



**Somaiya Vidyavihar University**  
**K. J. Somaiya College of Engineering, Mumbai -77**  
**(A Constituent College of Somaiya Vidyavihar University)**

Batch: D2

Roll No.: 16010221025

**Assignment No 1**

Grade: AA / AB / BB / BC / CC / CD / DD

Signature of the Staff In-charge with date:

<b>CO4</b>	Comprehend the process of PCB making, layout of house wiring, and electric arc welding.
------------	-----------------------------------------------------------------------------------------

Syllabus Module covered: 4 (Max. Marks: 10)

Q1 Select the correct choice.

A) In Arc welding Voltage of A.C. Supply is in the range of .....

- a) 1000V – 1200 V
- b) 400V – 500V
- c) 200V – 250V

**d) 70V – 100V**

B) During Arc welding as thickness of metal increases .....

**a) Current should increase Voltage remain same**

- b) Current should increase Voltage should decrease
- c) Voltage should increase Current remain same
- d) Current should decrease Voltage should increase

C) In Arc welding following electric supply can used .....

- a) AC
- b) DC

**c) Both AC or DC**

d) Both AC and DC at a time

D) Which of the following is not welding joint .....

- a) Lap Joint
- b) Butt Joint

**c) Mortise Joint**

d) T - Joint

**Somaiya Vidyavihar University**  
**K. J. Somaiya College of Engineering, Mumbai -77**  
**(A Constituent College of Somaiya Vidyavihar University)**

**Q2 What is welding Electrode? Why Electrodes are coated with flux?**

Ans. 2.) Welding electrodes are lengths of wires that are connected with your welding machine to create an electric arc. Current passes through these wires to produce an arc which generates a lot of heat to melt & fuse metal for welding. There are two major types of welding electrodes namely, consumable and non-consumable.

A flux coating is a layer of a chemical which acts as a cleaning agent, a purifying agent or a flowing agent. The coating is used on electric welding rods and serves several functions. It ~~pro~~ the weld pool and solid metal from atmospheric contamination and helps in



**Somaiya Vidyavihar University**  
**K. J. Somaiya College of Engineering, Mumbai -77**  
**(A Constituent College of Somaiya Vidyavihar University)**

removing impurities from the weld pool. The impurities float on the surface of the pool and are easily removed after it cools down. These two functions contribute to the formation of a strong and durable welded joint.

The flux coating also introduces deoxidized into reaction zone which reduces oxidation of the base metal. Additionally, one extra layer provides alloying effect to the welding electrode.

**Q3 What does Arc welding mean? List the types of Arc welding.**

Ans 3.) Arc welding is a welding process that is used for welding the metals with the help of electricity to generate sufficient heat for softened metal is cooled then the metals will be welded. This kind of welding uses a power supply to make an arc among a metal stick & the base material to soften the metals at the end of the contact.



**Somaiya Vidyavihar University**  
**K. J. Somaiya College of Engineering, Mumbai -77**  
**(A Constituent College of Somaiya Vidyavihar University)**

These welds can utilize either DC otherwise AC  $\Rightarrow$  electrodes like consumable otherwise non-consumable.

Consumable electrodes methods:

i) Metal inert gas welding (MIG) (MIG) and Metal active gas welding (MAG):

$\hookrightarrow$  Also known as Gas Metal Arc Welding (GMAW) uses a shielding gas to protect the base metals from contamination.

(ii) Shielding Metal Arc Welding (SMAW):

$\hookrightarrow$  Also known as manual metal arc welding (MMA) flux shielding arc welding is a process where the arc is struck between the metal rod and the work piece, both the rod and work piece surface melt to form a weld pool. Simultaneous melting of the flux coating on the rod will form gas, and slag, which protects the weld pool from the surrounding.



**Somaiya Vidyavihar University**  
**K. J. Somaiya College of Engineering, Mumbai -77**  
**(A Constituent College of Somaiya Vidyavihar University)**

**(iii) Flux cored arc welding**

↳ Created as an alternative to SMAW, FCAW uses a continuously fed consumable flux cored electrode and a constant voltage supply, which provides a constant arc length. This process either uses a shielding gas or just the gas created by the flux to provide protection from contamination.

**(iv) Submerged Arc Welding (SAW):**

↳ A frequency-used process with a continuously fed consumable electrode and a blanket of fusible flux which becomes conductive when molten, providing a current path between the part and the electrode. The flux also helps prevent spatter and sparks while specifically suppressing fumes and UV radiation.



**Somaiya Vidyavihar University**  
**K. J. Somaiya College of Engineering, Mumbai -77**  
**(A Constituent College of Somaiya Vidyavihar University)**

**(v.) Electro-Slag Welding (ESW) :**

A vertical process used to weld thick plates (above 25mm) in a single pass. (ESW) relies on an electric arc to start before a flux addition extinguishes the arc. The flux melts as the wire consumable is fed into the molten pool, which creates a molten slag on top of the pool, which creates a molten slag on top of the pool. Two water cooled copper shoes follow the process progression and prevent any molten slag from running off.

**(vi.) Arc stud welding (SW) :**

↳ Similar to flash welding, SW joins a nut or fastener, usually with a flange with nubs that melt to create the join, to another metal piece.



**Somaiya Vidyavihar University**  
**K. J. Somaiya College of Engineering, Mumbai -77**  
**(A Constituent College of Somaiya Vidyavihar University)**

### Non-consumable Electrode Methods:

#### i.) Tungsten Inert Gas Welding (TIG):

↳ Also known as Gas Tungsten Arc Welding (GTAW), uses a non-consumable tungsten electrode to create the arc and an inert shielding gas to protect the weld & molten pool against atmospheric contamination.

