Electrical Machines and Power Electronics Lab

Experiment-2

Operating characteristics of DC Motor

Group: W02

Experiment-2A

AIM:

To study and plot the operating characteristics of (Torque vs Speed & Armature current vs Speed) of DC shunt motor.

Procedure:

1. Firstly we Ensured that no load is connected to the motor and made connections as shown in fig 1 without powering the circuit.

2. Kept the Rheostat in the Field circuit at minimum resistance position resistance.

3. Kept the Rheostat in the Armature circuit at maximum resistance position resistance.

4. Increased the DC voltage from zero to rated voltage on field side circuit using SCR actuator slowly.

5. Adjusted the Rheostat in the Armature circuit to get rated voltage across the armature circuit.

6. Now slowly started loading the Motor.

7. Maintained constant voltage (rated voltage) across the armature circuit by adjusting the Rheostat in the Armature circuit for every reading.

8. For each set of loading, we note down the corresponding values of T 1 and T2, armature current and speed.

9. Calculated the load torque. Make sure that armature current does not exceed the rating of the motor.

Circuit Diagram:

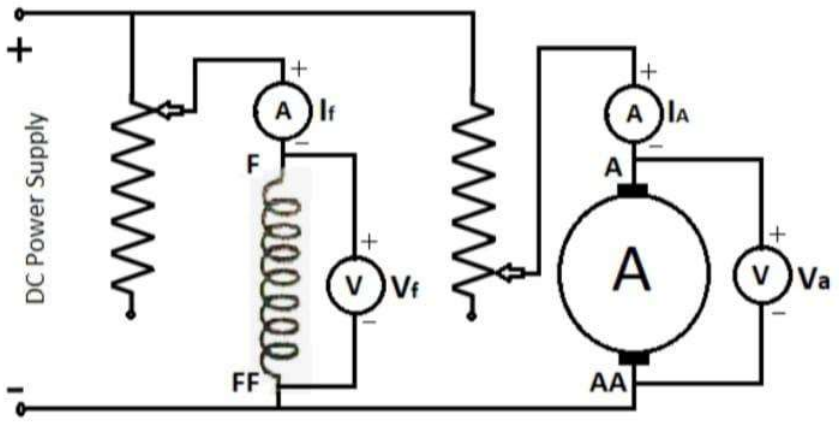


Fig 1: Connection Diagram for Armature voltage control and field control method of speed

Machine Specifications:

Radius of motor shaft was measured to be 7 cm (approximately).

Precautions:

1)Make sure the connections were made properly.

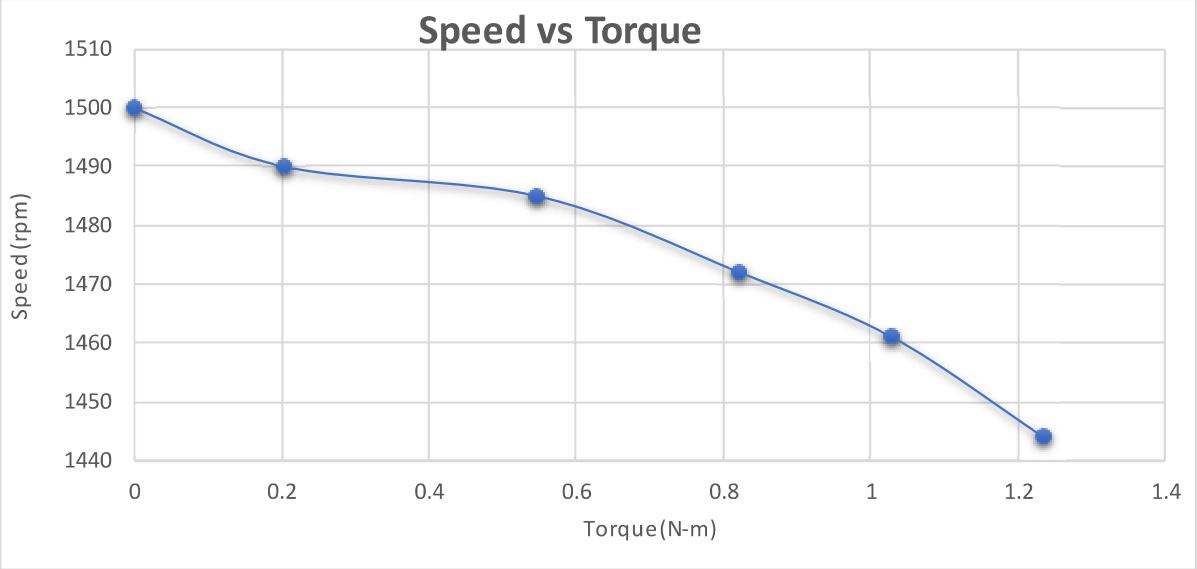
2)For the speed control analysis make sure some load is connected, and the tension belt is intact with the rotor.

