

EE160 : Experiment 8

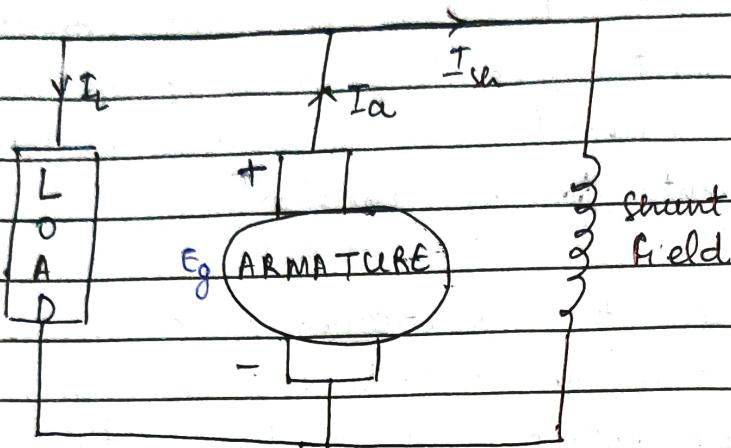
- Objectives :- (a) To study the local characteristics of DC shunt generator and to draw internal and external characteristics under different loading conditions.
- (b) To study the magnetisation characteristics of DC shunt generator and to draw the graph between armature voltage and field current.

Theory :-

BASICS OF DC SHUNT GENERATOR

DC Shunt generator is a type of self-excited generator that has its field winding arrangement in parallel with armature winding. This type gives the constant voltage output and is used for charging of batteries. Since, the field winding is connected in parallel with the armature, it receives less current across it as it is wound with more turns and thin wire. Due to this, it is capable of producing fewer losses and it cannot be loaded eventually. In short, the shunt field winding has many turns of fine wire having high resistance, so only a part of armature current flows through shunt field winding and the rest flows through load.

Equivalent circuit of DC Shunt generator for load characteristics is as follows:



Shunt Wound Generator

INTERNAL CHARACTERISTICS :-

The internal characteristics ~~are~~ curve represents the relation between generated voltage E_g and load current I_L when the generator is loaded ~~fully~~ then the generated voltage is decreased due to armature reaction. So, generated voltage will be lower than the emf generated at no load. In the figure that follows AD curve is showing the no voltage curve and AB curve is the internal characteristics curve.

EXTERNAL OR LOAD CHARACTERISTICS :-

The curve AC is showing the external characteristic of the shunt wound DC generator. It is

showing the variation of internal voltage with the load current. Ohmic drop due to armature resistance gives lesser terminal voltage than the generated voltage. That is why the curve lies below internal characteristics curve.

$$V = E_g - I_a R_a = E_g - (I_L + I_{sh}) R_a$$

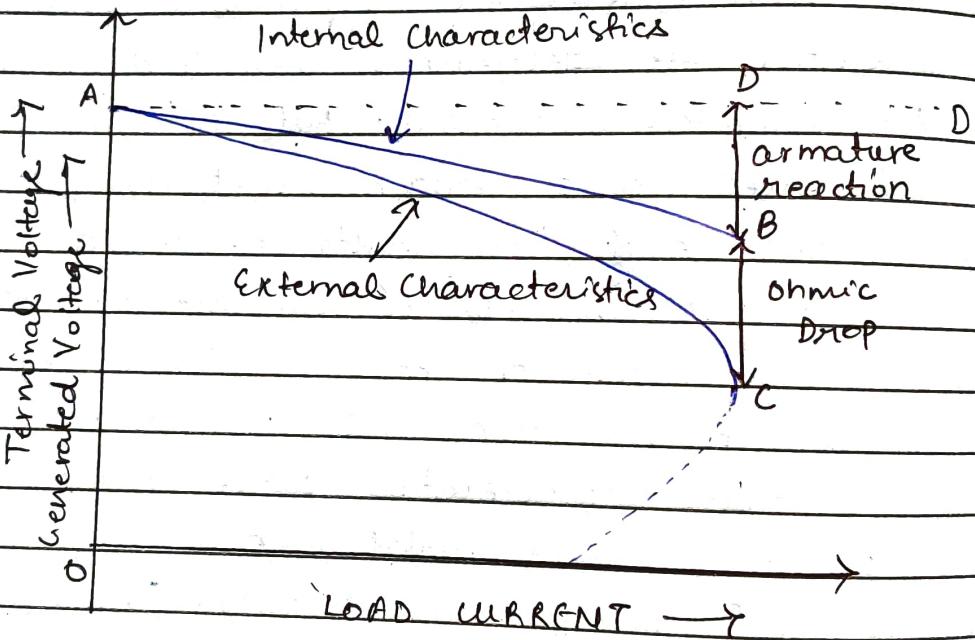
The terminal voltage can always be maintained constant by adjusting the load terminal. When the load resistance of a shunt-wound DC generator is decreased, then load current of the generator increased. But the load can be increased to a certain limit with (upto point C) the decrease of load resistance. Beyond this point, it shows a reversal in the characteristics. Any decrease of load resistance results in current reduction and consequently, the external characteristic curve turns back as shown in the dotted line, and ultimately terminal voltage becomes zero. Though, there is some voltage due to residual magnetism.

