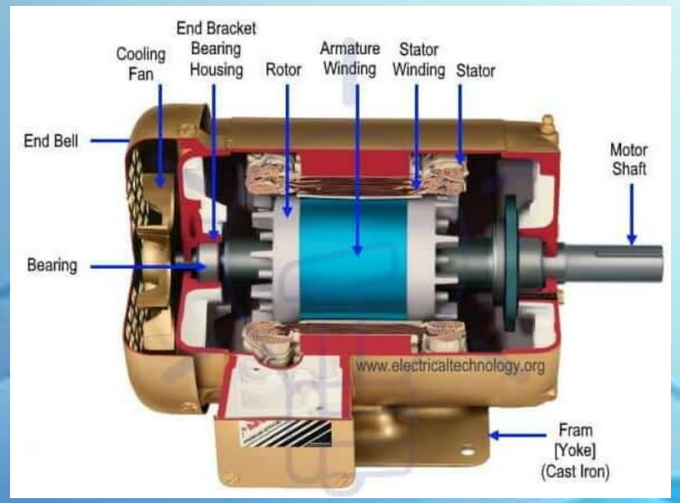
Subject: *Basic Electrical Electronics*
Experiment No.: *10*
Topic: *Working principle and characteristics of Induction Motor*

Sardar Patel Institute of Technology
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous College Affiliated to University of Mumbai)

Made By:
2021300098 Nikita Pawar
2021300099 Pratiksha Pawar
2021300100 Rohit Phalke
2021300101 Adwait Purao

SINGLE PHASE INDUCTION MOTOR



Working principle of a single-phase Induction motor

Consider two winding 'A' and 'B' so displaced that they produce magnetic field 90° apart in space. The resultant of these two fields is a rotating magnetic field of constant magnitude ϕm. Non-Uniform magnetic field produces a non-uniform torque which makes the operation of the motor noisy, affect starting torque.

A single-phase induction motor consists of a single-phase winding on the stator and a cage winding on the rotor. When a 1 phase supply is connected to the stator winding, a pulsating magnetic field is produced. In the pulsating field, the rotor does not rotate due to inertia. Therefore, a single-phase induction motor is not self-starting and requires some particular starting means. Two theories have been suggested to find the performance of a single-phase induction motor.

1) ***Double Revolving field theory*** ***2) Cross- field theory***

Characteristics of a split phase Induction motor :1) The starting torque of split phase induction motor is 1.5 to 2 times of the rated full load torque and the starting current is 6 to 8 times of the full load current.

- The cost of split phase induction motors is very low, due to which these are very popular in the market.

Characteristics of Capacitor-Start and Capacitor-Run Motor

- In case of capacitor-start and capacitor-run motor, the starting winding and the capacitor can be designed for perfect two-phase operation at any load. Thus, this motor produces a constant torque.
- Because of constant torque, the capacitor-start and capacitor-run motor is vibration free.

Characteristics of Shaded-Pole Motor

- The principle characteristics of shaded-pole motor is the extremely simple construction and absence of centrifugal switch.
- These motors are available in power ratings upto about 30W.

Working principle of Three phase Induction Motor

(1) When the 3-phase stator winding is energised from a 3-phase supply, a rotating magnetic field is produced which rotates around the stator at synchronous speed.

(2) The rotating magnetic field cuts the rotor conductors, which as yet, are stationary. Due to this flux cutting, emfs are induced in the rotor conductors. As rotor circuit is short circuited, therefore, currents start flowing in it.

(3) Now, as per Lenz's, "the direction of induced current will be such that it opposes the very cause that produced it. "

(4) Here, the cause of emf induction is the relative motion between the rotating field and the stationary rotor conductors. Hence, to reduce this relative motion, the rotor starts rotating in the same direction as that of the stator field and tries to catch it but, can never catch it due to friction and windage and therefore emf induction continues and motor keeps rotating.

When rotor winding is short-circuited with no resistance in series, it is called a squirrel cage induction motor and when rotor winding is shorted through a resistance in series, it is called slip ring induction motor.

Thus, principle of 3 phase induction motor also explains why rotor rotates in same direction as the rotating field and why induction motor is self-starting.

Characteristics of a Squirrel Cage Induction motor

1. The induction motor has very high starting current.
2. SCIM has very low starting torque.
3. Starters like direct on-line starter and star Delta stator can be used to reduce the starting current…
4. At starting time, the rotor speed is zero so it is called blocked rotor condition.
5. The slip at starting of IM is always maximum which is one

In case of SCIM we cannot add external resistance to develop the starting.

Conclusion: The experiment helped to learn about the single and three phase Induction motor. It helped to learn about about its characteristics and principle of working.

References: Javatpoint, Electrical4u, Tutorialspoint, etc.

THREE PHASE INDUCTION MOTOR