UNIT-II -DRIVE MOTOR CHARACTERISTICS

- Classification of Electrical Drives
- Another main classification of electric drive is
- DC drive-DC Motors
- A)Separately excited DC motor
- B)Shunt motor
- C)Series motor
- D)Compound motor

AC drive-AC Motors

A)Induction motor

B)Synchronous motor

MOTOR CHARACTERISTICS

- Electrical characteristics
- i) Torque vs. armature current
- (ii) Speed vs. armature current and
- Mechanical characteristics
- (iii) Speed vs. torque

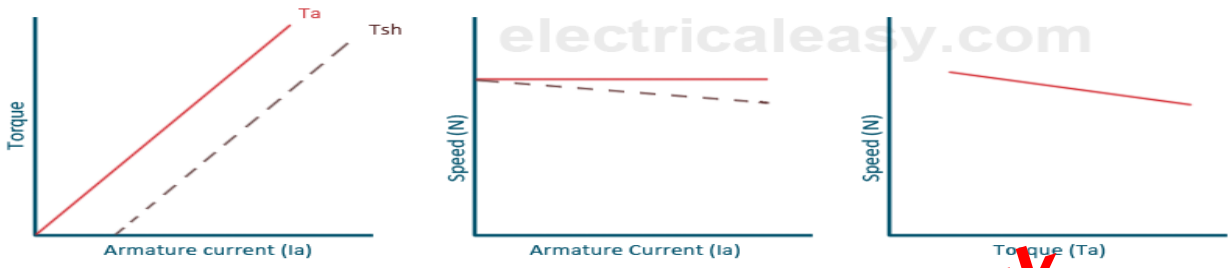
CHARACTERISTICS OF DIFFERENT TYPES OF LOADS

- Various load torques can be classified into broad categories.

Active load torques, Passive load torques

- Load torques which has the potential to drive the motor under equilibrium conditions are called active load torques. Such load torques usually retain their sign when the drive rotation is changed (reversed)
- Eg: Torque due to force of gravity
- Torque due tension
- Torque due to compression and torsion etc
- Load torques which always oppose the motion and change their sign on the reversal of motion are called passive load torques

- The shunt motor torque is proportional to flux and armature current.
- Ta ∝ Φ.Ia
- Armature current increases,torque also increases.
- **(iii) Speed vs. torque.**
- It is also called mechanical characteristics.
- When the load torque increases the speed lightly decreases



Characteristics of DC shunt motor

SERIES MOTOR CHARACTERISTICS

- (i) Torque vs. armature current
- (ii) Speed vs. armature current
- (iii) Speed vs. torque.
- **(i) Torque vs. armature current**
- This characteristic is also known as **electrical characteristic.**
- torque is directly proportional to the product of armature current and field flux, $T_a \propto \phi.I_a$.
- In DC series motors, field winding is connected in series with the armature, i.e. $I_a = I_f$.
- Therefore, before magnetic saturation of the field, flux ϕ is directly proportional to Ia. Hence, before magnetic saturation Ta α Ia^2.
- Therefore, the Ta-Ia curve is parabola for smaller values of Ia.
- After magnetic saturation of the field poles, flux ϕ is independent of armature current Ia. Therefore, the torque varies proportionally to Ia only, T ∝ Ia.Therefore, after magnetic saturation,

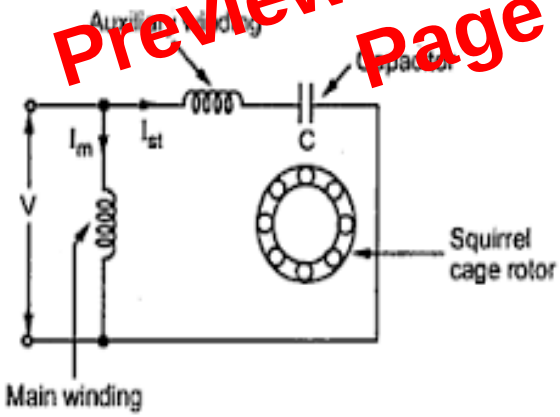
ii)Speed vs. armature current

- The above fig shows the capacitor start single phase induction motor.
- Here, a capacitor is connected in series with the auxiliary winding.
- I t is also used to get higher starting torque.
- The Iφ supply is applied to the two winding.
- The starting current I_s leads the line voltage, because the capacitor present in the auxiliary winding.
- The phase displacement bwetween two currents are equal to 90^0 on starting

APPLICATIONS

- These motors are used for the loads of higher inertia where frequent starting is required.
- Used in pumps and compressors
- Used in the refrigerator and air conditioner compressors.
- They are also used for conveyors and machine tools.

CAPACITOR RUN MOTOR



- In this motor, a capacitor is permanently connected is series with auxiliary winding.
- Here, the centrifugal switch is not, therefore the cost of the motor is less.
- The capacitor value is between the range of 20-50μF.
- The starting torque has to be sacrified because the capacitor chosen is a compromise between the best starting and running conditions.

The efficiency is very low as, the copper losses are high due to presence of copper band.

The speed reversal is also difficult and expensive as it requires another set of copper rings.

APPLICATIONS

- Fans
- Blowers
- Turntables
- Hair drivers
- Motion picture projectors

BRAKING OF ELECTRIC MOTORS

- When an electric drive is disconnected from the supply the speed of the driving motor is gradually decreases and becomes zero.
- Breaking methods can be classsified into
- Mechanical braking-The frictional force between the rotating part and brake drums provide the brake.
- Electric braking-The motor is made to work as generator.So it produce a negative slip and negative torque whether mechanical or electric braking,the braking of the drive should be such that as to stop the motor at the specified point of time and location

TYPES OF BRAKING

- Brakes are used to reduce or cease the speed of motors.
- Regenerative Braking-The motor operates as generator,the motor speed is greater than synchronous speed.
- Plugging type braking-The direction of rotation of an electric motor is dependent on several variables.
- For an AC machines the phase sequence of the ststor windings are one of the variables and DC machines the polarities of the field or armature voltage.
- Dynamic braking-When an electric motor rotates a kinetic energy is stored in its rotating mass.