1)

Name: Mohsin Ali

ID : 13746

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Subject Name: electrical machine

T. Name: Sir Sannaullah Sahib

Q1 A

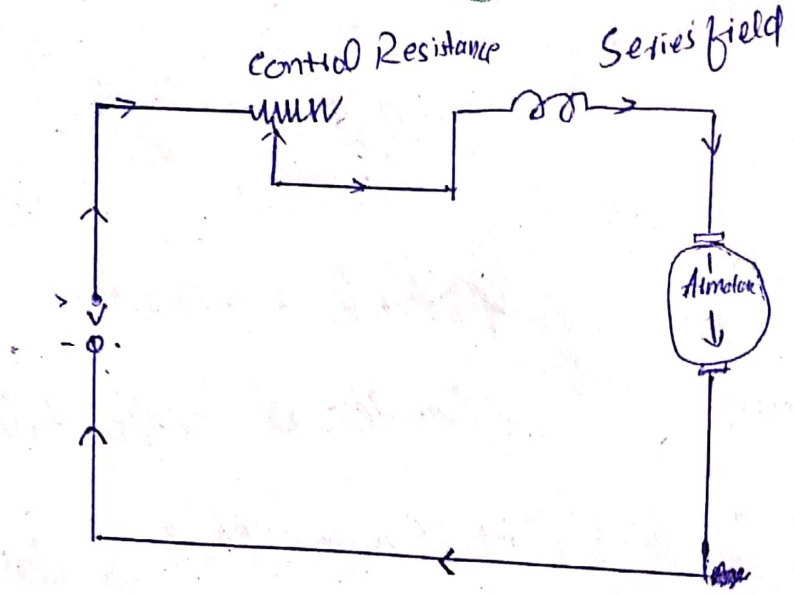
Ans:

Speed control of DC Series motor:

1) Armature Resistance Control Method:

Here The Controling resistance is cannected directly in Series With the Supply of The motor as shown

P.T.O



The Reduces The voltage avaliable across The armature and hence The Speed falls. by Changing The Value of Variable resistance

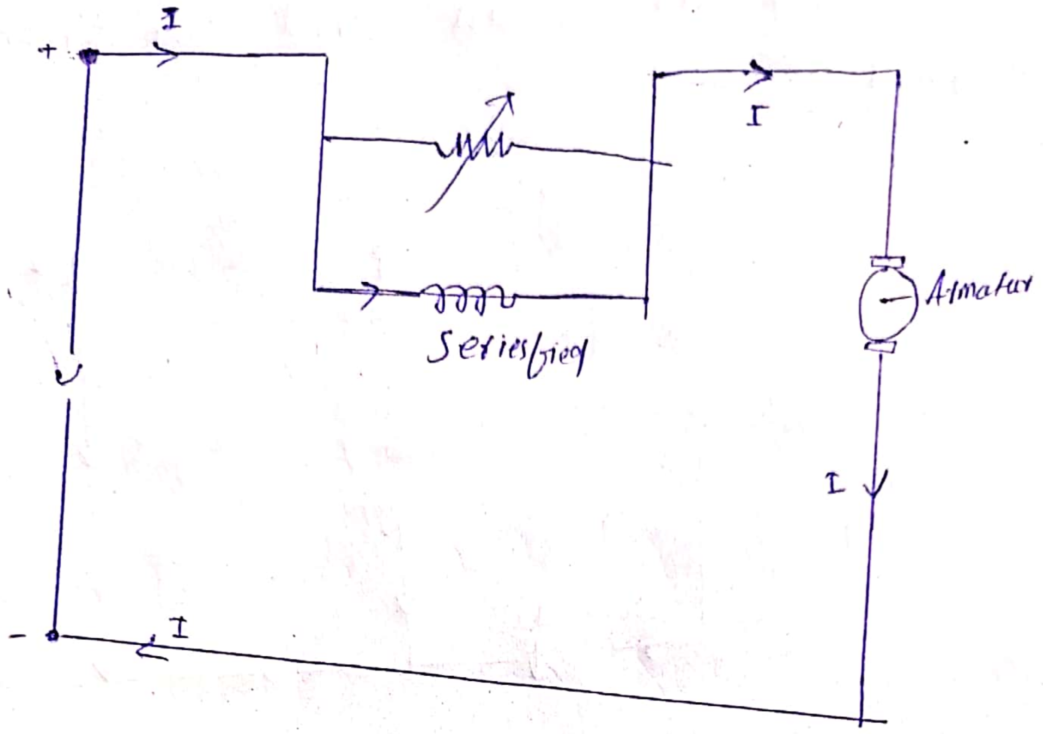
This Method of Speed control is most economical for Constant torque.

ii) Field Diverter Method:

This method uses a diverter. - Here The field Flux Can be reduced by Shunting a Portion of motor current around The Series field. Lesser Than The diverter Resistance less Then The field currents,

P.T.O

Less Flux There more fores Speed.



