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FACULTY OF ENGINEERING & TECHNOLOGY

Electrical Machine-ii

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COMPARISON BETWEEN INDUCTION MOTOR AND SYNCHRONOUS, MOTOR

BASIS OF DIFFERENCE	SYNCHRONOUS MOTOR	INDUCTION MOTOR
Type of Excitation	A synchronous motor is a doubly excited machine.	An induction motor is a single excited machine.
Supply System	Its armature winding is energized from an AC source and its field winding from a DC source.	Its stator winding is energized from an AC source.
Speed	It always runs at synchronous speed. The speed is independent of load.	If the load increased the speed of the induction motor decreases. It is always less than the synchronous speed.
Starting	It is not self starting. It has to be run up to synchronous speed by any means before it can be synchronized to AC supply.	Induction motor has self starting torque.
Operation	A synchronous motor can be operated with lagging and leading power by changing its excitation.	An induction motor operates only at a lagging power factor. At high loads the power factor becomes very poor.
Usage	It can be used for power factor correction in addition to supplying torque to drive mechanical loads.	An induction motor is used for driving mechanical loads only.
Efficiency	It is more efficient than an induction motor of the same output and voltage rating.	Its efficiency is lesser than that of the synchronous motor of the same output and the voltage rating.
Cost	A synchronous motor is costlier than an induction motor of the same output and voltage rating	An induction motor is cheaper than the synchronous motor of the same output and voltage rating.

STARTING METHODS FOR SYNCHRONOUS MOTOR

The different methods that are generally followed to start the synchronous motor are

i) By using a pony motor (Small induction motor)

ii) By using a damper winding

iii) By using DC motor

iv) Starting as an induction motor

By using a pony motor (Small induction motor)

In this method, the rotor of the synchronous motor is brought to its synchronous speed with the help of an external induction motor. This external motor is called the pony motor.

By using a damper winding

- The damper windings are provided on the pole face slots in the fields.
- These windings are short-circuited at both ends with the help of end rings, thus forming a squirrel-cage system.
- Now, when a three-phase supply is given to the stator of a synchronous motor, it will start as a three-phase induction motor.

By using DC motor

In this method of starting, the synchronous motor is brought to its synchronous speed with the help of a DC motor coupled to it. Once the rotor of the synchronous motor attains synchronous speed, the DC excitation to the rotor is switched on.

Starting as an induction motor

- The synchronous motor is started as a squirrel-cage induction motor.
- When the synchronous motor is started as a slip-ring induction motor, the three ends of the windings are connected to an external resistance in series through slip-rings.

Application of Synchronous Motor

1. Synchronous motor having no load connected to its shaft is used for power factor improvement.
2. Synchronous motor finds application where operating speed is less and high power is required.
3. As synchronous motor is capable of operating under either leading or lagging power factor, it can be used for power factor improvement. A synchronous motor under no-load with leading power factor is connected in a power system where static capacitors cannot be used.
4. It is used where high power at low speed is required such as rolling mills, chippers, mixers, pumps, pumps, compressors etc.