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FACULTY OF ENGINEERING & TECHNOLOGY

Electrical Machine-1

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Armature Winding of DC Machine

The armature winding of DC motor is attached to the rotor, or the rotating part of the machine, and as a result is subjected to altering magnetic field in the path of its rotation which directly results in magnetic losses. For this reason the rotor is made of armature core, that's made with several low-hysteresis silicon steel lamination, to reduce the magnetic losses like hysteresis and eddy current loss respectively. These laminated steel sheets are stacked together to form the cylindrical structure of the armature core.

Armature windings are two types

1. LAP WINDING

- A = P
- The armature windings are divided into no. of sections equal to the no of poles.
- It is connected in series

2. WAVE WINDING

- A = 2
- It is used in low current output and high voltage.
- It is connected in parallel.

Function of the commutator for motoring and generation action

For the DC Generator commutator as a mechanical rectifier or a rotary electrical switch. This mechanical rectifier commutate the alternating current produced in the armature winding of the Dc generator into a direct current and keep the torque from reversing its direction and that happens by the commutator and the help of the stationary brushes, we simply can say that the commutator works like a bridge rectifier.

For the DC motor the commutator is used to alternate the magnetic field created by the DC current, although, for AC motor the magnetic field is already alternated by the nature of the AC current.

Factors determining induced emf

The DC machine e.m.f can be defined as when the armature in the dc machine rotates, the voltage can be generated within the coils. In a generator, the e.m.f of rotation can be called the generated emf, and Er = Eg. In the motor, the emf of rotation can be called as counter or back emf, and Er = Eb.

Let Φ is the useful flux for every pole within webers

P is the total number of poles

z is the total number of conductors within the armature

n is the rotation speed for an armature in the revolution for each second

A is the no. of parallel lane throughout the armature among the opposite polarity brushes.

Z/A is the no. of armature conductor within series for each parallel lane

As the flux for each pole is 'Φ', every conductor slashes a flux 'PΦ' within a single revolution.

The voltage produced for each conductor = flux slash for each revolution in WB / Time taken for a single revolution within seconds

As 'n' revolutions are completed within a single second and 1 revolution will be completed within a 1/n second. Thus the time for a single armature revolution is a 1/n sec.

The standard value of produced voltage for each conductor

p Φ/1/n = np Φ volts

The voltage produced (E) can be decided with the no.of armature conductors within series I any single lane among the brushes thus, the whole voltage produced

E = standard voltage for each conductor x no. of conductors within series for each lane

E = n.P.Φ x Z/A

The above equation is the e.m.f. the equation of the DC machine.