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Subject Name - Basic Mechanical Engineering
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Experiment No - 3

* Name of the experiment - Demonstration of robot assisted welding process

* Aim - To study the various robot assisted welding processes.

* Objective - To understand the necessity of robot assisted welding process.

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Summary

Welding is a fabrication process whereby two or more parts are fused together by means of heat and pressure. A strong joint is formed as the part cools. It is generally used on metals and thermoplastics.

The parts that are joined are known as parent metals. The base of the parent metal is melted and/or a filler atmospheric material is added to help form the joint. A shielding gas is also required to protect the weld area from atmospheric gases. Different energy sources like gas flame, electric arc, laser, electron beam, friction, ultrasound, etc. are used for welding.

- Different types of welding joints are-
  1. Butt Joint
  2. Lap Joint
  3. corner Joint
  4. Tree Joint
  5. Edge Joint

* Need of Robotic welding -

Welding is a hazardous process and precautions are required to avoid burns, electric shocks, vision damage, inhalation of poisonous gases and fumes and exposure to radiations. Hence it is desirable to automate the process to require minimal human intervention.

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* What is Robotic welding -

Robotic welding is the complete automation of welding process by use of mechanized programmable tools. It can perform the welding and also handle the part by itself. This system has filled the gap due to shortage of labour and has improved the accuracy and the productivity.

* components of robotic welding -

① Welding Power Source -

It provides the power to the system for working of all components. It size and capacity varies according to requirement

② Welding Robot -

The robot is the main component that performs the welds. It has an arm that can move in three dimensions for rectilinear types and through more planes in articulating versions.

③ Robot Controller & Interface -

The controller is the brain of the system. It has a software program that controls the Robot. It processes the data and gives instructions like parts movement, robot tooling, gripping, etc. The interface allows the user to set and monitor paramaters that affect the weld.

④ Wire Feeder -

It supplies the wire to the torch for welding process. Its supply rate depends upon the speed of operation.

⑤ Torch -

It uses the power flowing in the electrode to heat up and join the materials together. Shielding apparatus and cooling unit (D) is also included in it.

⑥ Work Area -

The parts are placed and held here for the robot to weld.

⑦ Safety Features -

Robotic welding machine has safety features like fencing, access door, shields, alarms, interlocks, etc. to prevent any harm to operators and workers.

⑧ Wire Cleaner -

The cleaner is used to remove spatter from the torch between work cycles prolonging equipment life span.

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* Advantages of Robotic welding over Manual welding -

- Increased efficiency due to longer working hours and high speed.
- Better accuracy due to no human errors.
- Less waste due to precision
- Enhanced saftey due to no direct human contact & safety features.
- once installed, robotic welding are cost effective due to less man power requirement

* Disadvantages of Robot welding over Manual welding -

- Very high investment cost for setting up the machinery.
- Less flexibility due to fixed programs.
- Not feasible for small projects and applications due to more cost and time to set up and program.

* Conclusion -

Robotics is playing a very important in improving our standard of living. It is becoming crucial in the manufacturing sector also to meet the new standards of accuracy, quality and speed. A substantial opportunity in technology exists to relive people from monotonous, repetitive work.

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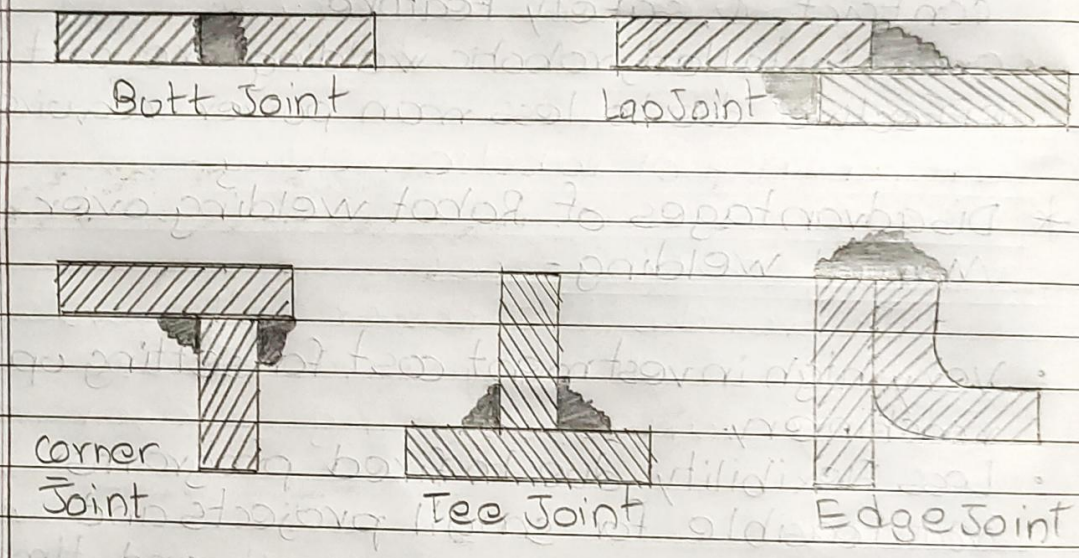
Questions

Q1) Explain various types of welding joints with neat sketch.

Ans->

Welding Joints



Q2) Name five industries manufacturing robotic arm.

-> The industries manufacturing robotic armare-

1. FANUC Robotics
2. Universal Robots
3. Yaskawa Electric
4. ABB
5. Omron Adept Technologies
6. Kuka Robotics
7. UC Berkley.

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Q3) write a short note on applications of robot assisted welding.

Ans → The applications of Robot assisted welding are-

1) Robot Arc welding-

A technique in which metals are welded using the heat generated by an electric arc. Arc welding is performed by skilled workers who are assisted by a person called fitter. The working condition of the welder is typically unpleasant and hazardous. Because of the hazards for human workers in continous arc welding, it is logical to consider industrial robots.

2) Robot spot welding-

For larger works on spot welding, the welding guns with cables attached is quite heavy and can easily exceed 100 lb in weight. To assist the operator in manipulating the gun, the apparatus is suspended from an overhead hoist system. Even with this assistance, the spot-welding gun represents a heavy mass and is difficult to manipulate by a human worker at high rates of production desired on a car body assembly line.