EXPERIMENT NO 5

NO LOAD AND LOAD CHARACTERISTICS CURVE OF SELF EXCITED DC SHUNT GENERATOR

EQUIPMENT

* DC Excited Generator
* Variable DC Supply
* Variable Resistor
* DC Voltmeter and Ammeter

INTRODUCTION

* No Load Characteristics:

The Generators in which field magnets are energized by the current supplied by them are called Self excited generators. In these types of generators, field coils are internally connected with the armature. Due to residual magnetism, some flux is always present in the poles. When the armature is rotated, some emf is induced; hence some induced current is produced. This small current flows through the field coil as well as the load and thereby strengthening the pole flux. As the pole flux strengthened, which will produce more armature emf, which cause further increase of current through the field. This increased field current further raises armature emf and this phenomenon continues until the excitation reaches its rated value.

The magnetization characteristics also known as “No load” or “Open circuit” characteristics are the relation between emf generated and field current at a given speed.



**(B)Load Characteristics:**

Load characteristic curve is the graphical representation which shows change in terminal voltage with respect to change in load. After building up of voltage, if a shunt generator is loaded then terminal voltage drops with increase in load current. There are three main reasons for the drop of terminal voltage for a shunt generator under load.

* Armature reaction

Armature reaction is the effect of magnetic field set up by the armature current on the distribution of flux under main poles of a generator. Due to demagnetizing effect of armature reaction, pole flux is weakened and so induced emf in the armature is decreased.

* Armature resistance

As the load current increases, more voltage is consumed in the resistance of armature circuit. Hence the terminal voltage (Vt = E – Ia \* Ra) is decreased where “E” is the emf induced in armature under load condition. I

* ii) Drop in terminal voltage

The drop in terminal voltage (Vt) due to armature resistance and armature reaction results in decreased field current, which further reduces emf induced. For a shunt generator.

Ra = 9.7 Ω

Ia = IL+ IF

E = Vt + IaRa

The circuit diagram for Load Characteristics is shown in Figure 5.2



OBJECTIVE

* To observe the no load characteristics of separately exited DC shunt generator (open circuit characteristics curve O.C.C).
* To draw the load characteristics curve of self-excited D.C shunt generator.

APPLICATION

* They are used for general lighting.
* They are used to charge battery because they can be made to give constant output voltage.
* They are used for giving the excitation to the alternators.
* They are also used for small power supply (such as a portable **generator**).

PROCEDURE

**(A) No Load Characteristics:**

1. Connect the shunt field to armature terminal through the ammeter, switch and rheostat as shown in Figure 5.1. 2. Connect the multi-range voltmeter across the terminals of armature.

3. Increase the voltage of permanent magnet DC (PMDC) motor (prime mover) by the help of power supply until it reaches at normal speed (i.e. 110V DC).

4. Note the reading of voltmeter which indicates the voltage due to residual magnetism.

5. Close field switch and excite the field at low current.

6. Increase the field current in steps and note the voltage each time.

7. Take at least 5 readings.

8. Tabulate the readings in Table - I and draw the curve between armature induced emf and Field current

**(B)Load Characteristics:**

1. Make the connections as shown in Figure 5.2.

2. Increase the voltage of permanent magnet DC (PMDC) motor (prime mover) by the help of power supply until it reaches at normal speed (i.e. 110V DC).

3. Increase the voltage of permanent magnet DC (PMDC) motor (prime mover) by the help of power supply until it reaches at normal speed.

4. When motor reaches rated speed, close the shunt field switch.

5. Now connect load to the armature terminals through ammeter.

6. Close the switch of load and vary the load current by means of load rheostat.

7. Note down the meter readings from all meters carefully and note them in Table – II

With no load

With load



ISSUE

No issues regarding this lab.

CONCLUSION

The open circuit characteristics of **DC Shunt generator** are drawn and the Critical field resistance is determined.

POST LAB QUESTIONS

* Draw the magnetization curve of self-excited Dc shunt Generator?



* Why the curve starts somewhat above the origin?

This **curve starts** from a point which is **slightly higher than the origin** representing that there is some flux produced by the field poles even no current is passed through the field windings.

* The voltage increases rapidly at first and then changes a little in value at higher excitations.

The voltage increases rapidly at first and then changes a little in value at higher excitations indicating the effect of the poles saturation.

 At speed 1, since the speed is fixed, **then** the armature **voltage** varies with the ... field windings are fine and have **high** resistance **value** at **first** the **increase** in goes up more **rapidly** than the + drop **rises**, field **excitation** current in **DC** locomotives.

* At which point terminal voltage of DC shunt Generator was maximum and why?

Minimum Voltage Terminal

A decrease in the resistance of the field circuit reduces the slope of the field resistance line resulting in a higher voltage. An increase in the resistance of the field circuit increases the slope of the field resistance line, resulting in a lower voltage.

Maximum Voltage Terminal

The flux is increased by a magneto motive force produced by the field current. As a result, of this, the generated voltage Ea increases. This increased armature voltage increases the terminal voltage. With the increase in the terminal voltage, the field current If increases further. This, in turn, increases flux and hence the armature voltage is further increases, and the process of voltage buildup continues.

5. What are the different types of Self excited DC Generators?

* **The three types of self-excited DC generators are:**
* Series Wound **Generators**.
* Shunt Wound **Generators**.
* Compound Wound **Generators**.