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D/p → Electrical

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Paper → Electrical Machine

QNo1 (A part)

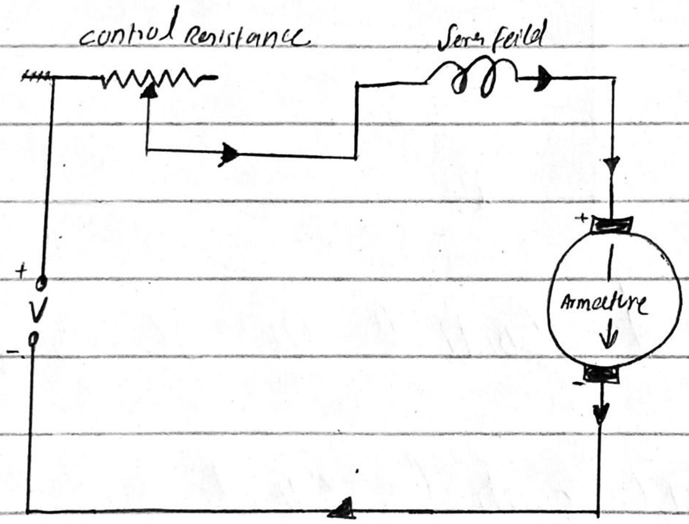
Definition:

Speed control is international change in speed of motor.

Speed Control of DC Series Motor:

ARCM (Armature Resistance Control Method)::

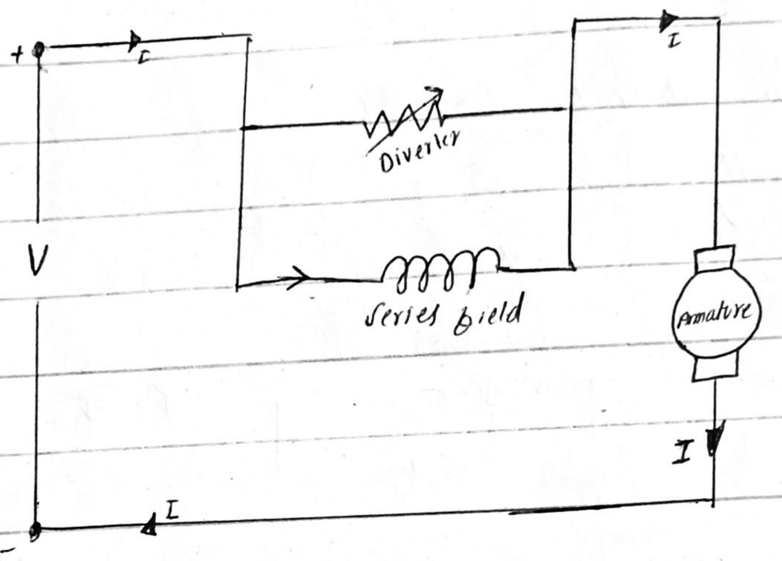
The controlling resistance is connected directly in series with the supply of the motor as shown



This will reduce the voltage available across the armature and hence the speed falls. By changing the value of variable resistance. This method of speed controls is most economical for constant torque.

Field Diverter Method:-

This Method is uses a diverter. Field flux can be reduced by shunting a portion of motor current around the series field. lesser the diverter resistance less is the field current less, flux there fore more speed.

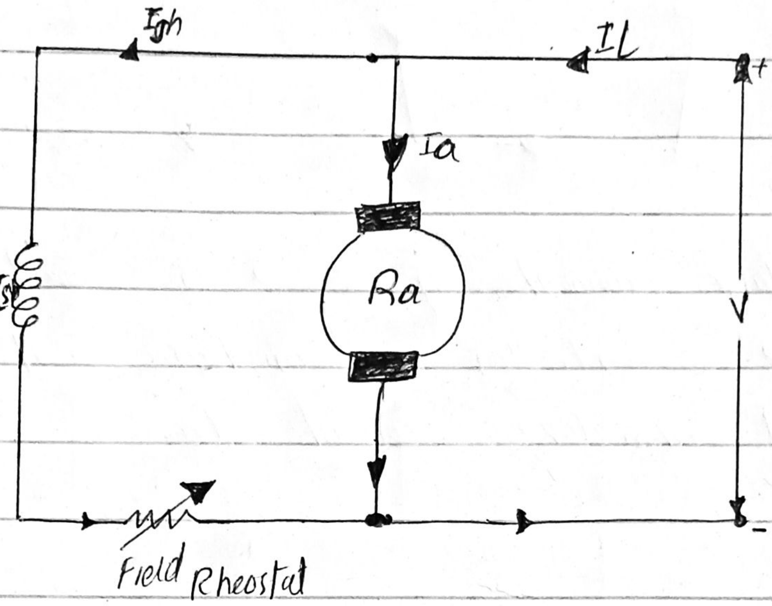


Speed Control Of DC Shunt Motor:-

(1) Flux control Method,

In this method, a variable resistance (known as shunt field rheostat) is placed in series with shunt field winding

