ROBOT CHARACTERISTICS:

PAYLOAD:

This is the weight a robot can carry and still remain within its other specifications. As an example, a robot's maximum load capacity may be much larger than its specified payload, but at these levels, it may become less accurate, may not follow its intended path (trajectory) accurately, or may have excessive deflections. The payload of robots compared to their own weight is very small, usually only a few percent.

REACH:

This is the maximum distance a robot can reach within its work envelope. As will be seen later, much of the workspace of the robot may be reached with any desired orientation (called dexterous points). However, for other points close to the limit of the robot's reach capability, orientation cannot be specified as desired (called non-dexterous points). Reach is a function of the robot's joints and lengths of its linkages and its configuration. This is an important specification for industrial robots and must be considered before a robot is selected and installed.

PRECISION (VALIDITY):

This is defined as how accurately a specified point can be reached. Precision is a function of the resolution of the actuators, as well as the robot's feedback devices. Most industrial robots can have precision in the range of 0.001 inches or better. The precision is a function of how many positions and orientations were used to test the robot, with what load, and at what speed. When the precision is an important specification, it is crucial to investigate these issues.

REPEATABILITY (VARIABILITY):

This is how accurately the same position can be reached if the motion is repeated many times. Suppose that a robot is driven to the same point 100 times. Since many factors may affect the accuracy of the position, the robot may not reach the exact same point every time, but be within a certain radius from the desired point. The radius of a circle that is formed by the repeated motions is called repeatability. Repeatability is much more important than precision. If a robot is not precise, it

generally shows a consistent error, which can be predicted and, therefore, corrected through programming.

ROBOT WORKSPACE:

Depending on their configuration and the size of their links and wrist joints, robots can reach a collection of points around them that constitute a workspace. The shape of the workspace for each robot is uniquely related to its design.

- CARTESIAN WORKSPACE:

Formed by linear movements in X, Y, Z directions (cubical or rectangular).

- CYLINDRICAL WORKSPACE:

Generated by rotation at the base and linear extension—resembles a cylinder.

- SPHERICAL WORKSPACE:

Formed by combinations of revolute joints creating a spherical region.

- ARTICULATED WORKSPACE:

Created by multi-joint arm robots (like 5-DOF or 6-DOF robotic arms). Shape is usually complex and irregular.