Universal, stepper and linear induction motor

Universal motors:

Single phase series motors can be used with either a D.C source or a single phase A.C source , therefore they are called universal motors. They are widely used in fractional horsepower ratings in many domestic applications such as drills , mixers ,and vacuum cleaner.

Both stator and rotor structures are made of laminated steel to reduce core losses and eddy current . For the same voltage and armature current the speed will be lower for A.C excitation . A.C excitation produces pulsating torque , poor power factor.

Linear induction motor:

A linear induction motor can produce linear or translational motion . Instead of squirrel – cage rotor , a cylinder of conductor enclosing the rotors ferromagnetic core is considered . If the rotary machine is cut along the line and unrolled a linear induction machine is obtained . Instead of the term stator and rotor , it is more appropriate to call them primary and secondary member of the linear induction machine . If one member is fixed and the other is free to move , the force will make the movable member move.

Stepper motors:

A stepper motor rotates by a specific number of degrees in response to an input electrical pulse . Typical step sizes are 2°, 2.5°, 5°, 7.5°, and 15° for each electrical pulse . The stepper motor is an electromagnetic incremental actuator that can convert digital pulse inputs to analog output shaft motion.

It is therefore used in digital control system . A train of pulses is made to turn the shaft of the motor by steps . Typical applications of stepper motors requiring incremental motion are printers , tape drivers , and disc drive .

Two types of stepper motors are widely used :

1. **the variable – reluctance type.**
2. **the permanent magnet type .**

Reluctance motors:

A single phase reluctance motor is essentially the same as the single phase induction motor , except that some saliency is introduced in the rotor structure by removing some rotor teeth at the appropriate places to provide the required number of poles . The squirrel cage bars and end rings are left intact so that the reluctance motor can start as an induction motor . The reluctance motor has a low power factor because it requires a large amount of reactive current for its excitation . A reluctance motor is several times larger than a synchronous motor with D.C excitation having the same horsepower and speed rating .