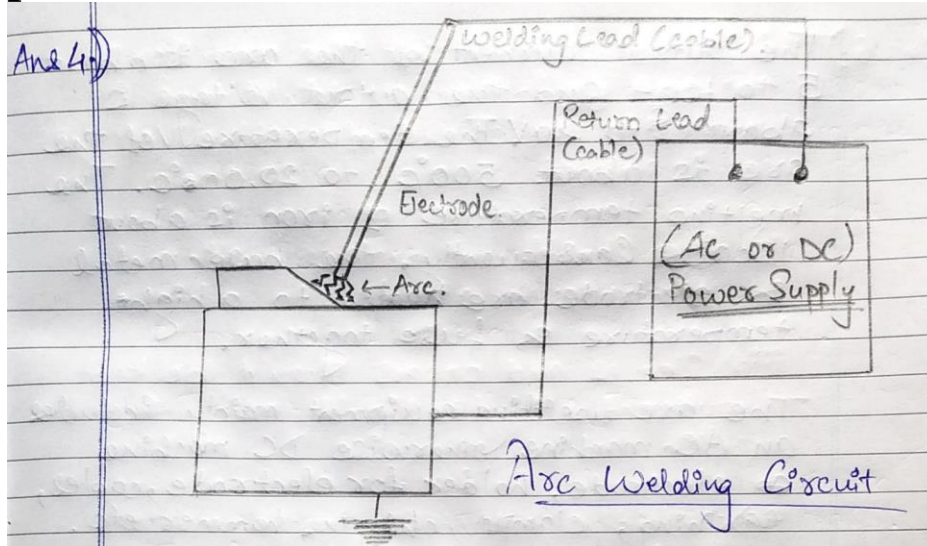
#### ii.) Plasma Arc Welding (PAW):

↳ Similar to TIG, PAW uses an electric arc between a non-consumable electrode and an anode, which is placed within the body of torch.

The electric arc is used to ionize the gas in the torch and create the plasma, which is then pushed through a fine bore hole in the anode to reach the base plate. In this way, the plasma is separated from shielding gas.

**Somaiya Vidyavihar University**  
**K. J. Somaiya College of Engineering, Mumbai -77**  
**(A Constituent College of Somaiya Vidyavihar University)**

**Q4 With circuit diagram explain working principal of Arc Welding process.**



The electric arc welding uses a phenomenon called arc discharge. An arc discharge is an electric discharge phenomenon of a gas and refers to current discharge released in air. When the voltage applied to two spatially separated electrodes is gradually increased, the air insulation finally breaks and current flows between the electrodes, emitting bright light and heat at the same time. The generated arc shaped light is called an electric arc. Arc welding is welding using the heat of an arc as a heat source.

In arc welding, positive voltage is applied to the electrode.



**Somaiya Vidyavihar University**  
**K. J. Somaiya College of Engineering, Mumbai -77**  
**(A Constituent College of Somaiya Vidyavihar University)**

The output current of the arc is about 5 to 100A and the output voltage is about 8 to 40V. The temperature of the arc is about  $500^{\circ}\text{C}$  to  $20,000^{\circ}\text{C}$ . The melting temperature of iron is about  $1500^{\circ}\text{C}$ . Consequently, the base metal & electrode are heated to a high temperature & fuse together.

The arc welding equipment mainly includes an AC machine or DC machine, electrode, holder for electrode, cables, earthing, clamps, chipping, hammer etc.

**Q5 What are advantages and disadvantages of arc welding?**

Ans. 5) Advantages of arc-welding:

- i.) It is suitable for high speed welds as compared to others.
- ii.) Both AC & DC electric supply can be used.
- iii.) Arc welding equipments are well priced and affordable. Also being simple instrument portability is not a concern.
- iv.) It has the ability to weld on porous metal and has high corrosion resistance.

**Somaiya Vidyavihar University**  
**K. J. Somaiya College of Engineering, Mumbai -77**  
**(A Constituent College of Somaiya Vidyavihar University)**

v.) Very less amount of smoke emission and sparks production takes place.

vi.) It produces very little distortion and provides high temperature range.

vii.) Its operations can be performed in rain or wind, and spatter isn't a major concern.

### Disadvantages of arc welding :

i.) It has lower ~~for~~ efficiency as more waste is generally produced in arc welding.

ii.) Operators of arc welding projects need a high level of skill & training.

iii.) It can be tough to use arc welding on certain thin materials.

iv.) It cannot be used for reactive metal like Al or Ti.

v.) Creation of wastage in some cases increased the cost of production.



**Somaiya Vidyavihar University**  
**K. J. Somaiya College of Engineering, Mumbai -77**  
**(A Constituent College of Somaiya Vidyavihar University)**

**Q6 What safety precautions are to be taken while performing Arc Welding?**

- Ans 6.) i.) It is essential that the operator & helpers be properly clothed and protected because of heat, UV rays and sparks.
- ii.) Eyes should be protected with transparent goggles.
- iii.) Sleeves and collars should be kept buttoned. Hands should be protected with leather gloves.
- iv.) Welding activities expose you to loud, prolonged noise which can result in hearing impairment.
- v.) Never use metal flooring or wet clothing as it will increase the risk of a person experiencing secondary electric shock.