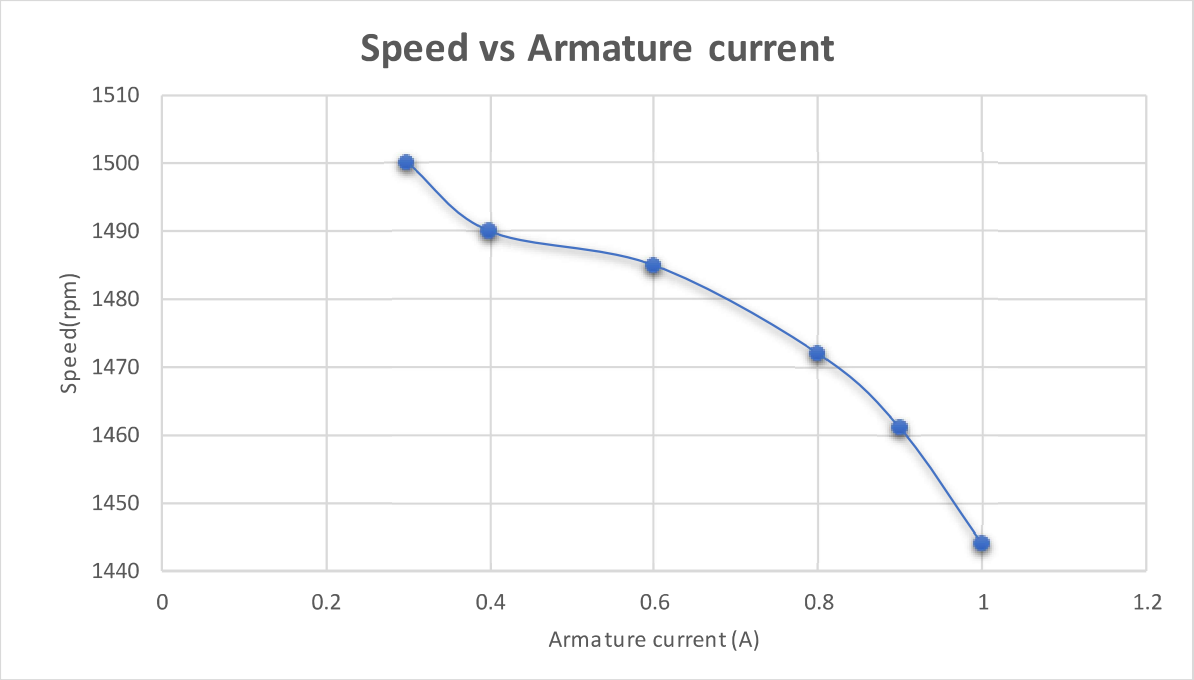
3)Do not touch the rotor while it is rotating with a high RPM.

4) Do not wear loose clothes while conducting this experiment.

Observations:

V	I(armature)	T1	T2	T=9.81*r*(T1-T2)	Speed(rpm)
180	0.3	0.1	0.1	0	1500
180	0.4	0.5	0.2	0.20601	1490
180	0.6	1	0.2	0.54936	1485
180	0.8	1.5	0.3	0.82404	1472
180	0.9	2	0.5	1.03005	1461
180	1	2.5	0.7	1.23606	1444





DC Series Motor

AIM:

To study and plot the operating characteristics of (Torque vs Speed & Armature current vs Speed) of DC series motor.

Procedure:

1. We Ensured that some load is connected to the motor. Without powering the circuit, made connections as shown in fig. 2.

2. Increased the DC voltage from zero to rated voltage gradually.

3. Slowly started loading the Motor by belt arrangement provided. For each set of loading, we note down the corresponding values of T 1 and T 2, armature current and speed.

4. Calculated the Torque.

5.We Made sure that armature current does not exceed the rating of the motor.

