SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME :THEORY OF DC MACHINES AND TRANSFORMERS

II YEAR /III SEMESTER

Unit 2- DC MOTOR

Topic : Speed Control of DC Shunt Motor

Speed Control

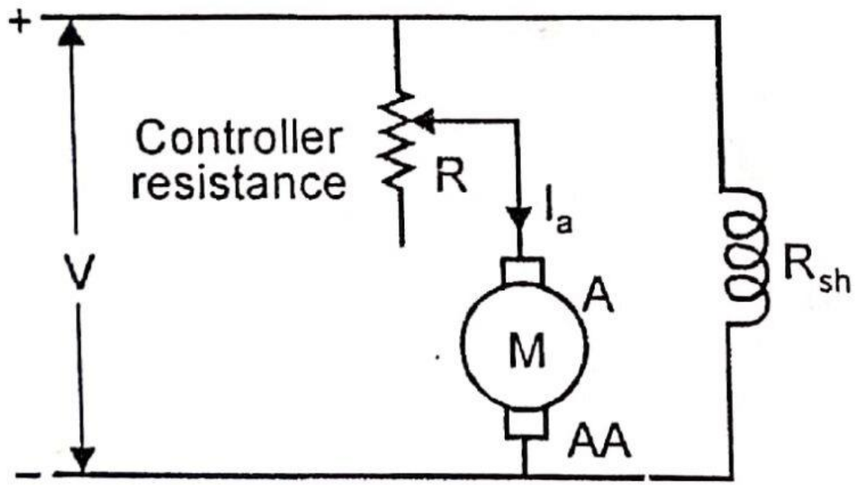
- ✓ A single motor can be used for different speeds for different works.
- ✓ Smooth speed control is possible in DC shunt motor.
- ✓ The speed of DC motor is

