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Assignment No. 3

Welding Shop

CO4: Comprehend the process of PCB making, layout of house wiring, and electric arc welding.

Q1) What is welding? What is weldability?

A) Welding is a fabrication process whereby two or more parts are fused together by means of heat, pressure or both, forming a join as the parts cool down. Welding is usually used on metals and thermoplastics but can also be used on wood. The completed welded joint may be referred to as a weldment.
The parts that are joined are known as a parent material. The material added to help form the joint is called filler or consumable. The form of these materials may see them referred to as parent plate or pipe, filler wire, consumable electrode (for arc welding), etc.

Weldability is the ability of any material (usually metals and its alloys) to weld with similar materials. Many plastics and metals can be welded together to fabricate a final material that is required further in the fabrication process or any other industrial process.

Q2) What is working principle of electric arc welding?

A) Electric arc welding is a welding process that is used for welding the metals with the help of electricity to generate sufficient heat for softening the metal, as well as when the softened metal is cooled then the other metals will be welded. This kind of welding uses a power supply to make an arc among a metal stick and the base material to soften the metals at the end of the contact.

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Principle

> The working principle of arc welding is, in a welding process the heat can be generated with an electric arc strike among the workpiece as well as an electrode. This is glowing electrical discharge among two electrodes throughout ionized gas.

> The arc welding equipement mainly includes an AC machine otherwise DC machine, electrode, holder for the electrode, cables, connectors for cables, earthing clamps, chipping hammer, helmet, wire brush, hand gloves, Apron, etc.

> The electrical energy is converted into heat energy. The current passes through the work piece and the electrode, which produces an electric arc. Due to the heat developed, both the electrode and the base metal get melted. The electrode and work piece are brought nearer with a small air gap of approx 3mm. Slag protects the weld pool from oxidation and heat loss (i.e. slow cooling). Slow cooling avoids distortion and brittleness of the joint.

Q3) What is function of coating on electrode?

A) (i) Sheilding of molten metal –
Electrode coating produces sheild gas such as carbon dioxide under heat, which can sheild molten metal from atmospheric oxygen, nitrogen and hydrogen. This sheilding is necessary to ensure no gas pockets in welding and then avoids contamination of the weld joint.

(ii) Stabilization of arc –
Some elements that can stabilize the arc are also added in electrode coating. It helps in arc igniting and giving a smooth arc.

(iii) Formation of slag and slag control –
Slag sheilds metals from atmospheric air and reduces cooling rate. Slag influenced metal droplets make them highly viscous. Viscous slag is useful in welding in a vertical position.

(iv) Provides Deoxidizer –
Coating helps to reduce oxide impurities by providing deoxidizer like Si, Mn.

(v) Metal alloying –
Special alloying elements such as nickel, vanadium, molybdenum, etc can be added to weld joint by introducing them through the electrode coating to improve the properties of weld metal.

Q4) Prepare a list of arc welding equipment and explain the function of each.

A) (i) Arc welding power source (welding machine) –
It comes in two types, direct current (DC) and alternative current (AC). These machines have their own advantages, AC power supply is used where electricity supply is available. It is used to melt work peice and filler metal and then joined using glowing electrical discharge.

(ii) Welding electrode –
Electrode is a rod made of the filler metal used in welding. The current passes through the base metal and electrode which melts them and are used to produce the arc. The electrode is coated with a layer of flux. The filler present inside the metal fills inside the work piece to produce a strong joint.

(iii) Welding cables –
Welding cables are made of aluminium or copper cables insulated with either red, black or blue colour. They are used for connecting or transfering current from power source to electrode holder and produced arc to the workpiece back to the power source.

(iv) Earth clamp –
It is used to complete the flow of current in the welding circuit.

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(v) Electrode Holder –
It is designed to have capacity of dipping the electrode manually in order to receive current and create arc. It is available in sizes that range from 150 to 500 amps.

(vi) Welding booth and table –
Area used for welding is called the welding booth. The table on which the workpiece is kept and welded is called welding table. Welding booth are black in colour to absorb the light produced during welding.

~~(vii)~~

(vii) Protective clothing –
They are used to protect different parts of the body of the operater. Protective clothing include: welding goggles (Eyes), welding screen (Face and eyes), Helmet, Gloves, Apron etc.

(viii) Chipping hammer –
This are welding equipment is used to reduce slag that occurs during welding. It is made of a wooden or rubber handle and a flat and punch head made of metal. It is used by striking off the slags by the head of the hammer.

(ix) Wire Brush –
They are used to clean dirt and to wipe away rust from the metal before welding. It is made of a wooden handle and wires on its surface.

(x) Jigs and Fixtures –
They are used to hold the work peice in one place while welding.

(xi) According to need many other tools are used during welding and various measuring instruments are used to measure the workpeice.

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Q5) For the given welding job drawing write the process plan.

Operation No	Operation Description	Machine / Job holding device used	cutting / Marking Tool used	Measuring Instrument
1.	Cutting the Plat of size 50x5 in 40mm length. 4 No.s	Power saw machine	HSS Blade (8 TPI)	Steel Rule
2.	Inspection of price for size and defects.	—	—	Steel Rule
3.	Burrs removing	Bench vise	Rough Flat File	—
4.	Edge preparation of two prices for Butting Welding as per Drawing	Bench vise	Rough Flat File	Steel Rule
5.	Tagging	Welding Table	Welding Transformer, Welding cables, Holder, Electrod Tong etc.	—
6.	Butt Joint Welding	Welding Table	—"—	—
7.	Lap welding Joint	Welding Table	"	—
8.	Vertical Welding Joint	Welding Table	"	—
9.	Chipping	Welding Table	Chipping Hammer	
10.	Finishing	Bench vise	Wire Brush	
11.	Inspection	—	—	Steel Rule, Try square

Raw material size - 50 x 43 x 6 mm - 4 Nos.
Job - Lap Jt., Butt Jt, and Vertical Jt.