



Experiment No.5: Permanent Magnet DC Machine

Introduction

Permanent Magnet DC (PMDC) motors are a type of DC motor that relies on a permanent magnet to produce the magnetic field, instead of using field windings as in conventional DC motors. These motors are known for their simplicity, high efficiency, and quick response.

Objectives of the Experiment

1. Understand the working mechanism of PMDC motors.
2. Study the relationship between voltage, current, speed, and torque.
3. Analyze motor performance under different loading conditions.
4. Measure motor efficiency and calculate power losses.

Required Equipment and Materials

1. Permanent Magnet DC Motor (PMDC Motor).
2. DC Power Supply.
3. Rheostat for load control.
4. Voltmeter and Ammeter.
5. Tachometer for speed measurement.
6. Dynamometer for torque measurement.

Experimental Procedures

1. No-Load Test

Steps:

1. Connect the motor to the DC power supply without any load.
2. Adjust the voltage to different levels and record the current and speed at each voltage.
3. Plot the voltage-speed relationship.

2. Load Test

Steps:

1. Connect the motor to a variable resistance or a dynamometer as a load source.
2. Adjust the load at different levels and record the following values:



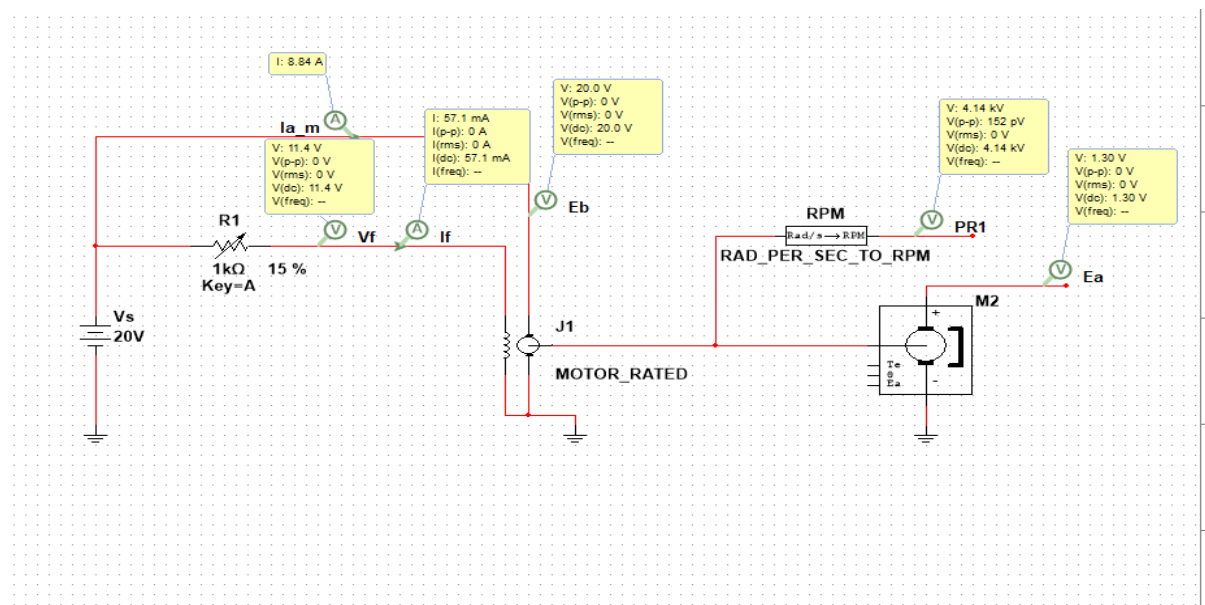
- Applied voltage (V).
 - Drawn current (I).
 - Rotational speed (N).
 - Mechanical torque (T).
3. Plot the torque-current relationship.

3. Motor Efficiency Measurement

Calculations:

- **Input electrical power:**
- **Output mechanical power:**
 - where (in rad/sec)
- **Efficiency:**

Connection of the circuit





Expected Results and Analysis

1. Speed increases with increasing voltage in the no-load test.
2. As the load increases, the drawn current increases, while speed slightly decreases.
3. Efficiency increases with load up to a certain point, then starts decreasing due to heat losses.

Ea	RPM	Ia_M	Eb	IF	VF	Ra	RF	R1	VS	ن
						2	200	50	20	1
						2	200	100	20	2
						2	200	150	20	3
						2	200	200	20	4
						2	200	250	20	5
						2	200	300	40	6
						2	200	350	40	7
						2	200	400	40	8
						2	200	450	40	9
						2	200	500	40	10
						2	200	550	60	11
						2	200	600	60	12
						2	200	650	60	13
						2	200	700	60	14
						2	200	1000	60	15

Conclusions

- PMDC motors exhibit good efficiency and operational simplicity.
- They do not require additional excitation current, making them more efficient than some conventional DC motors.
- Speed is directly proportional to voltage, and torque is proportional to the drawn current.