We know that, terminal voltage,

$$V = E_g - (I_L + I_{sh}) R_a$$

Now, when I_L is increased, then terminal voltage decreases. After a certain limit, due to heavy load current and increased ohmic drop,

the terminal voltage is reduced drastically. This drastic reduction of terminal voltage across the load, results in the drop in the load current although at that time load is high or load resistance is low. That is why, the load resistance of the machine must be maintained properly. The point in which the machine gives maximum current output is called the breakdown point (point C in the graph).



CRITICAL FIELD RESISTANCE :-

It is the value of the field resistance at which the DC shunt generator will fail to excite.

OR

It is the resistance of the field circuit at a given speed at which generator just excites and

starts voltage building while beyond this value, generator fails to excite.

Critical Speed is the speed for which the given shunt field resistance becomes the critical field resistance.

Critical field resistance is plotting the O.C.C as in the figure and determining the slope of tangent to the linear position of the curve from the origin. While drawing tangent, the initial position of O.C.C. is neglected.

MAGNETISATION CHARACTERISTICS OF DC SHUNT GENERATOR

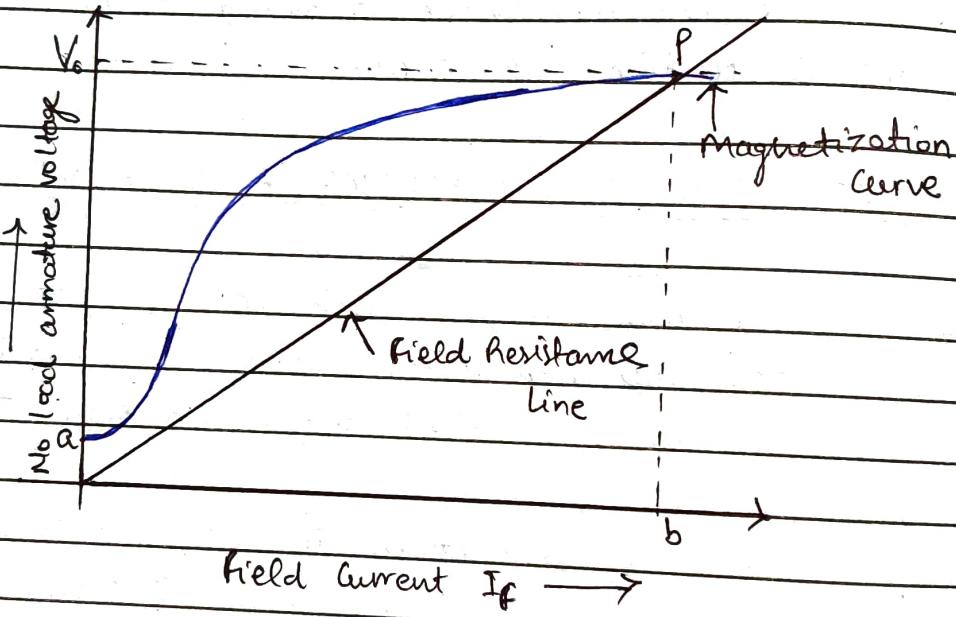
Its curve has great importance because it represents saturation of magnetic current. For this reason, it is also called saturation current.

Due to residual magnetism in poles, a small amount of emf is generated even when $I_e = 0$. Hence, the curve starts a little way up. The slight curvature at the lower end is due to magnetic inertia.

It is observed that the first part of the curve is practically straight. Hence, the flux and consequently generated EMF is directly proportional to the exciting current. However, at higher flux densities where it is small iron path,

reluctance becomes appreciable and straight. Due to residual magnetism some initial emf and hence some current will be generated. This current while passing into the field coils will strengthen the magnetism of poles. This will increase pole flux which will further increase the generated emf. Increased emf and flux proceeds till equilibrium, reached at some point in the graph between I_f and E_g .

