2. How Armature reaction and commutation affects the performance of a dc machine. 4

Definition: The armature reaction simply shows the effect of armature field on the main field. In other words, the armature reaction represents the impact of the armature flux on the main field flux. The armature field is produced by the armature conductors when current flows through them. And the main field is produced by the magnetic poles.

Effect of Armature Reaction

The effects of Armature Reaction are as follows:-

- Because of the armature reaction the flux density of over one-half of the pole increases and over the other half decreases. The total flux produces by each pole is slightly less due to which the magnitude of the terminal voltage reduces. The effect due to which the armature reaction reduces the total flux is known as the demagnetizing effect.

demagnetizing effect.

- The resultant flux is distorted. The direction of the magnetic neutral axis is shifted with the direction of resultant flux in the case of the generator, and it is opposite to the direction of the resultant flux in the case of the motor.
- The armature reaction induces flux in the neutral zone, and this flux generates the voltage that causes the commutation problem.

The MNA axis is the axis in which the value of induced MEF becomes zero. And the GNA divides the armature core into two equal parts.

3. Write short note on Speed control of a DC machine. 5

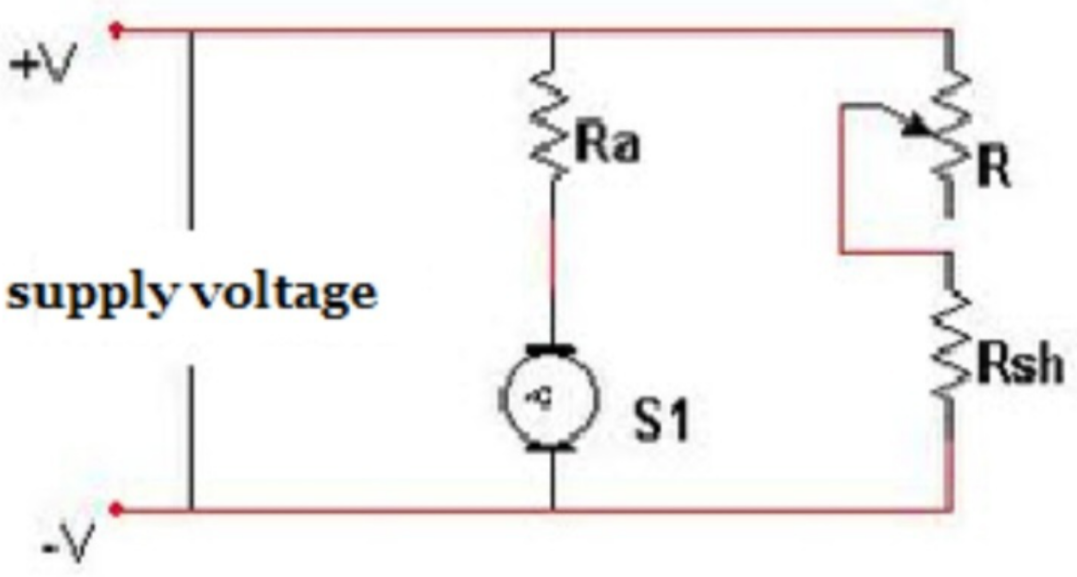
1. Speed of the motor is directly proportional to supply voltage.
2. The Speed of the motor is inversely proportional to armature voltage drop.
3. The motor speed is inversely proportional to the flux due to the field findings

Thus, the speed of a DC motor can control in three ways:

- By varying the flux, and by varying the current through field winding
- By varying the armature voltage, and the armature resistance
- Through the supply voltage

1. Flux Control Method

Due to the field winding, the magnetic flux varies in order to vary the speed of the motor. As the magnetic flux depends on the current flowing through the field winding, it changes by varying the current through the field winding. This can achieve using a variable resistor in a series with the field winding resistor.