6.Plotted the characteristics of the DC Series motor.

Circuit Diagram:

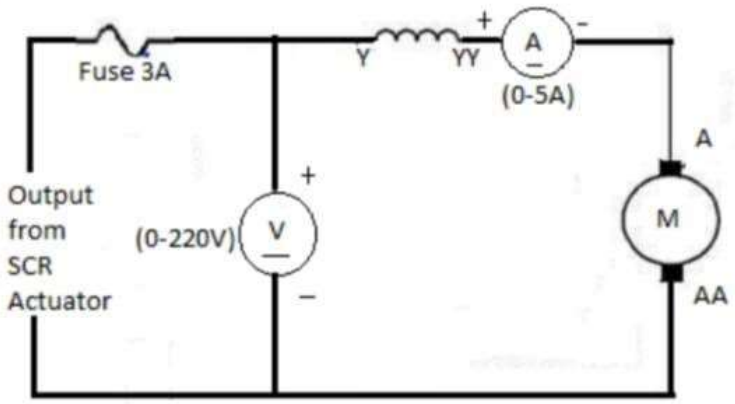
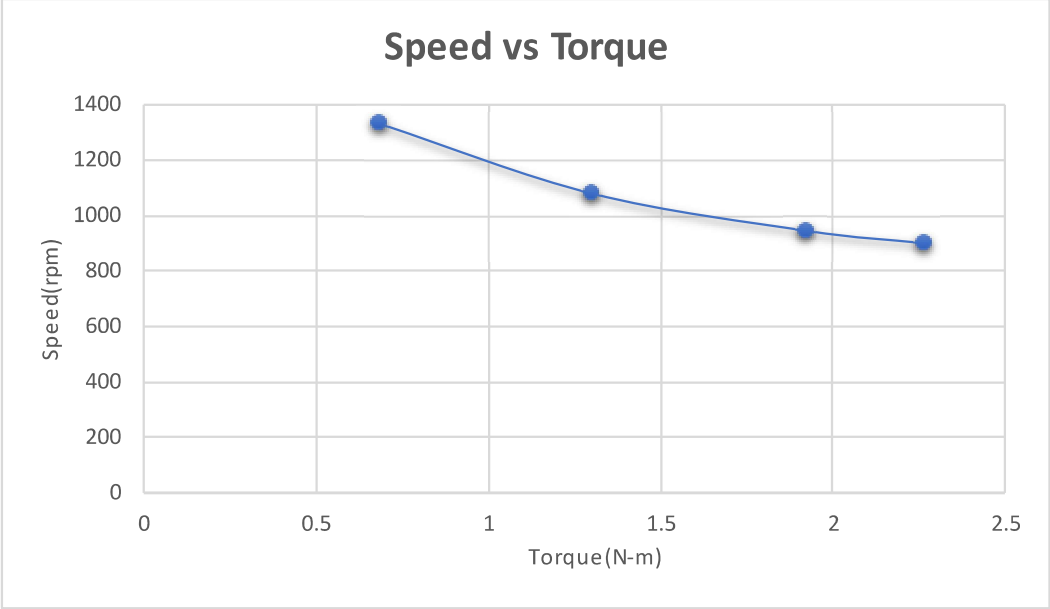
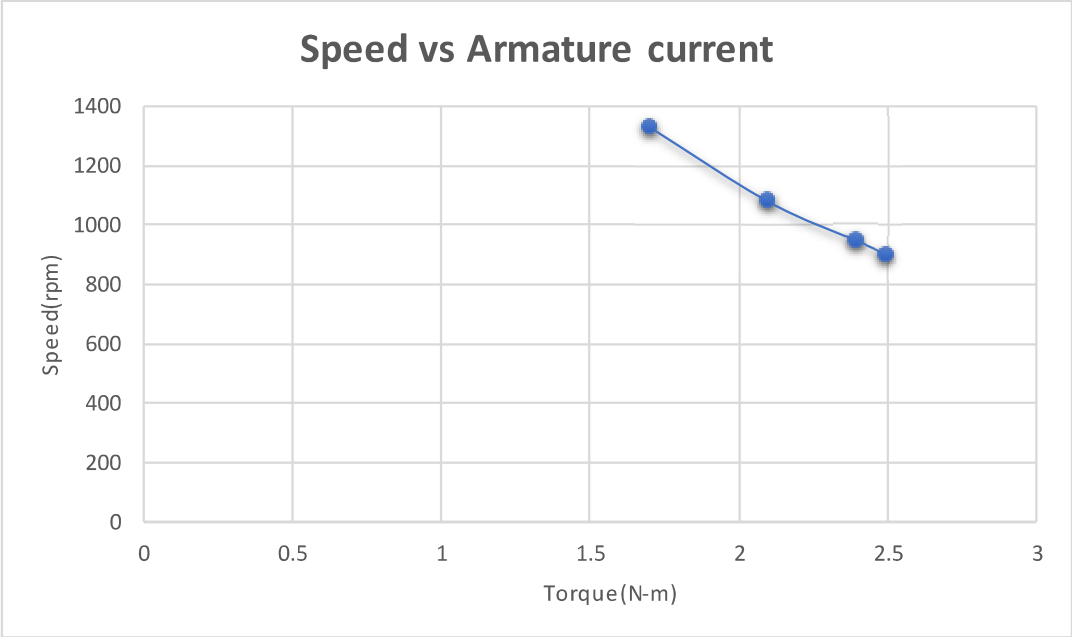


