SNS COLLEGE OF TECHNOLOGY

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DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 19AUB204 – AUTOMOTIVE ELECTRICAL AND ELECTRONICS ENGINEERING

II YEAR / IV SEMESTER

Unit 3 – Charging System

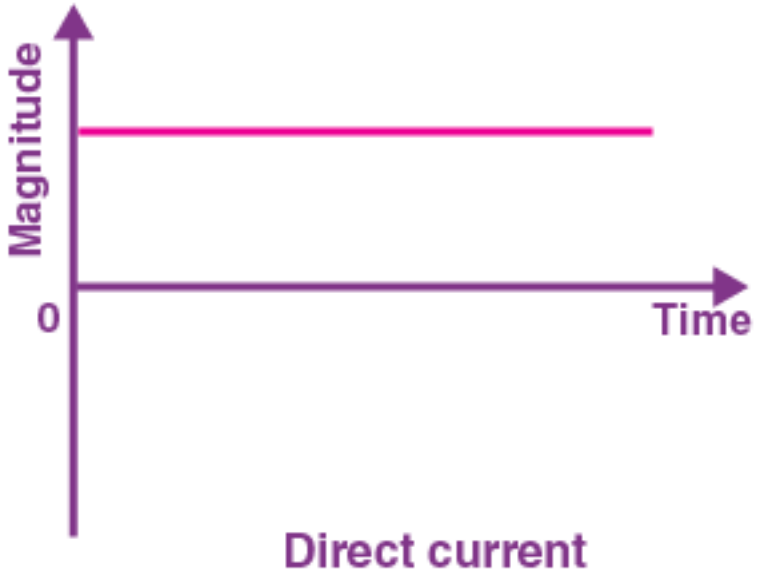
Topic : Generation of Direct Current

ALTERNATING CURRENT

- Alternating current (AC) is a type of electrical current where the flow of electric charge periodically reverses direction.
- In an AC circuit, electrons move back and forth, alternating in direction, typically in a sinusoidal pattern.

DIRECT CURRENT

- Direct current (DC) is an electric current that flows consistently in one direction.
- In a DC circuit, the electric charge moves in a single direction from the positive terminal to the negative terminal of a voltage source, such as a battery or a DC power supply.



DC GENERATOR IN AUTOMOBILE

- Dynamos, also known as DC generators, were used in older automobiles before alternators became prevalent.
- Unlike alternators, which produce AC internally, dynamos generate direct current (DC) directly. However, they are less efficient and bulkier compared to alternators.
- Dynamos have brushes and commutators to maintain the flow of electricity, which can wear out over time and require maintenance.

AC GENERATOR IN AUTOMOBILE

- Alternators are the most common type of generator used in modern automobiles. They convert mechanical energy from the engine into electrical energy.
- Alternators produce alternating current (AC) internally, but a built-in rectifier converts this AC into direct current (DC) before it is used to power the vehicle's electrical systems and recharge the battery.
- Alternators are highly efficient and capable of producing higher electrical output at lower engine speeds compared to traditional generators.

DC Current Generation

- DC generators, also known as dynamos, use electromagnetic induction to convert mechanical energy into electrical energy.
- These devices have a rotating armature within a magnetic field, where the motion induces a voltage in the coils, generating DC output.

COMPONENTS OF DC GENERATOR

- **Field Magnets**: The field magnets establish a magnetic field within the generator. These magnets can be either permanent magnets or electromagnets. The magnetic field interacts with the armature to induce a voltage when it rotates.
- **Armature**: The armature is the rotating component of the generator. It consists of a coil of wire wound around a core, usually made of iron, mounted on a shaft. As the armature rotates within the magnetic field, it generates an electromotive force (EMF) due to electromagnetic induction.

COMPONENTS OF DC GENERATOR

- **Commutator**: The commutator is a split-ring device mounted on the armature shaft. It consists of multiple segments or bars that are insulated from each other. The commutator reverses the direction of the current in the armature coil each time it rotates half a cycle, ensuring that the output current flows in the same direction.
- **Brushes**: The brushes are conductive contacts that press against the commutator segments. They provide a path for the current to flow from the armature to the external circuit. Brushes typically contain carbon or graphite material, which provides good electrical conductivity and low friction against the commutator.

COMPONENTS OF DC GENERATOR

- **Shaft and Bearings**: The shaft provides support for the armature and allows it to rotate within the generator. It is typically mounted on bearings to reduce friction and allow smooth rotation.
- **Housing or Frame**: The housing or frame encloses the internal components of the generator and provides structural support. It also serves to protect the components from external elements and provides mounting points for installation.

WORKING OF DC GENERATOR

- The generator has a set of stationary magnets or electromagnets arranged to create a magnetic field within the generator.
- This magnetic field is typically uniform and establishes the basis for the generator's operation.
- Inside the generator, there is a coil of wire known as the armature.
- This armature is mounted on a shaft that can rotate.
- When the shaft is rotated, the armature spins within the magnetic field produced by the stationary magnets.

WORKING OF DC GENERATOR

- As the armature rotates within the magnetic field, it cuts across the magnetic lines of flux.
- According to Faraday's law of electromagnetic induction, this cutting action induces a voltage across the ends of the armature coil.
- The induced voltage is directly proportional to the rate at which the magnetic flux is changing, which is influenced by the speed of rotation.
- Initially, the voltage induced in the armature coil results in the generation of an alternating current (AC).

WORKING OF DC GENERATOR

- This AC waveform changes direction as the armature rotates within the magnetic field.
- Each half-rotation of the armature coil induces a voltage in one direction, followed by a voltage in the opposite direction as the rotation continues.
- To convert the alternating current produced by the armature into direct current (DC), a commutator is used.
- The commutator consists of a split-ring device attached to the armature shaft.

WORKING OF DC GENERATOR

- It rotates with the armature and reverses the direction of the current in the armature coil every half-cycle.
- This reversal ensures that the output current flows in the same direction, resulting in DC.
- The direct current produced by the generator is collected from the brushes, which are conductive contacts that press against the commutator segments.
- The collected DC output can then be used to power electrical loads or stored in batteries for later use.

THANK YOU !!!