Eg.

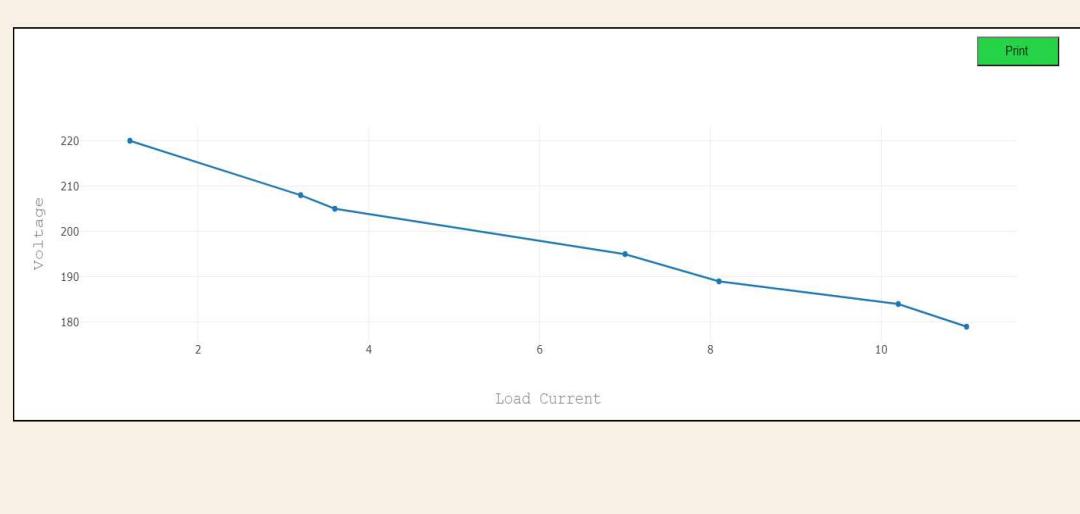
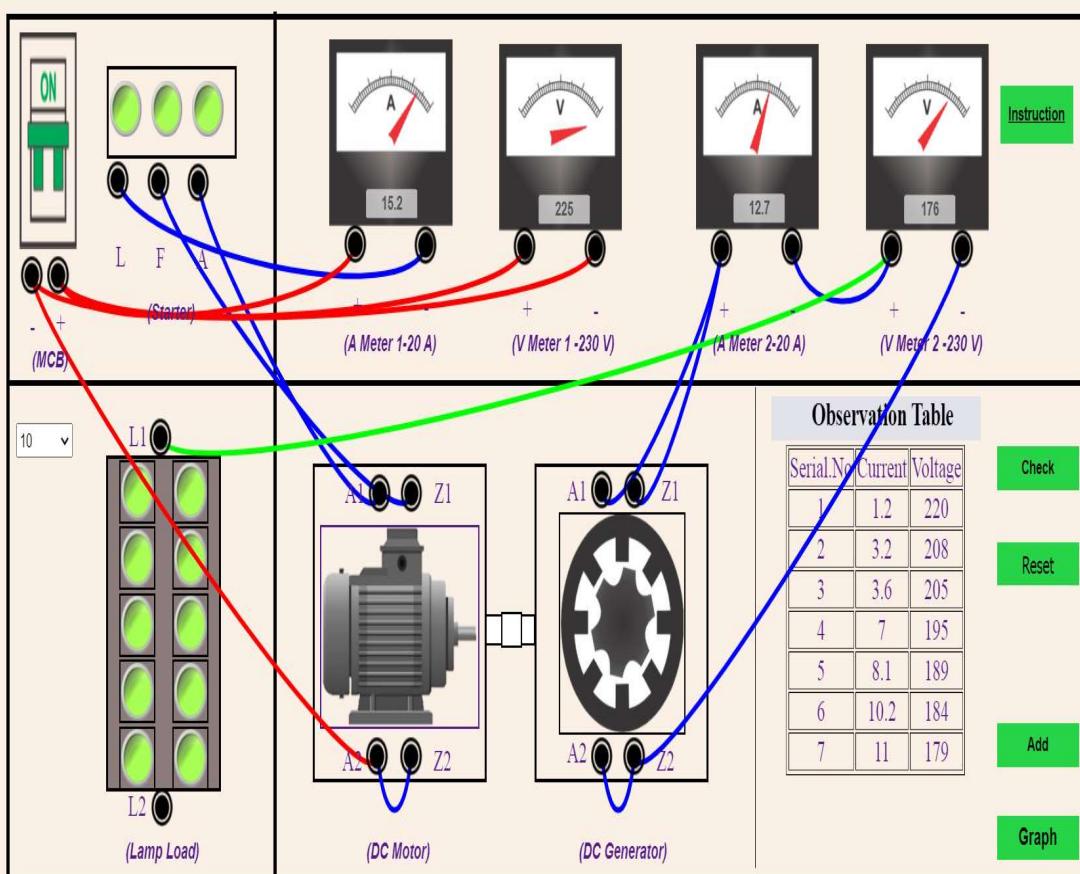