Fig 2 Connection diagram for DC series Motor

Observations:

V	I(armature)	T1	T2	T=9.81*r*(T2-T1)	Speed
120	1.7	1.5	2.5	0.6867	1330
120	2.1	2	3.9	1.30473	1078
120	2.4	2.5	5.3	1.92276	945
120	2.5	2.6	5.9	2.26611	900





Experiment-2B

Speed Control of DC Shunt Motor

a) Armature control

Aim:

To control the speed of given shunt motor below rated speed by armature control method

Procedure:

1. Made connections as shown in Fig 1

2. Kept the Rheostat in the Armature circuit at maximum resistance position resistance.

3. Kept the Rheostat in the Field circuit at minimum resistance position resistance.

4. Increased the DC voltage to get rated field current on field side circuit using SCR actuator slowly.

5. Adjusted the Rheostat in the Armature circuit to get rated voltage across the armature circuit.

6. Increased the resistance of rheostat in the Armature circuit in steps and recorded the speed for various armature Voltage

Circuit Diagram:

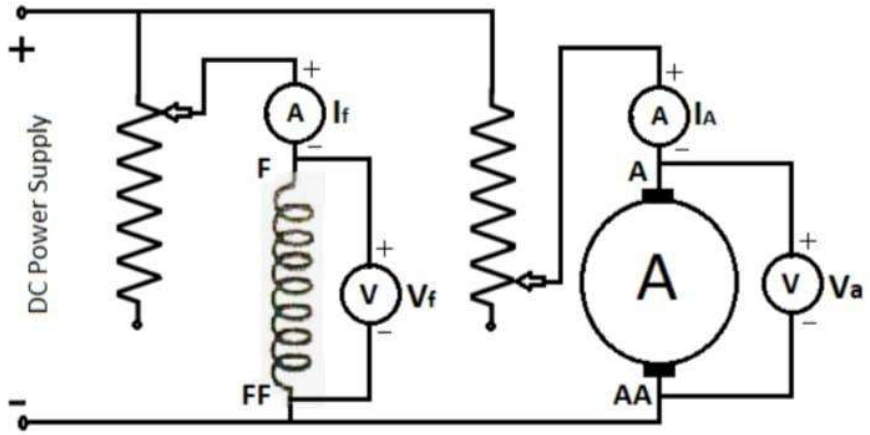
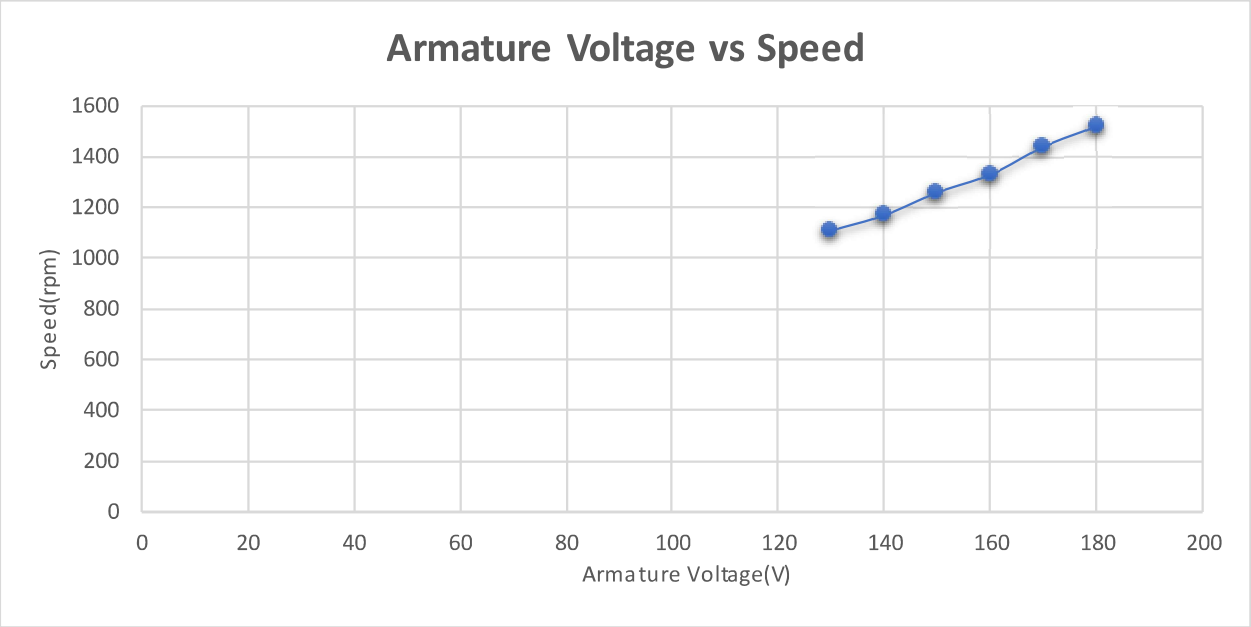


