Q: For each of the following applications, what is a good choice for the type of the electric motor used? Justify your choice: robot arm joint, ceiling fan, electric trolley, circular saw, NC milling machine, electric crane, disk drive head actuator, disk drive motor, windshield wiper motor, industrial conveyor motor, washing machine, clothes dryer.

A: The choice varies:

1. robot arm joint: PMSM.

Low speed, high torque.

1. ceiling fan: Single-phase Induction Motor.

Simple structure, High efficiency, Easy to control angular speed.

1. electric trolley: Switched Reluctance Motor.

High power density, Large speed, Reliable, Low weight.

1. circular saw: Single-phase AC/DC Induction Motor.

Small size, High speed, Large starting torque.

1. NC milling machine: Permanent Magnet DC Motor.

Less vibration, small size, simple structure, high power, low cost.

1. electric crane: Induction Motor

Heavy load, requires large starting torque and control torque.

1. disk drive head actuator: Voice Coil.

Linear response, Low inertia of moving coil, Bidirectional capability.

1. disk drive motor: BLDC.

Easy to obtain constant speed.

1. windshield wiper motor: PMDCM.

Simple and cheap, small size, light weight, low noise.

1. industrial conveyor motor: 3-phase Induction Motor.

High starting torque, easy to regulate speed.

1. washing machine: Induction Motor.

Easy to control direction.

1. clothes dryer: Induction Motor or BLDC.

Simple structure, avoid electric spark.