| Name | [redacted] | Year | 2019 |
|---|---|---|---|
| Subject | Manufacturing Lab IC-156 | Class | Ist year |
| Semester | II | Roll No. | [redacted] |

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# SAFETY MEASURES

## Milling Machine :

1. Use a cutter guard whenever possible
2. Do not take any measurements while machine is running
3. Use proper feeds and depths of cuts.
4. Before taking out any cut, ensure that the job is properly clamped.
5. Clean the cutter of workpiece while machine is in still position.
6. Don't use machine table as storage spaces.
7. While using lubricant directly at machine, make sure the flow pipe outlet is well clear at milling cutter
8. Check the job for proper clamping.

## Drilling Machine :

1. During a drilling operation, drill rotates while the job remains stationery.
2. Stop the machine before cleaning.
3. Never remove the swarf with hand. Always use a brush.
4. For deep drilling, withdraw drill frequently and clean
5. Never attempt to drill with excessive pressure.
6. Use proper speeds for drilling.
7. Sharpen the drill properly before drilling.

## Surface Grinding :

1. Grinding wheel guards should be kept in position whenever possible.
2. Never use a defective grinding wheel.
3. Grinding wheel should always be kept dressed.
4. Wear safety goggles while dressing the grinding wheel.
5. Do not wear loose clothes.
6. Job must be checked for clamping before starting the machine.

## Fitting Bench :

1. Wear safety goggles during chiselling / grinding.
2. Always chip the material away from yourself.
3. Workpiece should be securely tightened in vice jaws.
4. Do not use file without handle.
5. Never cut a job without fitting the blade properly.
6. Do not use too much pressure to tighten vice jaws.
7. Do not strike hardened pieces together, these might chip and cause injury.
8. Hammer with loose head should not be used.
9. Always keep the tools in proper position.

## Gas Welding :

1. Gas cylinders should be stored in ventilated areas
2. A cap must be fitted on cylinder when not in use.
3. Don't pick hot jobs or objects.
4. Gas torches or strips should be stored.
5. Never oxygen hose for acctylene.
6. Clamps should be used for all fitting.
7. Never allow hose to come in contact with oil and grease
8. Use spark lighter for torch.
9. Fire extinguishers or sand should be available.

## Arc Welding :

1. Work area and floor should be kept clean and clear of electrode stubs, metal scarp etc.
2. Power supply source should be isolated.
3. One should not look at electric arc with naked eye
4. Don't leave electrode holder on the table or in contact with metallic surface.

[redacted]

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# EXPERIMENT - 1
## BUTT JOINT

OBJECT : To make a butt joint using the given two mild steel pieces by arc welding.

MATERIAL REQUIRED : Mild steel plate
(Raw material for job.)

TOOLS REQUIRED :

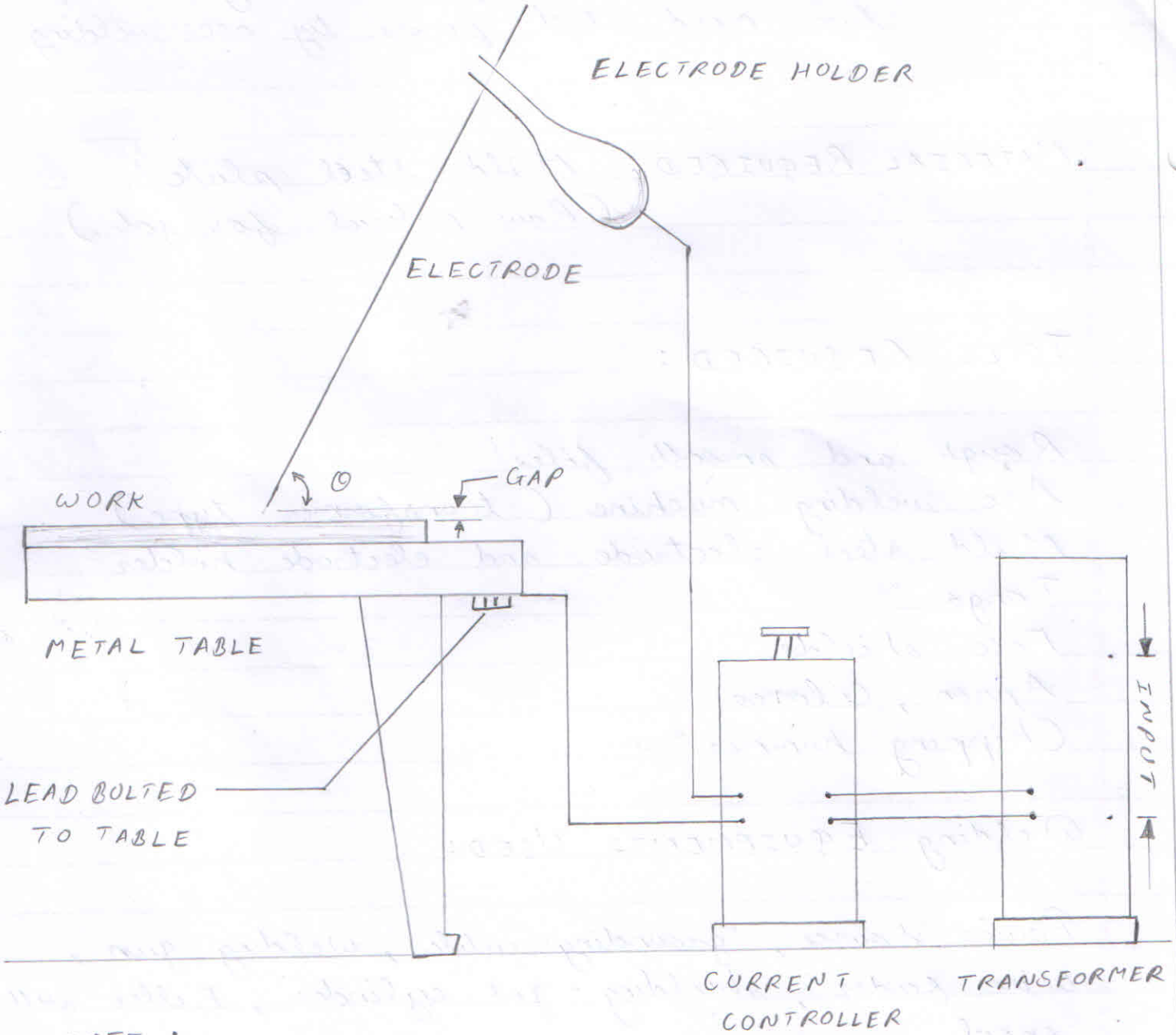
Rough and smooth files
Arc welding machine ( transformer type)
Mild steel electrode and electrode holder
Tongs
Face shields
Apron, Gloves
Chipping hammer

