

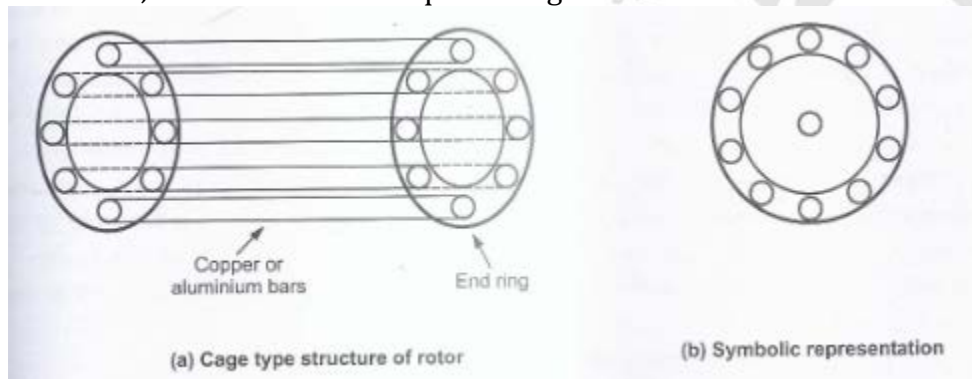
**Subject** : Basic electrical engineering

**Question** : Explain the squirrel cage rotor and phase wound rotor in induction motor.

**Answer** :

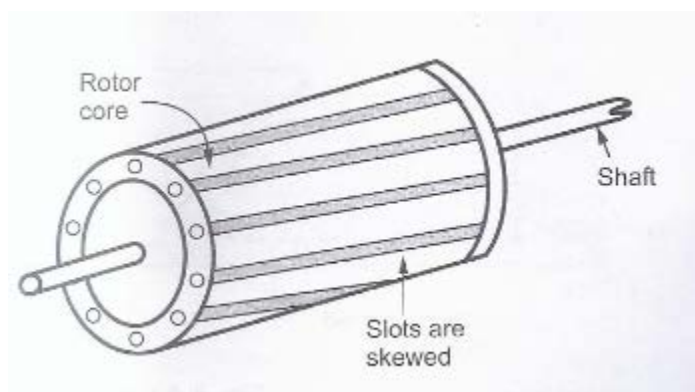
### Squirrel Cage Rotor

The rotor core is cylindrical and slotted on its periphery. The rotor consists of uninsulated copper or aluminium bars called rotor conductors. The bars are placed in the slots. These bars are permanently shorted at each end with the help of conducting copper ring called end ring. The bars are usually brazed to the end rings to provide good mechanical strength. The entire structure looks like a cage, forming a closed electrical circuit. So, the rotor is called squirrel cage rotor. The construction is shown in the Fig. 1



**Fig. 1 Squirrel cage rotor**

As the bars are permanently shorted to each other through end ring, the entire rotor resistance is very small. Hence, this rotor is also called as short circuited rotor. As the rotor by itself is short circuited, no external resistance can have any effect on the rotor resistance. Hence, no external resistance can be introduced in the rotor circuit. So, slip ring and brush assembly is not required for this rotor. Hence, the construction of this rotor is very simple.



**Fig2. Skewing in rotor construction**

Fan blades are generally provided at the ends of the rotor core. This circulates the air through the machine while operation, providing the necessary cooling. The air gap between stator and rotor is kept uniform and as small as possible.

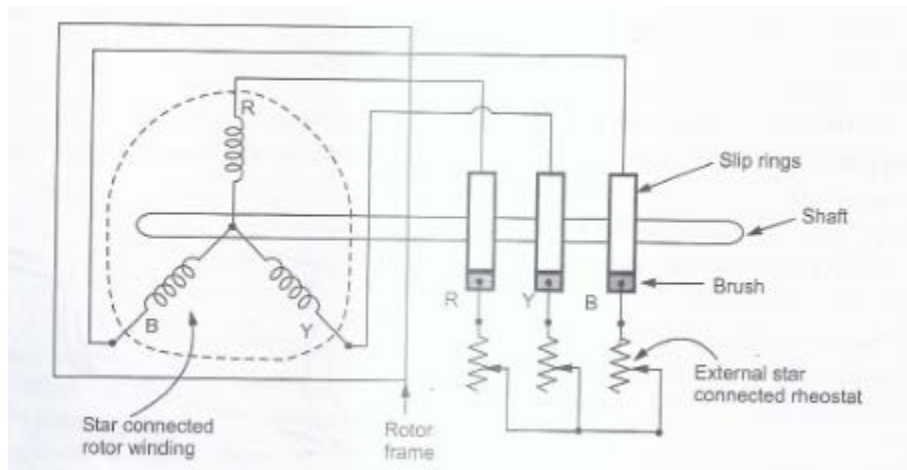
In this type of rotor, the slots are not arranged parallel to the shaft axis but are skewed as shown in the Fig. 2

***The advantages of skewing are,***

1. A magnetic hum (i.e. noise) gets reduced due to skewing. Hence, skewing makes motor operation quieter.
2. It makes the motor operation smooth.
3. The stator and rotor teeth may get magnetically locked. Such a tendency of magnetic locking gets reduced due to skewing.
4. It increases the effective transformation ratio between stator and rotor.

### Slip Ring Rotor or Wound Rotor

In this type of construction, rotor winding is exactly similar to the stator. The rotor carries a three phase star or delta connected, distributed winding, wound for same number of poles as that of stator. The rotor construction is laminated and slotted. The slots contain the rotor winding. The three ends of three phase winding, available after connecting the winding in star or delta, are permanently connected to the slip rings. The slip rings are mounted on the same shaft. We have seen that slip rings are used to connect external stationary circuit to the internal rotating circuit. So, in this type of rotor, the external resistances can be added with the help of brushes and slip ring arrangement, in series with each phase of the rotor winding. This arrangement is shown in the Fig. 3



**Fig3. Slip rings or wound rotor**

In the running conditions, the slip rings are shorted. This is possible by connecting a metal collar which gets pushed and connects all the slip rings together, shorting them. At the same time, brushes are also lifted from the slip rings. This avoids wear and tear of the brushes due to friction. The possibility of addition of an external resistance in series with the rotor, with the help of slip ring, is the main feature of this type of rotor.