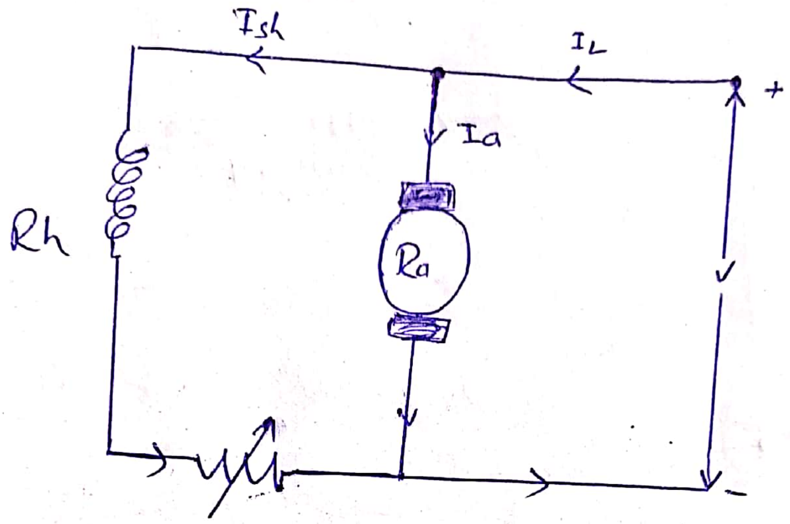
Speed Control of DC Shunt Motor:

i) Flux Control Method.

- In This Method, a variable resistance (known as shunt field rheostat) is placed in Series with shunt field winding as shown:
- An increase in controling resistance

p.to

reduces The field current with a reduction in Flux and an Increase In Speed



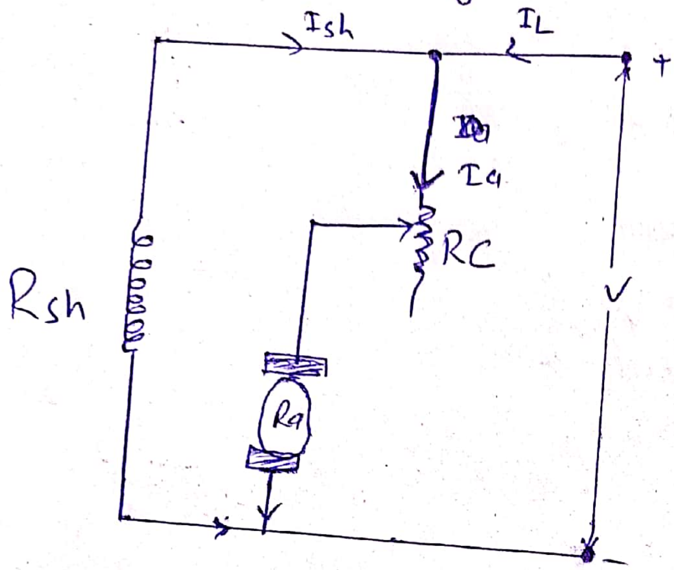
i) This is an easy and convenient Method
ii) it is an inexpensive method since very little power is wasted in the shunt field rheostat due to relatively small value of Ish.

ii) Armature Controll Method:

This is done by Inserting a Variable resistance Rc(known as controller resistance) In Series with The armature as shown.

P.T.O

- The flux remains Constant while armature Current is Changed Produces Chang in Speed.



Large amount of power is wasted in The Controller resistance since it carries full armature Current Ia

Q1

Part (b)

$Z = 480$

$P = 8$

emf = 2.2 V

Current = 100A

total voltage = ?

O/P current = ?

P = ?

Soll:

For Lap $A = 8$

$$Emf = 2.2 \times \frac{480}{8} = 132\ V$$

Current = $100 \times 8 = 800\ A$

$P = VI = 800 \times 132$

$= 105\ kW$

For wave

$A = 2$

$$emf = 2.2 \times \frac{480}{2} = 528\ V$$

current = $100 \times 2 = 200$

$P = 528 \times 200$

$P = 105\ kW$

Q2: A

Torque and Armature current relation ship

$P_e = P_m$

P_e = Electrical Power

P_m = Machinical Power

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

$P_e = (E_b + I_a R_a) I_a$

$P_e = E_b I_a + I_a^2 R_a$ (as dissipate in form of heat)

$P_e = E_b I_a$

Now

$P_m = T_g \omega$ :: T_g (Torque in N.M)

and ω (angular speed in rad/sec)

~~Pm = Tg~~ 1 radian $\frac{1}{2\pi}$ :: in RPM = $N \times 2\pi / 60$ rad/sec

$P_m = T_g N 2\pi / 60$

$P_m = P_e$

$T_g N 2\pi / 60 = E_b I_a$ $E_b = \frac{P \cdot \phi \cdot Z \cdot N}{60 \cdot A}$ P.T.O.

$$T = \frac{P \cdot Z \cdot \phi \cdot I_a}{2 \cdot \pi \cdot A}$$

Q2 B

Difference b/w Lap winding and wave winding

- Definition
- Connection
- Petralel paths
- Emf Induced
- No of Brushes
- Types
- Efficiency
- Additinol Coils
- cost
- voltage and current

PTO

Bassis for Comparision	Lap winding (8)	(9) wave winding
Definition	• The coil is lap back to The succeding coil	• The coil of winding form The wave shape.
Connection.	• The end of The armature coil is Cannected to an adJacent segment on The commutators.	• The end of the armature coil is Cannected to Commutator segment Some distance apart
Perrallel path.	• The numbers of perrallel path are equal to The total of number poles.	• The number of perralled paths is equal to Two.
Other name.	• Perrallel winding or multipel winding	• Two Circut or Series winding
EMF	• Less	• more
number of brushes:	• equal to the number of perral paths	• Two
Types:	• Simplex and duplex lap winding	• progressive and Retrogressive
Effeeincy	• Less	• High
Additional coil.	• equalizer Ring	• Dummy coil.
winding cost	• High(be more conductor is required	• Low

p.t.o

10)

	Lap windg	wave windg
uses:	in Low voltag, hig current machine	In high voltages, Low current Machine.