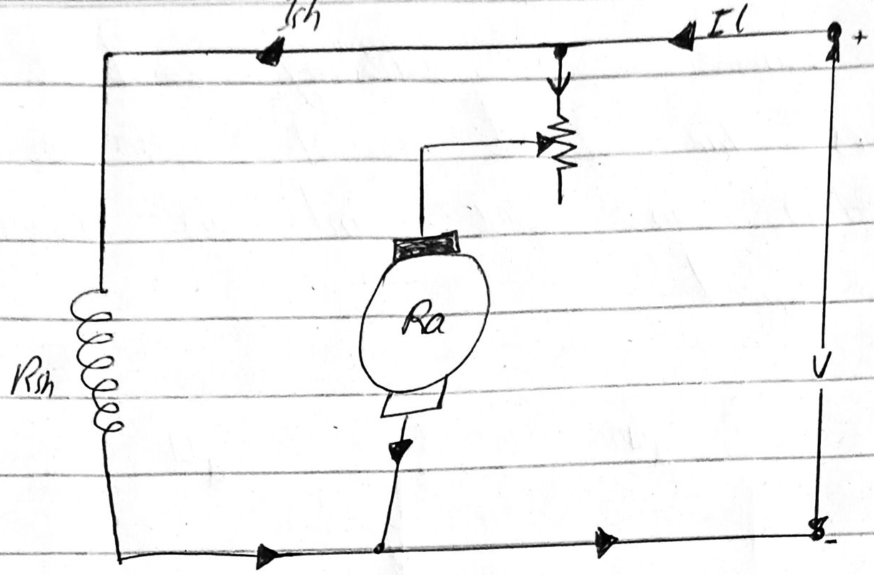
An increase in controlling resistance reduces the field current with a reduction in flux and an increase in speed.



Armature Control Method:-

This is done by inserting a variable resistance Rc (known as controller resistance) in series with the armature.

The flux remains constant while armature current is changed, produces change in speed.



large amount of power is wasted in the controller resistance it carries full armature current Ia.

Q1 (B Part):-

Given data:-

DC generator = 8 poles

Z = 480

Emf per 10 conductor = 2.2V

current per conductor = 100 A

Required:- Terminal voltage E_t = ?

output current I = ?

power generated for both lap and wave windings = ?

Solution:-

No of conductors per path

$480/8 = 60$

we know that

Terminal voltag = emf per conductor x number of conductors

$= 2.2 \times 60 = 132V$

Terminal voltages = 132V

output current

current per conductor X no of parallel paths.

= 100 X 8 = 800 A

output current = 800 A

Power generated for lap winding is

output current X generated EMF

⇒ 800 X 132 = 105600 W

power generate lap = 105.6 kW

For wave winding:

No of parral paths = 2

No of conductors per path.

480/2 = 240

Terminal voltag = 2.2 X 240 = 528V

⑦

out put current = 100 x 2 = 200A

Power generated for wave winding is

200 x 528 = 105600 W

power generated wave = 105.6 KW

Ans.

QNO 2 (A Part):

Torque and Armature current Relationship:-

We have

$Pe = Pm$

Pe = Electrical power

Pm = Mechanical power

$Pe = E_a I_a$ as $(E_a = E_b + I_a R_a)$ KVL

$Pe = (E_b + I_a R_a) I_a$

$pe = E_b I_a + I_a^2 R_a$

$Pe = E_b I_a$ ∵ $I_a^2 R_a \rightarrow$ desipated in Form OF heat.

Now

$Pm = T_g W$

∵ T_g is (Torque in N.M)

∵ W is (angular speed in rad/sec)

1 radian = $1/2\pi$

∴ In RPM = $N^* 2\pi/60$ = rad/sec

$pm = T_g N\, 2\pi/60$

$pm = pe$

$T_g N 2\pi/60 = E_b I_a$

$E_b = P.\phi.Z.N/60.A$

$$\boxed{T_g = \frac{P.Z.\phi.I_a}{2.\pi.A}}$$

T_g is direactly pro to I_a.

QNO2 (B Part).

Differeniation b/w lap winding and wave winding:-

	LAP Winding	Wave Winding.
①	The coil is lap back to the suceeding coil.	The coil of the winding form the wave shap.
②	The end of the armature coil is connected to an adjacent segment on the commutator	The end of the armature coil is connected to commutator segments some distance apart
③	The numbers of parallel path are eaual to the total of numbers poles.	The numbers of parallel paths is eaual to two.
④	Parallel winding or Multiple winding is other name.	Two circuit or series winding is other name
⑤	EMF less	EMF More.
⑥	Brushes eaual to the number of parallel paths	Brushes are two

(7)	Types simplex and Duplex lap winding.	Progressive and Retrogressive wave winding.
(8)	Efficiency is less	Efficiency is high.
(9)	Additional coil is Equalizer Ring	Additional coil is Dummy coil.
(10)	Winding cost is high	Winding cost is low.
(11)	Use in low voltage and high current machines.	Use in high voltage and low current Machines.

END.