

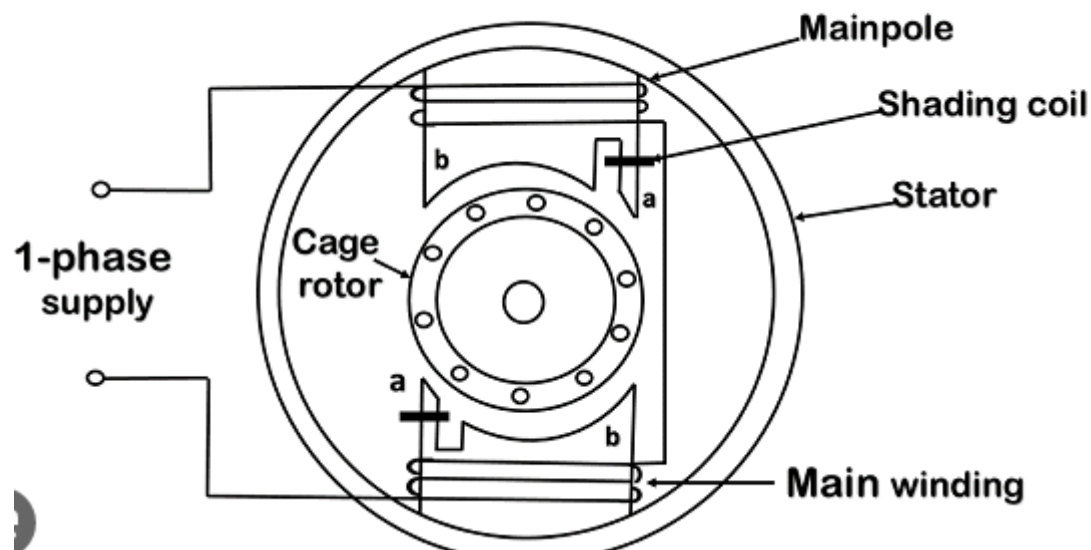


19MEE402 Hybrid Technology

UNIT 4- ELECTRIC VEHICLE MOTORS

Induction Motors

An induction motor is a type of AC (alternating current) electric motor widely used in various industrial and domestic applications. It operates on the principle of electromagnetic induction. Let's discuss its parts, working principle, and advantages and disadvantages.



Parts of an Induction Motor:

- Stator:**
 - The stationary part of the motor.
 - It contains the primary winding, which is connected to the AC power supply.
- Rotor:**
 - The rotating part of the motor.
 - It can be of two types: squirrel cage rotor (most common) or wound rotor.
- Air Gap:**
 - The space between the stator and rotor where the magnetic field is generated.
- Bearings:**
 - Support the rotor and allow it to rotate freely.

5. **End Rings:**

- Found in squirrel cage rotors, they short-circuit the rotor bars to form a closed loop.

Working Principle:

1. **Stator Current:**

- AC power is applied to the stator winding, creating a rotating magnetic field.

2. **Rotating Magnetic Field:**

- The rotating magnetic field induces a voltage in the rotor according to Faraday's law of electromagnetic induction.

3. **Rotor Current:**

- Current is induced in the rotor conductors, generating a magnetic field.

4. **Torque Production:**

- The interaction between the stator and rotor magnetic fields produces a torque, causing the rotor to turn.

5. **Motor Rotation:**

- The rotor follows the rotating magnetic field, achieving synchronous speed (the speed of the rotating magnetic field).

6. **Slip:**

- The actual rotor speed is slightly less than synchronous speed due to slip, which is necessary for torque production.

Advantages of Induction Motors:

1. **Simple Construction:**

- Induction motors have a simple and robust design, leading to lower manufacturing costs.

2. **Low Maintenance:**

- They have fewer moving parts, resulting in lower maintenance requirements.

3. **High Efficiency:**

- Induction motors can be highly efficient, especially under full load conditions.

4. **Self-Starting:**

- Induction motors are self-starting, and additional starting mechanisms are not required.

5. **Rugged and Reliable:**

- They can withstand harsh operating conditions and are known for their reliability.

Disadvantages of Induction Motors:

1. **Limited Speed Control:**

- Speed control of induction motors is more challenging compared to some other types of motors.

2. **Lower Power Factor at Low Loads:**

- The power factor may decrease at partial loads, affecting overall power efficiency.

3. **Limited Operating Speed Range:**

- Induction motors may not be suitable for applications requiring a wide range of operating speeds.

4. **Requires Reactive Power:**

- Induction motors require reactive power, and power factor correction may be needed.

5. **Sensitive to Voltage Fluctuations:**

- Performance can be affected by variations in the power supply voltage.

Despite these limitations, induction motors are widely used due to their simplicity, reliability, and cost-effectiveness in various applications.