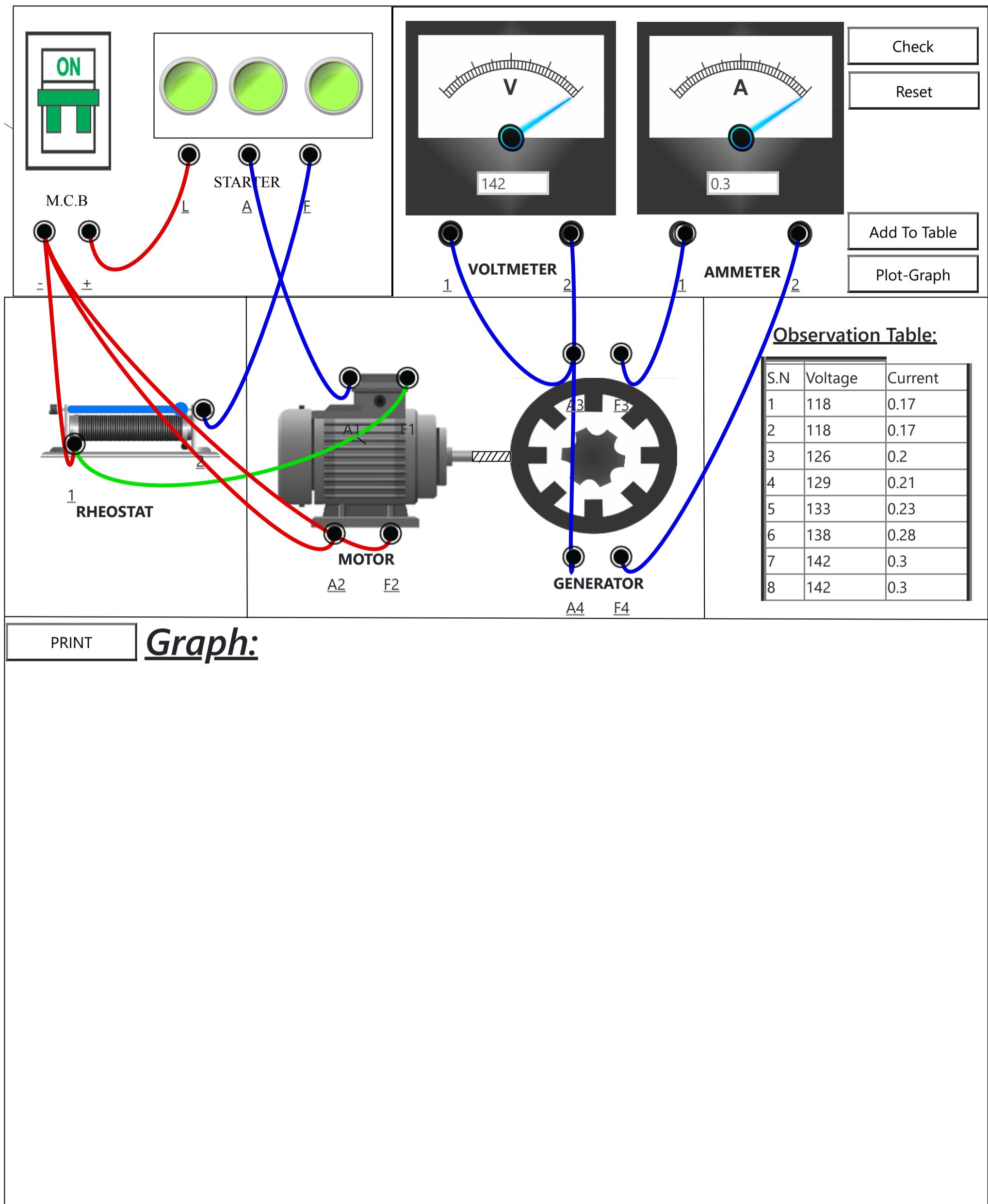
► Procedure :-

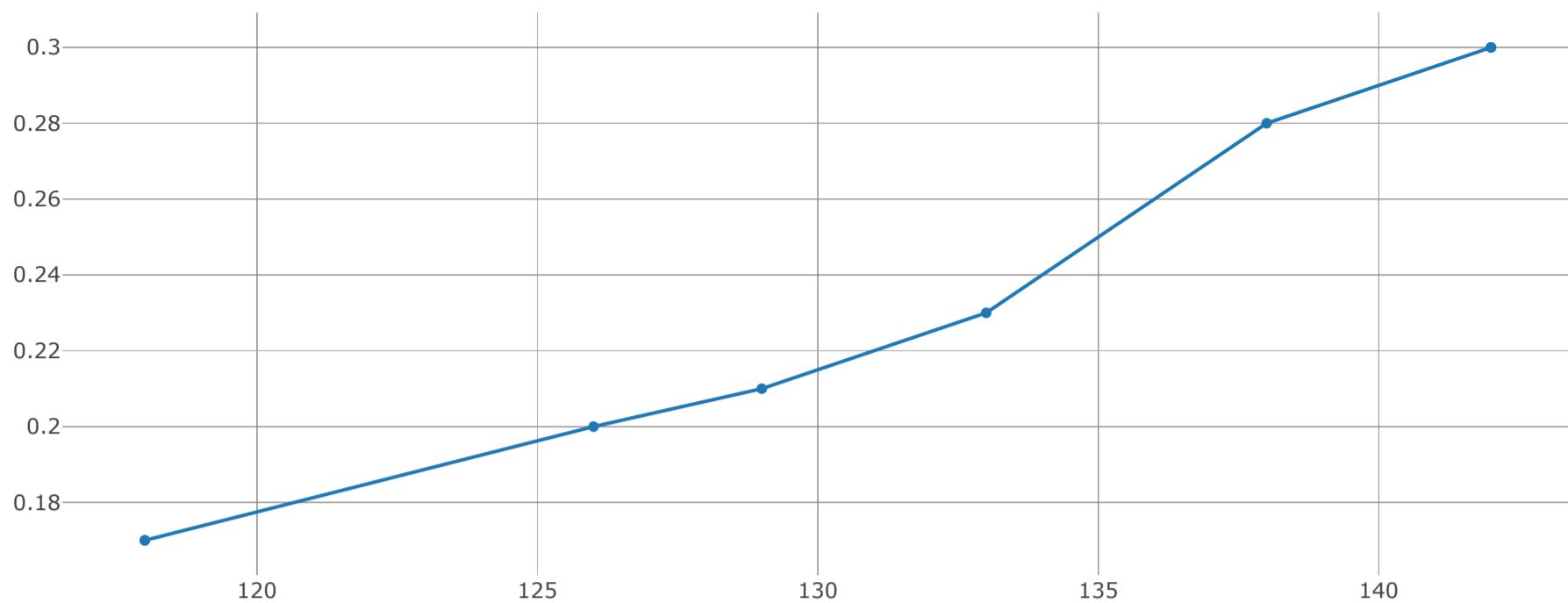
- Make all correct connections
- Check connection
- After correct connections, circuit will be turned ON.
- Select the no. of bulbs from lamp load.
- Note the readings of ammeter and voltmeter
- Add value to table
- Click on 'Graph' to obtain graph.

- (b)
- Make correct connections.
 - Check connection
 - If the connection is correct, click on MCB switch
 - Move slider on Rheostat to take observations from voltmeter and ammeter
 - Add atleast 6 observations to table
 - ~~Step 8~~ Plot 'Graph'.

To study the Load Characteristics of DC shunt generator







[Electrical Engineering](#) > [Electrical Machines \(Simulation\)](#) > [Experiments](#)

[Aim](#)[Theory](#)[Pretest](#)[Procedure](#)[Simulation](#)[Posttest](#)[References](#)[Feedback](#)

To study the Load Characteristics of DC shunt generator

DC shunt generator has terminal voltage versus load current characteristic which is

- a: Constant
- b: Slightly drooping
- c: Slightly rising
- d: Highly drooping

Which of the following type of dc generator gives constant output voltage at all loads ?