Welding EQUIPMENTS USED :

Power source, grounding cable, welding gun, wire feeder, shielding - gas cylinder, Filler wi spool.

# BLOCK DIAGRAM OF ELECTRIC ARC

## WELDING SET - UP




NOTE :

- $45^\circ \leq \theta \leq 60^\circ$
- GAP $< 3$ mm

PRINCIPLE:

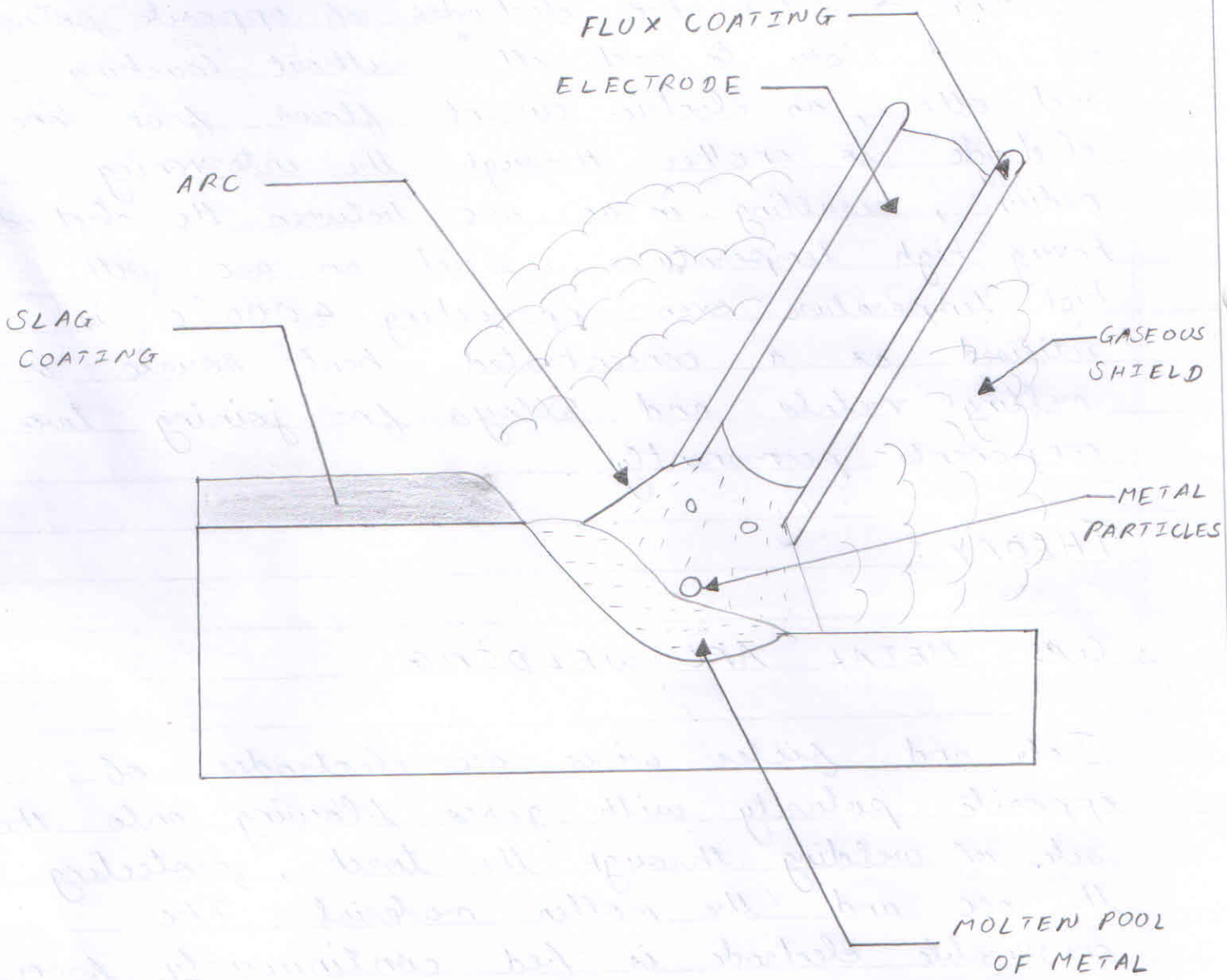
Welding → when two electrodes of opposite polarity are held close to each other without touching each other, an electric current flows from one electrode to another through the intervening medium, resulting in an arc between the electrodes having high temperatures. Such an arc with high temperature even approaching 4000°C is utilised as a concentrated heat source in melting metals and alloys for joining two components permanently.

