DC Generator Characteristics

1 Aim of the Experiment

To obtain magnetization characteristic of a separately excited DC generator, and external/internal characteristics of a self excited DC generator.

2 Background

In a DC generator, expression for the voltage generated E in the armature winding is

$E = (\phi)ZNP/60Avolts$

where,

$\phi = Flux/polesinwebers$
Z = No. of armature conductors
N = speed in rpm
P = No. of poles
A = No. of parallel paths

Assume that the generator is running at a constant speed $E = K_1\phi = K_B$
where,

B = flux density in the air gap
$N_f = No.ofturns$
I_f = Field current

The flux is established due to field mmf (Nf If). The magnetic field intensity H is H = Nf If /L (L length of the magnetic path/pole). From the above, E is proportional to B, and H is proportional to If . Thus the relation between E and If must be similar, as that between B and H for the magnetic circuit of the machine.

3 Observation

S.No.	Field Current (I_f) (Generator)	Terminal Voltage (V_0)

Table 1: Open circuit Characteristics

4 Procedure

4.1 OCC of the DC Generator

1. Connection is made as per the circuit diagram.
2. Armature rheostat (R_{am}) and the Field rheostat (R_{fm}) are kept in maximum and minimum positions respectively.
3. Switch on the EM clutch and keep the DG Gen field at its minimum.
4. Switch on the DC motor and reduce the armature rheostat to run the motor at rated speed.
5. Increase the field of the DC Gen till the rheostat reaches its minimum position and measure the voltage across its armature.
6. Now, decrease the field and note the voltage developed. 7. Plot the voltage Vs Field current of the DC Gen.

4.2 External/Internal Characteristics of the DC Generator

1. Connection for the motor remains the same but the DC Generator is connected in a self excited manner.
2. Armature rheostat (R_{am}) and the Field rheostat (R_{fm}) are kept in maximum and minimum positions respectively.
3. Switch on the EM clutch and keep the DG Gen field at its minimum.
4. Increase the field of the DC Gen to its rated value.
5. Connect resistive load in steps across the DC Gen armature. At every step, keep the speed at its rated value by varying the field of the motor.
6. Measure the terminal votage and the armature current of the DC Gen.
7. Plot terminal voltage Vs armature current - External characteristics.
8. Plot (terminal voltage + Ia Ra) Vs armature current - Internal Characteristics.

S.No.	Load/Armature Current (I or I_a)	Terminal Voltage (V_0)

Table 2: External Characteristics

S.No.	Load/Armature Current (I or I_a)	Generated Voltage(E_g)

Table 3: Internal Characteristics

5 Report

1. In an A4 sheet of paper, write your name and roll number, and also the name of the experiment.
2. Include the data from the excel sheet where the experimental data is stored.
3. Include the relevant plots.