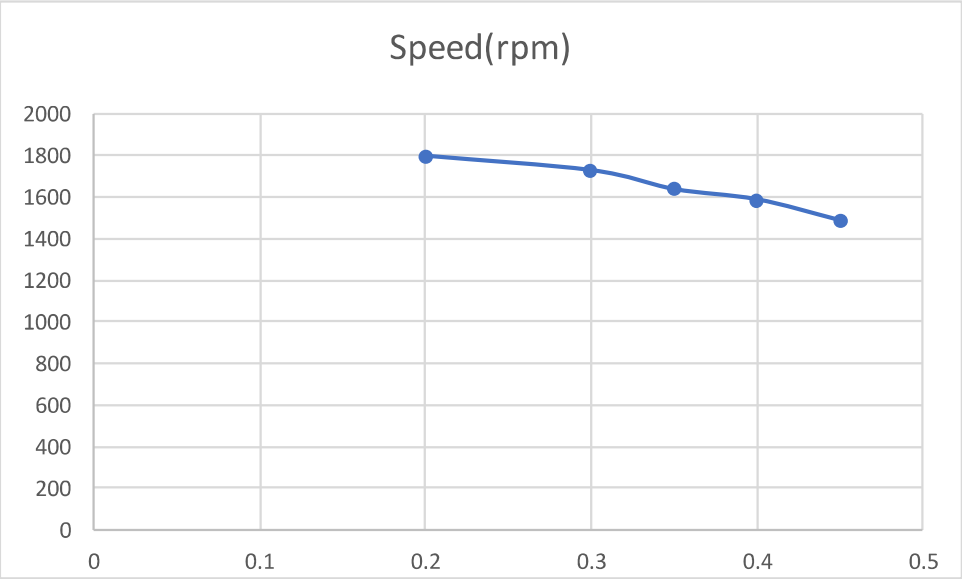
Fig 1 Connection diagram for DC shunt Motor

Armature Voltage(V)	Speed(rpm)
180	1520
170	1440
160	1330
150	1260
140	1170
130	1110



B) Field control

Field Current(A)	Speed(rpm)
0.45	1490
0.4	1590
0.35	1640
0.3	1730
0.2	1800



Results and conclusion:

→After the experiment we observed and concluded that the torque increases linearly with increase in the armature current.

→Also concluded that speed is inversely proportional to the armature current, i.e., if armature current is increased the speed will decrease.

→Speed can be controlled by changing the terminal voltage. Gain in speed can be observed by increasing the terminal voltage.

→By reducing the field flux, increase the speed of the motor is observed. That shows that they are inversely proportional.