THEORY:

GAS METAL ARC WELDING

Job and filler wires are electrodes of opposite polarity with gases blowing onto the site of welding through the torch, protecting the arc and the molten material. The consumable electrode is fed continuously from a spool of metal wire at a required speed. The process parameters such as feed rate, current, voltage are electronically controlled, enabling efficient control over metal transfer mechanism.

# ELECTRIC ARC WELDING IN PROCESS



Process variables are - type of current, current magnitude, electrode diameter, electrode composition, electrode extension beyond the gun, welding speed, welding voltage, arc length, shielding gas.

Its advantages over the shielded metal arc welding which is more widely used due to its versatility and low cost are :

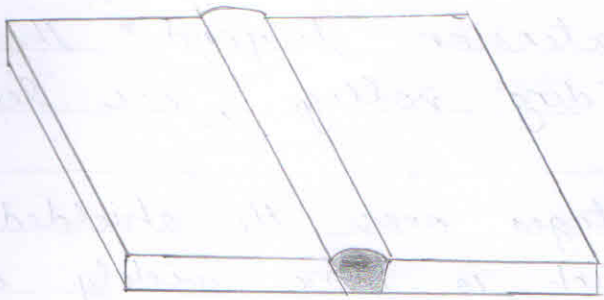
1. No frequent change of electrodes due to continuous feed mechanism.
2. No flux is required as shielding is provided by blown gas.
3. No slag is formed over the weld as flux is not used.
4. Readily automable, compact, light weight welding unit.

PROCEDURE:

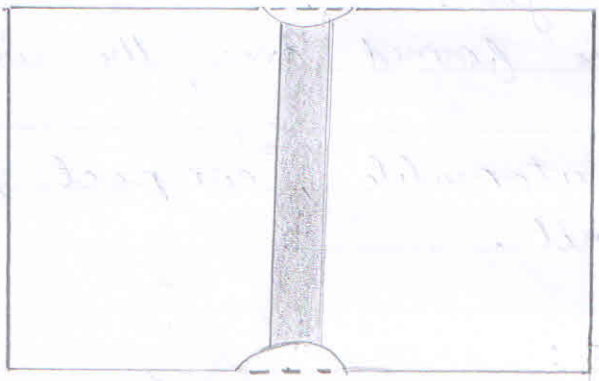
Operations involved : (i) Filing (ii) Welding

i) Filing - Filing is done on the metal steel plate to bring it to the required dimensions. Finally, fill the surfaces of the metal plates to remove oxide coating and rust, for better welding.

## BUTT JOINT



## LONGITUDINAL SHRINKING



ii Welding

1. Switch on the Power Source
2. Place the two metal plates at required orientation with a little gap.
3. Make weld spots
4. Fix the work piece and perform the welding from one end to another, maintaining an angle between 45° and 60° and a gap less than 3 mm.
5. Allow the welded joint to solidify and cool.
6. Remove the extra material and brush the metal surface.

OBSERVATION:
Subtle longitudinal shrinkage

INFERENCE:
Uneven expansion of base metal occurs while heating due to constraints given by colder outer metal. But while cooling, contraction of the base metal occurs evenly resulting in longitudinal shrinkage as shown and observed.

RESULT: Job was performed as per guidance.

PRECAUTIONS:
1. Frame of welding machine should be efficiently earthed
2. Face shield is must. Eyes should not be exposed to UV radiations. A.Cv 18.01