X350994

UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

Department of Electrical Engineering

Experiment No._____DC Generator Characteristics

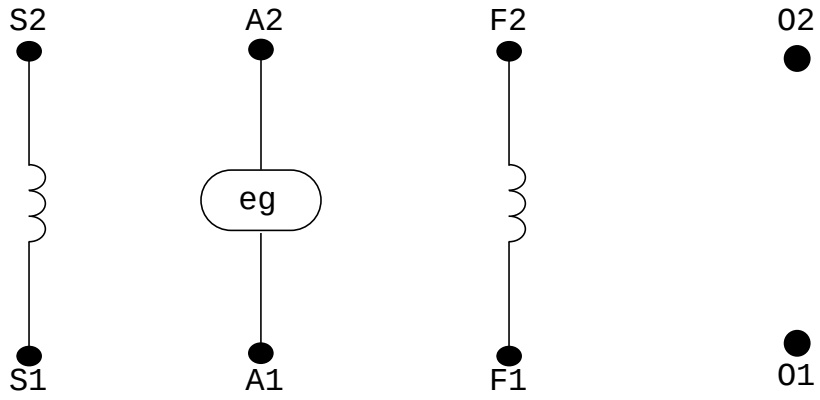
INTRODUCTION

The DC generator is a good source of DC power and can be driven by various prime movers, i.e., elbow grease, DC motors, AC motors, waterpower, airpower, steam turbines, etc. They can be connected as separately-excited, self-excited, cumulative-compounded, or differentially-compounded. Each connection has its advantages and disadvantages. The purpose of this experiment is to investigate the characteristics of these connections and to discuss the results.

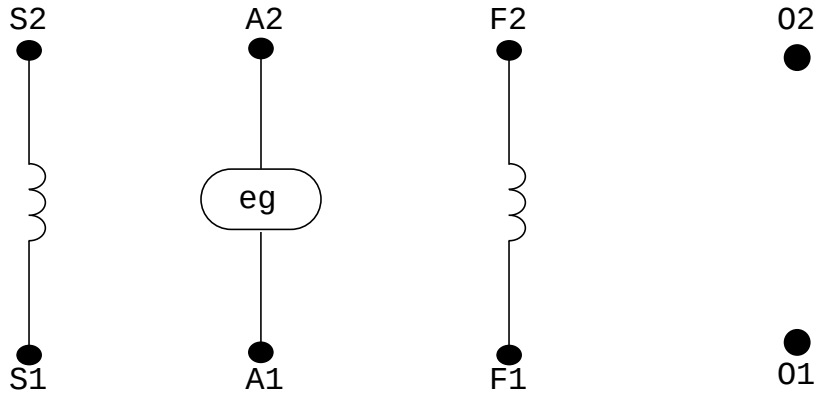
PRELIMINARY

P-1. Complete the diagrams below showing the connections necessary to run a DC generator as a (a) separately-excited machine, (b) self-excited machine, (c) cumulative-compounded machine, and (d) differentially compounded machine.

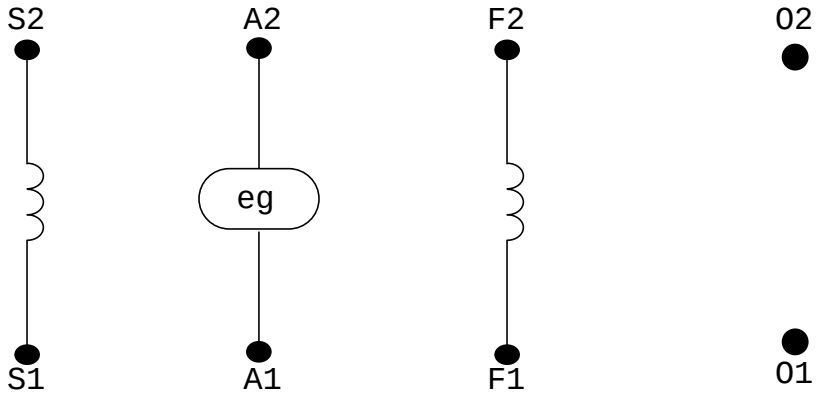
a.