- a: Shunt generator
- b: Series generator
- c: Shunt shunt compound generator
- d: Level compound generator

The terminal voltage of dc shunt generator drops on load because of

- a: Armature reaction
- b: Armature resistance
- c: Weakening of the field due to armature reaction
- d: All of these

If the load on an over-compounded dc generator is reduced, the terminal voltage

- a: Increases
- b: Decreases
- c: Remains unchanged
- d: May increase or decrease

Copper losses in armature of dc generator amount to which of the following percentage of full load losses ?

- a: 5 to 10%
- b: 10 to 20%
- c: 20 to 30%
- d: 30 to 40%

[Submit Quiz](#)

5 out of 5

Community Links

- [Sakshat Portal](#)
- [Outreach Portal](#)
- [FAQ: Virtual Labs](#)

Contact Us

- Phone: General Information: 011-26582050
 Email: support@vlabs.ac.in

Follow Us



[HOME](#)[PARTNERS](#)[CONTACT](#)[Aim](#)[Theory](#)[Pretest](#)[Procedure](#)[Simulation](#)[Posttest](#)[References](#)[Feedback](#)

To study the Load Characteristics of DC shunt generator

Armature magnetic field in a dc generator produces which of the following effect?

- a: It demagnetizes or reduces the main flux
- b: It cross-magnetizes the main flux
- c: It magnetizes or reinforces the main flux
- d: Both (a) and (b)

In a dc generator, the polarity of the interpole is

- a: Always N
- b: Always S
- c: Same as the main pole ahead
- d: Same as main pole behind

In a dc generator, compared to the air gap under field poles, the interpole air gap is made

- a: Larger
- b: Smaller
- c: The same
- d: Much smaller

The function of using compensating winding in dc machines is to neutralize the

- a: Armature reaction in the interpole zone
- b: Armature reacting in the commutating zone
- c: Armature reaction under the pole faces
- d: Cross-magnetizing armature reaction

The yoke of a dc generator is made of cast iron because

- a: It is cheaper
- b: It completes the magnetic path
- c: It gives mechanical protection to the machine
- d: All of these

[Submit Quiz](#)

5 out of 5

Community Links

Sakshat Portal
Outreach Portal
FAQ: Virtual Labs

Contact Us

Phone: General Information: 011-26582050
Email: support@vlabs.ac.in

Follow Us



Electrical Engineering > Electrical Machines (Simulation) > Experiments

[HOME](#)[PARTNERS](#)[CONTACT](#)**Pretest****Procedure****Simulation****Posttest****References****Feedback**

In a dc machine 72 number of coils are used. Find the number of commutator segments required?

- a: 36
- b: 37
- c: 72
- d: 74

Which of the following windings are necessary in case of all dc machines?

- a: a closed winding
- b: lap winding
- c: wave winding
- d: open type winding

DC machine windings are....

- a: full pitched
- b: short pitched
- c: either of these
- d: none of the above

In a dc machine 4 pole lap winding is used. The number of parallel paths are?

- a: 2
- b: 4
- c: 1
- d: 8

Dummy coils are used for....

- a: increasing efficiency
- b: reducing armature reaction
- c: mechanical balancing
- d: all of the above

[Submit Quiz](#)

5 out of 5

Community Links

- [Sakshat Portal](#)
- [Outreach Portal](#)
- [FAQ: Virtual Labs](#)

Contact Us

- Phone: General Information: 011-26582050
 Email: support@vlabs.ac.in

Follow Us

[Electrical Engineering](#) > [Electrical Machines \(Simulation\)](#) > [Experiments](#)

[Aim](#)[Theory](#)[Pretest](#)[Procedure](#)[Simulation](#)[Posttest](#)[References](#)[Feedback](#)

To study Magnetisation Characteristics of DC shunt generator.

In DC machine torque is proportional to which of the following?

a: flux(ϕ)

b: armature current(I_a)

c: both A and B

d: none of the above

Field weakening control method is used for the....

a: above rated speed

b: below rated speed

c: both 1 and 2

d: none of the above

Armature resistance control method is used for the....

a: above rated speed

b: below rated speed

c: both 1 and 2

d: None of above

If the speed of a DC machine is doubled and the flux remains a constant, the generated e.m.f....

a: remains the same

b: is doubled

c: remains the same

d: None of above

If the flux per pole of a shunt-wound DC generator is increased, and all other variables are kept the same, the speed....

a: decreases

b: stays the same

c: increases

d: None of above

[Submit Quiz](#)

5 out of 5

Community Links

Sakshat Portal
Outreach Portal
FAQ: Virtual Labs

Contact Us

Phone: General Information: 011-26582050
Email: support@vlabs.ac.in

Follow Us