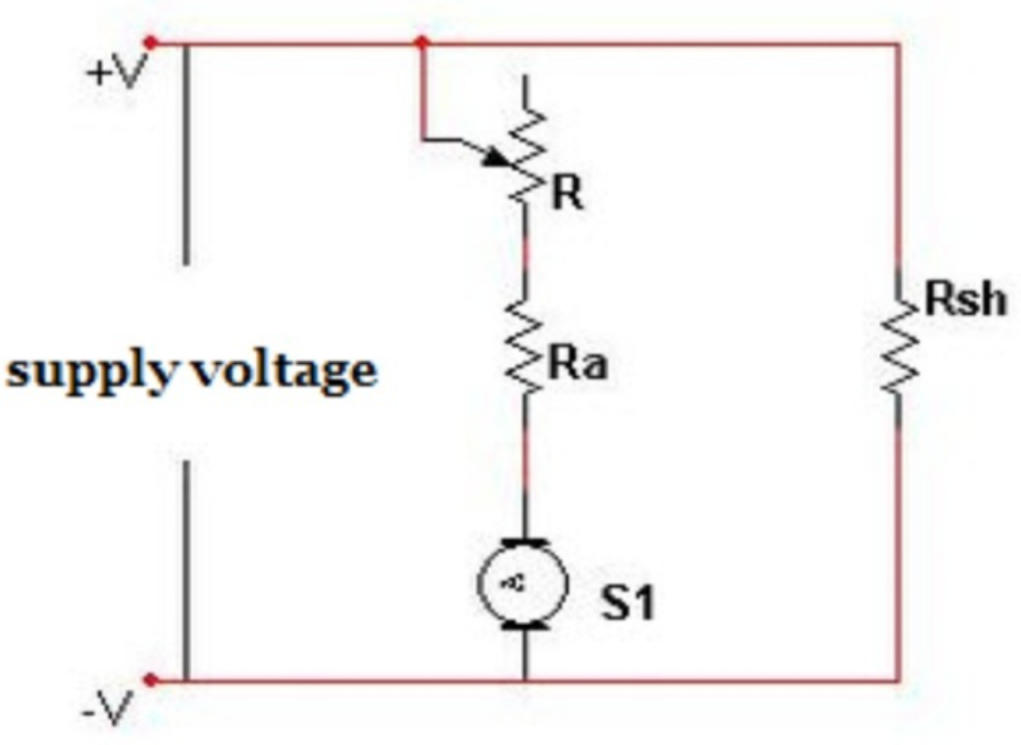


Initially, when the variable resistor keeps at its minimum position, the rated current flows through the field winding

due to a rated supply voltage, and as a result, the speed is kept normal. When the resistance increases gradually, the current through the field winding decreases. This in turn decreases the flux produced. Thus, the speed of the motor increases beyond its normal value.

2. Armature Control Method

The controlling of armature resistance controls the voltage drop across the armature. With this method, the speed of the DC motor can control. This method also uses a variable resistor in series with the armature.



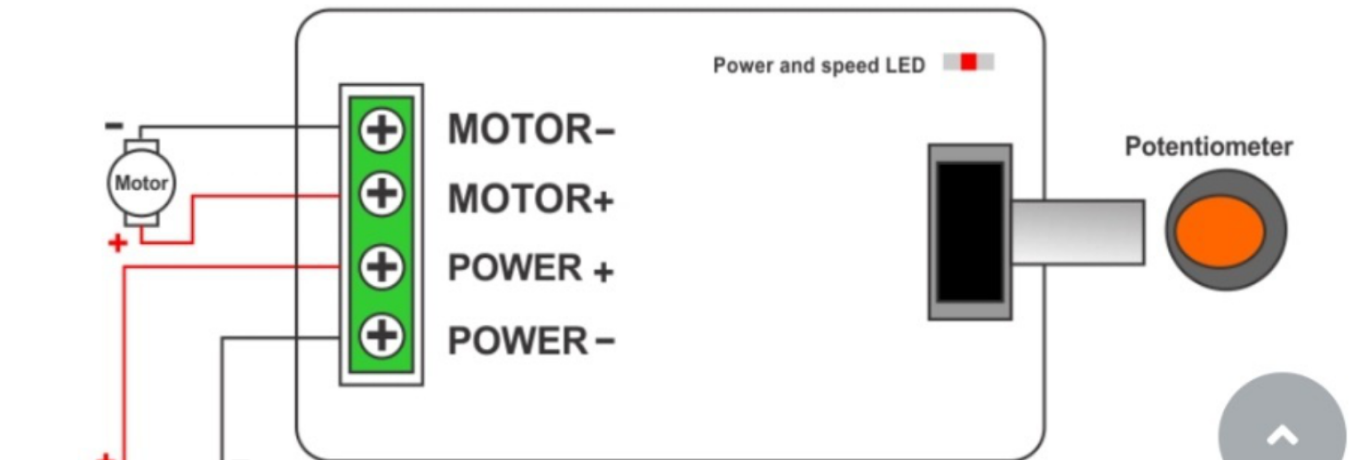
When the variable resistor reaches its minimum value, the armature resistance is at normal one. Therefore, the armature voltage drops. When the resistance value gradually increases, the voltage across the armature

decreases. This in turn leads to decrease in the speed of the motor. In this way, this method achieves the speed of the motor below its normal range.

3. Voltage Control Method

Both the above mentioned methods cannot provide speed control in the desirable range. Moreover, the flux control method can affect commutation. Whereas the armature control method involves huge power loss due to its usage of resistor in series with the armature. Therefore, a different method is often desirable – the one that controls the supply voltage to control the motor speed.

In such a method, the field winding receives a fixed voltage, and the armature gets a variable voltage. One such technique of voltage control method involves the use of a switch gear mechanism to provide a variable voltage to the armature. Another one uses an AC motor driven Generator to provide variable voltage to the armature (named as Ward-Leonard System).



4. Discuss about different characteristics of a DC generator. 5

DC generators, or dynamos, are devices that convert mechanical energy into direct current (DC) electrical energy. Here are some key characteristics of DC generators:

Armature: The armature is the rotating part of the generator, consisting of coils of wire that cut through magnetic fields, inducing an electromotive force (EMF).

Field System: DC generators have a field system, usually consisting of magnets or coils carrying a DC current, to create a magnetic field that interacts with the armature.

Brushes and Commutator: DC generators use brushes and a commutator to facilitate the flow of current in a consistent

direction as the armature rotates, ensuring a unidirectional current output.

Types of DC Generators:
Shunt-Wound Generator: The field winding is connected in parallel with the armature winding.
Series-Wound Generator: The field winding is connected in series with the armature winding.
Compound-Wound Generator: Combines characteristics of both shunt and series generators.
Applications: DC generators were historically used in various applications like early power systems, but with advancements, AC generators (alternators) are more commonly used today. DC generators are still found in some specific applications, such as battery charging and certain types of electronic devices.