

QUESTIONS ON ELECTRIC MOTOR WITH ANSWERS

Q1. WHAT IS ELECTRIC MOTOR?

ANS. An **electric motor** is an electrochemical device that converts electrical energy into mechanical energy. Most electric motors operate through the interaction of magnetic field and current carrying conductors to generate force.

Q2. ON WHAT PRINCIPLE ELECTRIC MOTOR WORKS?

ANS. **The Motor Principle:** when a current-carrying conductor is located in an external magnetic field perpendicular to the conductor, the conductor experiences a force perpendicular to itself and to the external magnetic field. The physical principle behind production of mechanical force by the interactions of an electric current and a magnetic field.

The right-hand rule for force on a conductor can be used to determine the direction of the force experienced on the conductor.

Q3. HOW MANY TYPES OF ELECTRIC MOTORS ARE THERE?

ANS. Mainly there are two types of electric motors:

- a. AC motors
- b. DC motors

Q4. WHAT IS AC MOTOR?

ANS. An **AC motor** is an electric motor driven by an alternating current (AC). It commonly consists of two basic parts, an outside stationary stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft that is given a torque by the rotating field.

Q5. WHAT IS DC MOTORS?

ANS. A **DC motor** is a mechanically commutated electric motor powered from direct current (DC). The stator is stationary in space by definition and therefore so is its current. The current in the rotor is switched by the commutator to also be stationary in space. This is how the relative angle between the stator and rotor magnetic flux is maintained near 90 degrees, which generates the maximum torque.

Q6. WHAT ARE THE APPLICATIONS OF ELECTRIC MOTOR?

ANS. Electric motors applications are: industrial fans, blowers and pumps, machine tools, household appliances, power tools, and disk drives, record players.

Q7. WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF AC,DC MOTORS?

ANS. ADVANTAGES OF AC: Low cost, long life, high efficiency, large ratings available (to 1 MW or more), large number of standardized types.

DISADVANTAGES OF AC: Starting inrush current can be high, speed control requires variable frequency source.

ADVANTAGES OF DC: Precision positioning, High holding torque, Long lifespan, Low maintenance, High efficiency.

DISADVANTAGES OF DC: Some can be costly, Require a controller, Higher initial cost, Requires a controller.

Q8. WHAT IS UNIVERSAL MOTOR?

ANS. A series-wound motor is known as a universal motor when it has been designed to operate on either AC or DC power. It operate well on AC because the current in both the field and the armature (and hence the resultant magnetic fields) will alternate in synchronism and hence, the resulting mechanical force will occur in a constant direction of rotation.

Q9. HOW IS THE EFFICIENCY OF MOTOR IS CALCULATED?

ANS. To calculate a motor's efficiency, the mechanical output power is divided by the

electrical input power: $\eta = \frac{P_m}{P_e}$, where η is energy conversion efficiency, P_e is electrical input power, and P_m is mechanical output power.

In simplest case $P_e = VI$, and $P_m = T\omega$, where V is input voltage, I is input current, T is output torque, and ω is output angular velocity. It is possible to derive analytically the point of maximum efficiency. It is typically at less than 1/2 the stall torque.

Q10. WHAT ARE THE STANDARDS OF MOTOR?

ANS. The following are major designs and manufacturing standards covering electric motors:

- International Electro-technical Commission: IEC 60034 Rotating Electrical Machines
- National Electrical Manufacturers Association (USA): NEMA MG 1 Motors and Generators
- Underwriters Laboratories (USA): UL 1004 - Standard for Electric Motors