$$N \propto \frac{V - I_a R_a}{\emptyset}$$

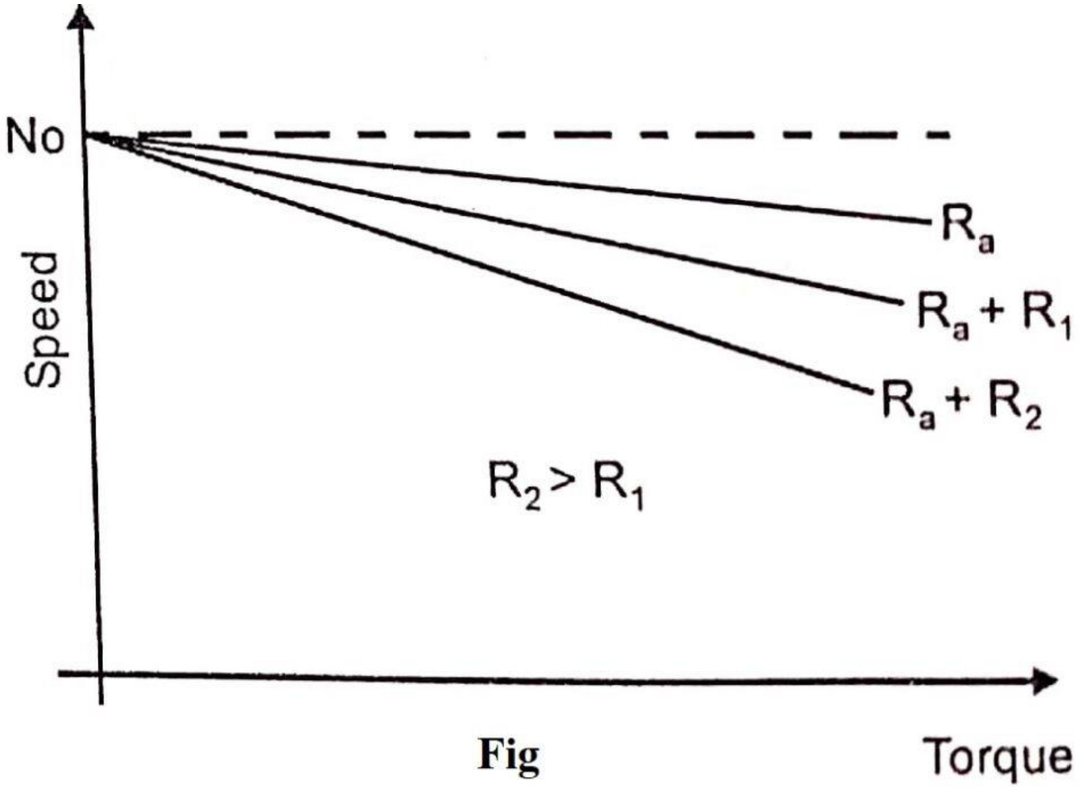
Types

- ✓ Armature Control Method
- ✓ Field Control Method

Armature Control Method



Fig



Fig

Armature Control Method

- ✓ A variable resistance “R” is connected in series with armature circuit.
- ✓ The speed of the motor can be controlled by varying the resistor.
- ✓ The speed equation is, $N \propto \frac{V - I_a(R_a + R)}{\emptyset}$
- ✓ By increasing the resistance “R” the potential drop across the armature is decreased (Because Ia decreases)
- ✓ Therefore the motor speed also decreases .
- ✓ This method is applicable only for speed less than No-load speed (Base Speed).

Advantages:

- ✓ Simple method of speed control

Disadvantages:

- ✓ Here, the input power is not changed.
- ✓ Output power becomes less for lower speeds.
- ✓ More power is wasted so its highly inefficient.

Assessment 1

1. Which of the following assumptions is true for armature controlled DC motor?

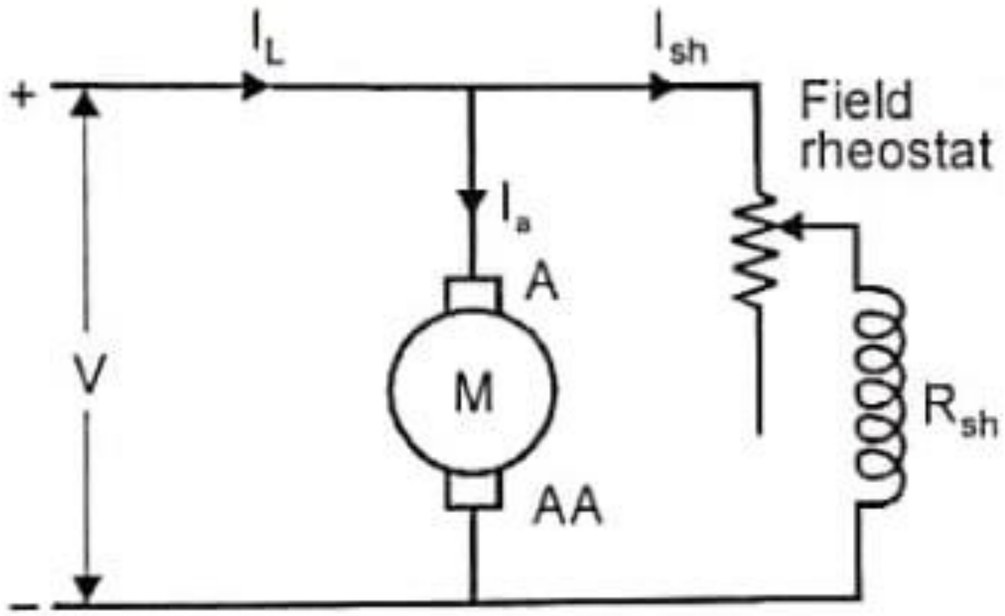
   a. Torque developed is inversely proportional to armature curren