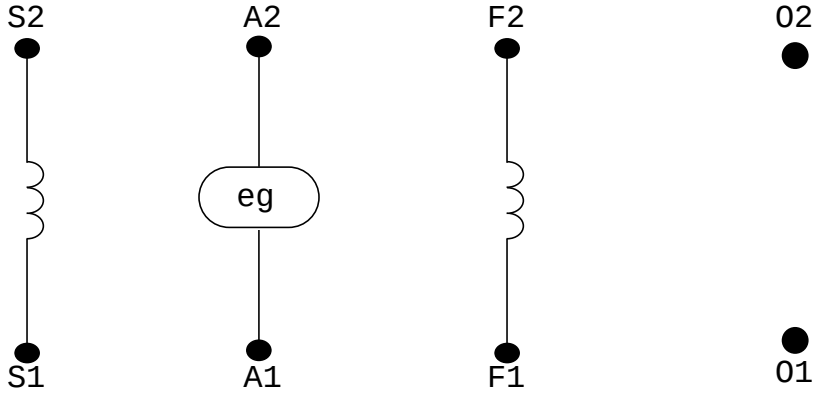
b.



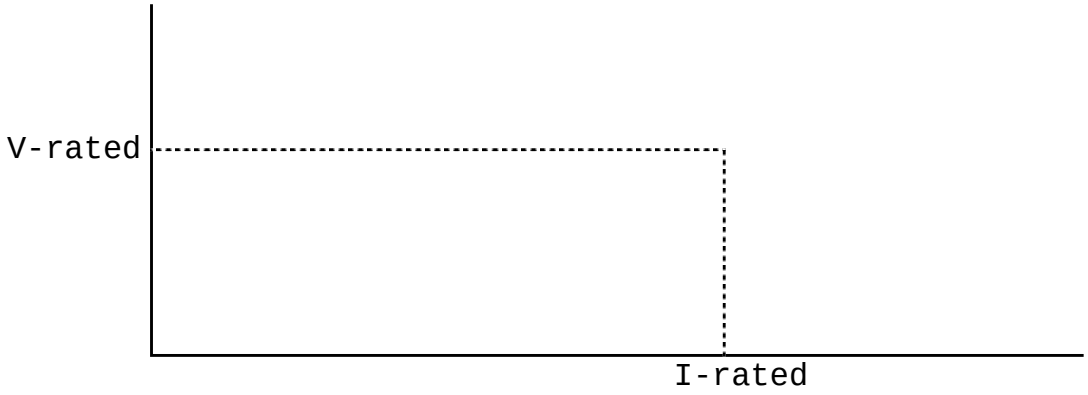
c.



d.



P-2. Sketch curves of output voltage versus output current that could be expected for the different connections in P-1 above.



P-3. To get meaningful output characteristics for a DC generator, it is necessary that the speed of the generator be held constant. Why is this?

P-4. Voltage regulation is an important characteristic of a DC generator. Discuss regulation and give the equation for it.

(INSTRUCTOR'S SIGNATURE_____DATE_____)

PROCEDURE

F-1. Connect the generator as a separately-excited machine. Have the instructor check all of your connections before power is applied.

CAUTION: DISCONNECT POWER BEFORE MAKING CHANGES IN THE CIRCUIT!

F-2. Take data to plot a magnetization curve. This is done by measuring armature voltage as the field current is increased in steps until the armature voltage is 125% of its rated value. The speed of the generator is maintained at its rated value.

F-3. Next connect a variable load in series with an ammeter to the output of the generator of F-1 above. Maintaining the speed of the generator at its rated value, adjust the field current and the load until rated output voltage and current are obtained. Next while maintaining the speed of the generator at its rated value and leaving the field current at its previously set value, lower the output current in steps down to zero by varying the load and measure the output voltage.

F-4. Connect the generator as a self-excited machine with the load and ammeter of F-3 above connected to its output. While maintaining the speed of the generator at its rated value, adjust the load until rated output voltage and current is obtained. Next, lower the output current of the generator by varying the load and measure the output voltage while maintaining the speed of the generator at its rated value.

NOTE: IF THE VOLTAGE DOES NOT BUILD UP, REVERSE THE FIELD CONNECTIONS!

F-5. Repeat F-4 above for the generator connected as a cumulative-compounded machine (long-shunt).

NOTE: IT MAY BE NECESSARY TO INCLUDE A RESISTOR IN THE FIELD (F1-F2) IN ORDER TO OBTAIN RATED CONDITIONS!

F-6. Repeat F-4 above for the generator connected as a differentially-compounded machine (long-shunt).

REPORT

R-1. Plot a magnetization curve (V-armature vs. I-field).

R-2. Plot the load characteristics for the different connections all on the same graph (V-out vs. I-out).

R-3. Determine the voltage regulation for each connection.

R-4. Discuss the results.