1.7 SPEED OF ROBOT MOTION:

It refers to how fast a robot or its joints can move while performing various tasks. It is generally desirable in production to minimize the cycle time of a give task. It depends on the factors such as:

- The accuracy with which the wrist must be positioned.
- The weight of the object being manipulated.
- The distance to be moved.

TYPES OF SPEED OF MOTION:

LINEAR SPEED:

- Speed at which a point (like the end-effector) moves along a straight-line.
- E.g.: A robot arm moving its tool horizontally from point A to point B.

ANGULAR SPEED:

- Rate of Rotation around a joint or axis.
- E.g.: A robots joint rotating 90-degree in one second.

JOINT SPEED:

- The speed at which a specific robot moves (can be linear or angular depending on the joint type).
- E.g.: A robotic elbow joint bending or extending.

END-EFFECTOR SPEED:

- It refers to the rate at which the tool or gripper move in space. It includes both linear speed and sometimes angular speed, depending on the task.
- E.g.: For cutting, welding, painting or assembly require the right speed for quality.

TYPES OF ROBOTS WITH RESPECT TO SPEED OF MOTION:

1. POINT-TO-POINT (PTP) CONTROL ROBOT: It is capable of moving from one point to another point. The locations are recorded in the control memory. PTP robots do not control the path to get from one point to the next point. Common applications

include component insertion, spot welding, whole drilling, machine loading and unloading, and crude assembly operations.

2. CONTINUOUS-PATH (CP) CONTROL ROBOT: With CP control, the robot can stop at any specified point along the controlled path. All the points along the path must be stored explicitly in the robot's control memory. Typical finishing, application gluing, and arc welding operations.

3. CONTROLLED-PATH ROBOT: The control equipment can generate paths of different geometry such as straight lines, circles, and interpolated curves with a high degree of accuracy. All controlled-path robots have a servo capability to correct their path.

1.8 PAYLOAD:

In robotics, payload refers to the maximum weight a robot can carry or manipulate using its end-effector (such as a gripper, welding torch, or tool), without losing performance, speed, or accuracy.

Payload includes:

- The object being picked, moved, or processed
- The tool or end-effector (gripper, sensor, etc.)
- Any attachments connected to the robot arm

Why is Payload Important:

- Ensures the robot operates safely and efficiently
- Helps determine the right robot for a task
- Affects speed, precision, and durability of the robot
- Prevents overloading that could damage the robot

Payload not only applies to the weight of the workpiece handled by the robot; it also applies to the weight of any end of arm tooling (EOAT)and bracketing integrated with the robot wrist. Payload is expressed as a weight unit, with most robot manufacturers using kilograms(kg).

If we have an ABB TRB 2600(6-axis industrial robot, used for Arc welding, Machine tending, Assembly, Material handling etc.). With a payload of 20 kg

Example:

If a robot arm has a payload capacity of 10 kg:

- It can lift a 5 kg object using a 2 kg gripper (total = 7 kg)
- But cannot lift an 11 kg object with the same gripper (total = 13 kg)