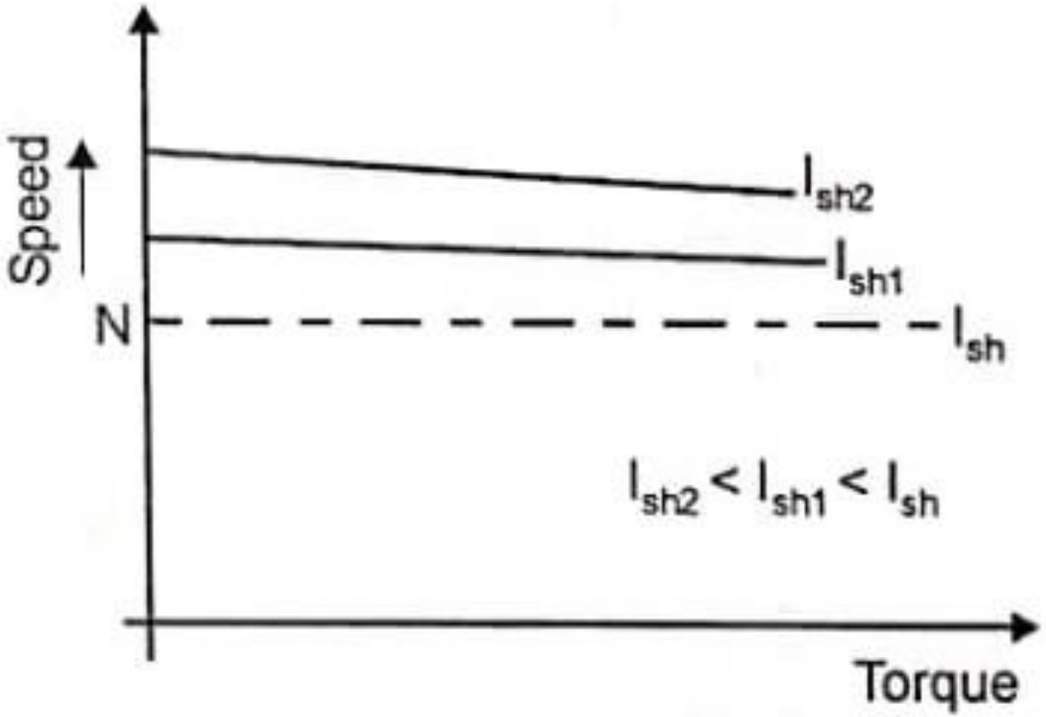
   b. Field is given variable excitation

   c. Back emf is proportional to speed

   d. Coefficient of friction varies with speed.

Field Control Method





Field Control Method

- ✓ The speed is inversely proportional to flux i.e $N \propto \frac{1}{\emptyset}$
- ✓ By varying the flux, the motor speed can be varied.
- ✓ The flux of a DC motor can be changed by changing the field current. Its obtained by a variable resistance connected in series with shunt field winding. $I_{sh} = \frac{V}{(R_{sh}+R)}$
- ✓ By varying the field circuit resistance, the shunt field current can only be decreased.
- ✓ Thus motor speed can be increased by decreasing the flux.
- ✓ This method of speed control is applicable for above the rated speed.

Advantages:

- ✓ Conventional and easy method.
- ✓ Little power is wasted as heat.
- ✓ Speed is independent of load

Disadvantages:

- ✓ Only speeds higher than the rated speed can be obtained.

Assessment 2

1. If the speed of a DC shunt motor is increased, the back emf of the motor will _____-

a. increase

b. decrease

c. remain same

d. become zero

References

1. Murugesh Kumar K, “Electric Machines Vol I”, Vikas Publishing Pvt Ltd , (2010)
2. Murugesh Kumar K. , „Electric Machines Vol II“, Vikas Publishing House Pvt Ltd, 2010.
3. Mehta V.K. and Rohit Mehta, „Principles of Power System“, S.Chand and Company Ltd, 2003.
4. Fitzgerald A.E., Charles Kingsley, Stephen.D.Umans, Electric Machinery”, Tata McGraw Hill publishing Company Ltd, 2003.
5. Gupta J.B., Theory and Performance of Electrical Machines”, S.K.Kataria and Sons, 2002.
6. Kothari D.P. and Nagrath I.J., Electric Machines”, Tata McGraw Hill Publishing Company Ltd, 2002.
7. Bhimbhra P.S. , Electrical Machinery”, Khanna Publishers, 2003.

Thank You