

## UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

Department of Electrical Engineering

Experiment No. \_\_\_\_\_ Speed Control of a DC Shunt Motor

INTRODUCTION

The speed of a DC shunt motor can be varied by;

- a. Varying the field current
- b. Varying the armature voltage
- c. Placing a small, variable resistor in the armature circuit

The relationship between speed and armature voltage, armature current, armature resistance, and field current is as follows;

$$n = \frac{V_a - R_a I_a}{K_f I_f} \quad \text{rpm}$$

where,

- $V_a$  - armature, volts
- $R_a$  - armature resistance, ohms
- $I_a$  - armature current, amperes
- $K_f$  - field constant, volts/rpm-ampere
- $I_f$  - field current, amperes.

In this experiment, the techniques mentioned above are used to vary the speed of a DC shunt motor.

PRELIMINARY

P-1. Describe how speed of a DC shunt motor will vary as a function of the parameters below (assume armature current stays constant).

Armature voltage:

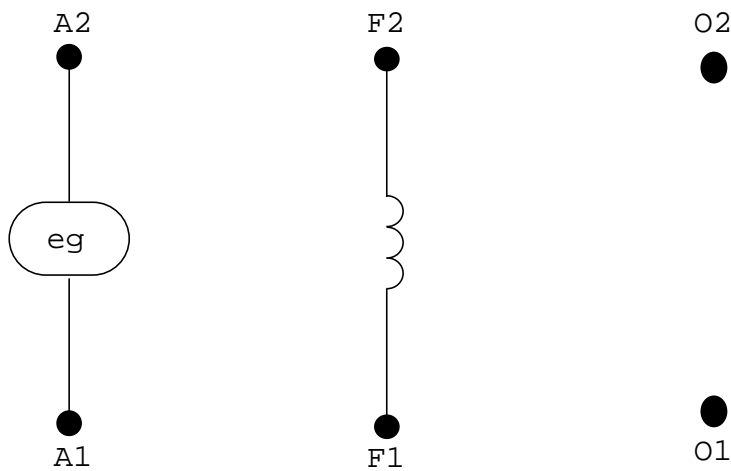
Armature resistance:

Field current:

P-2. Describe what is meant by armature reaction.

P-3. Discuss speed regulation and give the mathematical equation.

P-4. Complete the schematic diagram below for a DC shunt motor in which armature voltage, armature resistance, and field current can be varied (use only one voltage source).



( INSTRUCTOR 'S SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_ )

PROCEDURE

F-1. Connect a DC shunt motor as determined in P-4 above and couple it to a generator connected as shown in Figure 1. Have your instructor check the circuit before applying power.

CAUTION: DO NOT MAKE CHANGES IN THE CIRCUIT UNLESS THE POWER IS OFF!

F-2. Run the tests below varying the motor current by varying the voltage on the field ( $V_f$ ) of the generator.

Test No.	Armature Voltage	Field Current	Armature Resistance	Motor Current ( $I_m = I + I_f$ )
1	rated	maximum	zero	vary in steps from zero load to rated current
2	1/2 rated	minimum	zero	
3	rated	minimum	20 ohms	
4	vary in steps from 40 volts to rated value	maximum	zero	hold constant at rated current by varying the load

REPORT (should include at least the following)

R-1. Plot motor speed ( $n$ ) versus motor current ( $I_m$ ) for the first three tests in F-2 above all on the same graph.

R-2. Plot motor speed ( $n$ ) versus armature voltage ( $V_a$ ) for the fourth test in F-2 above.

R-3. Determine speed regulation for the first three tests in F-2 above.

R-4. Discuss the results.

GENERATOR CONNECTION

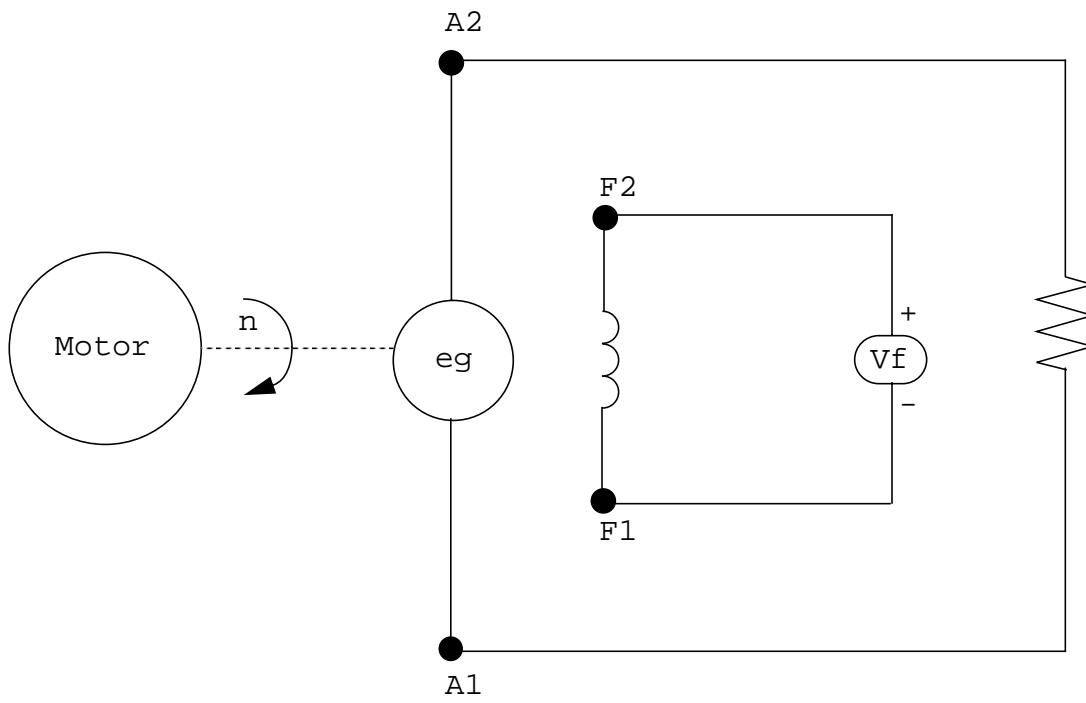


Figure 1.