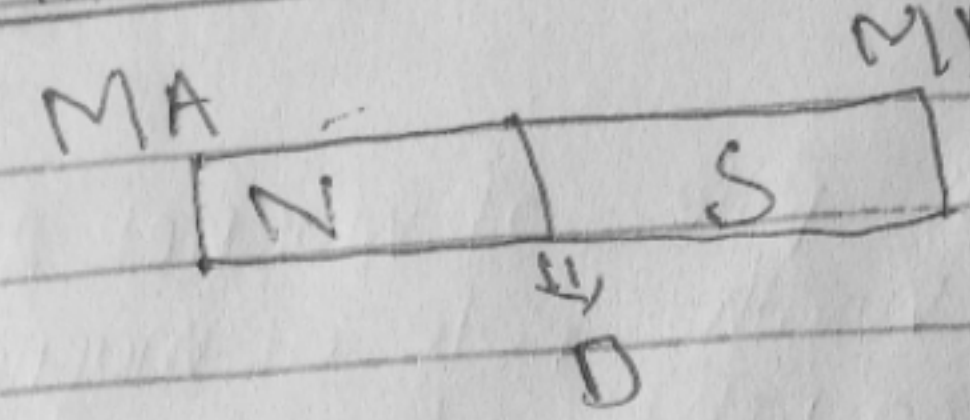




in unit I (opposite charges attract and like charges repel each other).

The force of attraction or repulsion between two magnetic poles is directly proportional to the product of their pole strengths and inversely proportional to the square of the distance between them.

Mathematically:-

Suppose we have 2 poles of a magnet and the pole strength of (N) pole is (MA) and the south(S) pole is (MB) as shown.




where (d) is the distance between the poles. Then according to Columb's law.

$$F \propto M_A M_B$$

$$\text{and } F \propto \frac{1}{d^2}$$

$$F \propto \frac{M_A M_B}{d^2}$$

$$F = \frac{M_A M_B}{\mu_o \mu_R d^2}$$