Chapter:4

Single phase Induction motor

Single-Phase Induction Motor

- A single phase induction motor **is similar to the three phase squirrel cage induction** motor except there is single phase two windings (instead of three phase winding in 3-phase motors) mounted on the stator.
- Similar to a three-phase induction motor, single-phase induction motor also has **two main parts; Stator and Rotor**

Stator

- In a single-phase induction motor, there **are two winding used in stator**
- Out of these two windings, one winding is the **main winding** and the second is **auxiliary winding.**

Rotor

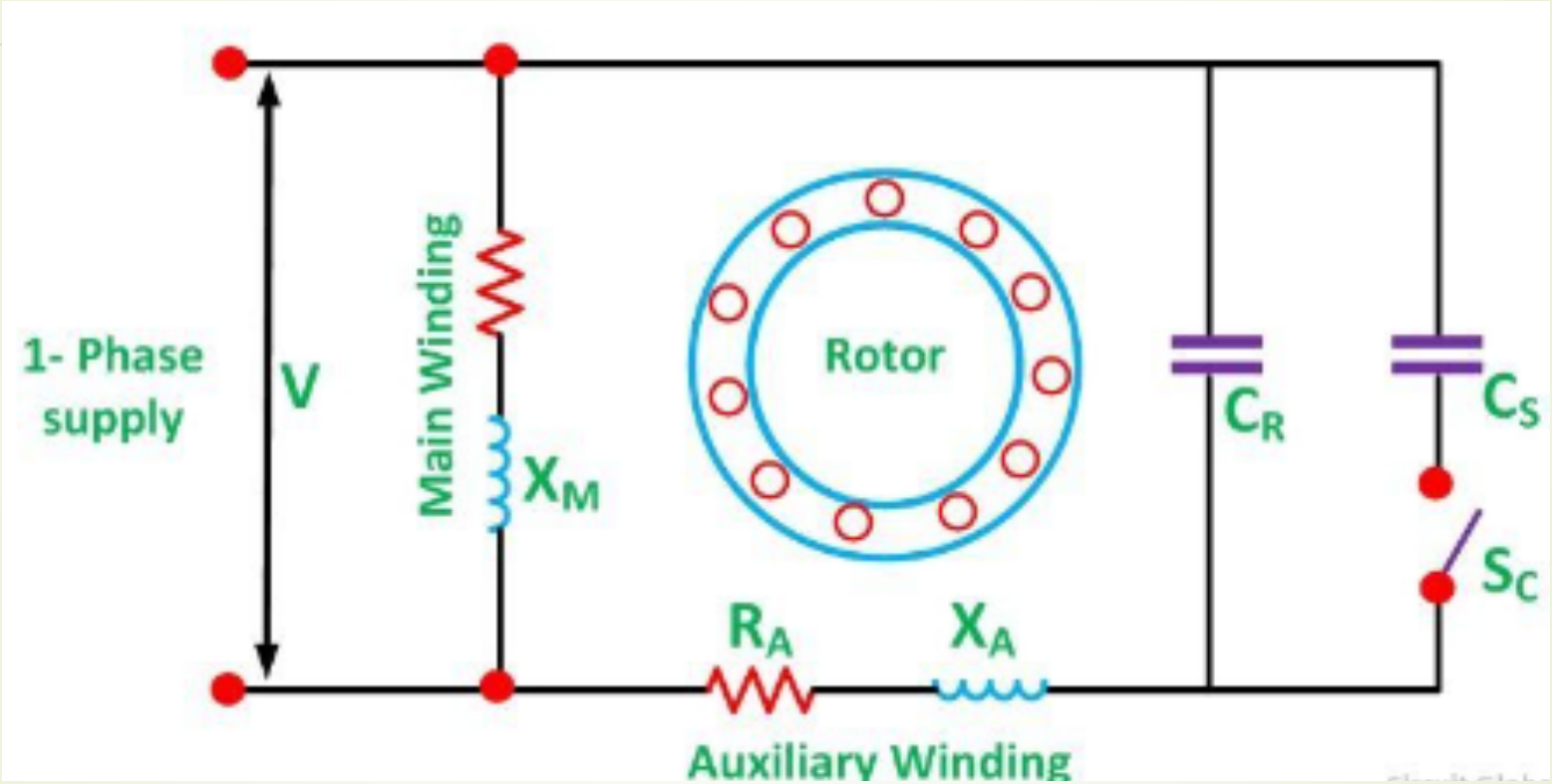
- Rotor of single-phase induction motor is the same as a rotor of **squirrel cage induction motor.**
- Instead of rotor winding, rotor bars are used and it is short-circuited at the end by end-rings.

Working Principle of Single phase induction motor

- Single-phase AC supply is given to the stator winding (main winding). The alternating current flowing through the stator winding ***produces magnetic flux***. This flux is known as the **main flux**.
- According to Faraday's law, **emf is induced in rotor** and the induced current start flowing in the rotor circuit it is a close path. This current is known as **rotor current.**
- Due to the rotor current, the **flux produced around the rotor winding**. This flux is known as **rotor flux.**
- There are two fluxes; **main flux which is produced by stator** and second is the **rotor flux which is produced by the rotor**.
- Interaction between main flux and rotor flux, the **torque is produced** in the **rotor and it starts rotating.**

Capacitor Start Capacitor Run Induction Motor

- The **Capacitor Start Capacitor Run Motor** has a cage rotor, and its stator has two windings known as **Main and Auxiliary Windings.**
- The two windings are **displaced 90 degrees.**
- There are two capacitors in this method one is used at the **time of the starting and is known as starting capacitor**. The other one is used for continuous running of the motor and is known **as RUN capacitor.**
- So this motor is named Capacitor Start Capacitor Run Motor and is sometimes known as Two Value Capacitor Motor.


1- Phase supply
V
Main Winding
X_M
Rotor
C_R
C_S
S_C
R_A
X_A
Auxiliary Winding

- There are two capacitors in this motor represented by **C_S and C_R.**
- In the starting, the **two capacitors are connected in parallel.**
- The capacitor Cs is the Starting capacitor is **short time rated**. It is almost electrolytic. A large amount of current is required to obtain the starting torque.
- Therefore, the value of the **capacitive reactance X should be low** in the starting winding. Since, $X_s = 1/2\pi fC_s$, the value of the **starting capacitor should be large**.
- The rated line current is smaller than the starting current at the normal operating condition of the motor. Hence, the value of the **capacitive reactance should be large.** Since, $X_R = 1/2\pi fC_R$, the value of the **run capacitor should be small.**
- As the motor reaches the synchronous speed, the starting capacitor **Cs is disconnected** from the circuit by a **centrifugal switch Sc**. The capacitor **C_R is connected permanently** in the circuit and thus it is known as **RUN Capacitor.**