21/12/2022

WMP - Lec - 5

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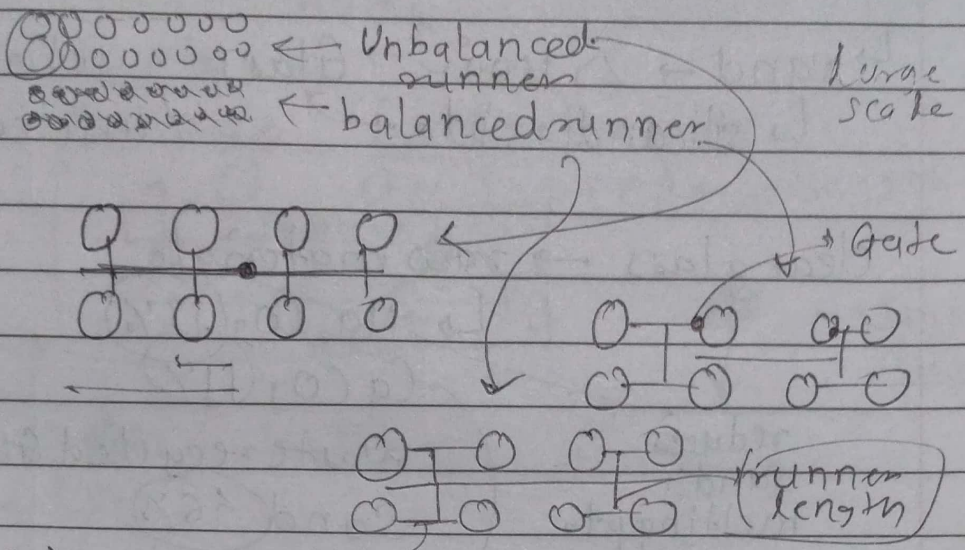
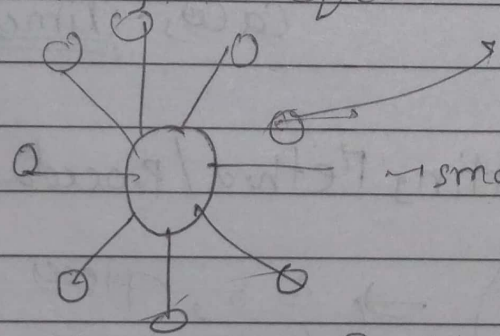
Date

* Runner balancing



→ passage for molten plastic material from nosel to mold.
→ to fill this cavity uniformly in less time
→ runner length → equal → balanced runner



→ Draw a diagram of 6/8 cavities

→ portion where molten material enters cavity → gate

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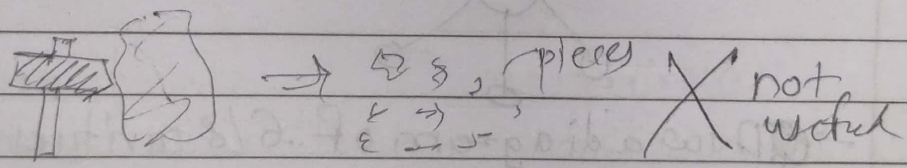
* Glass Manufacturing

↳ sand → △ 1500°C → Glass → yellow / unclear glass
↳ silicandioxide →

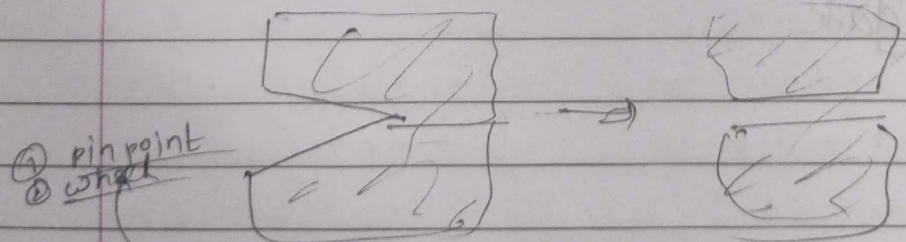
clear glass → raw materials
↳ Na_2CO_3 (13%)
$CaCO_3$ (11%)
Waste recycled Glass (6%)
Sand (46%)

reduces sand's melting pt.
↓
drawback: → water soluble.
↓ to avoid
$CaCO_3$ → Limestone

* Glass Cutting Method / Procedure



→ scratcher → cut



Tools:
pistol grip → more force can be applied
pencil grip → for detailing / designing
custom grip → for intricate cutting

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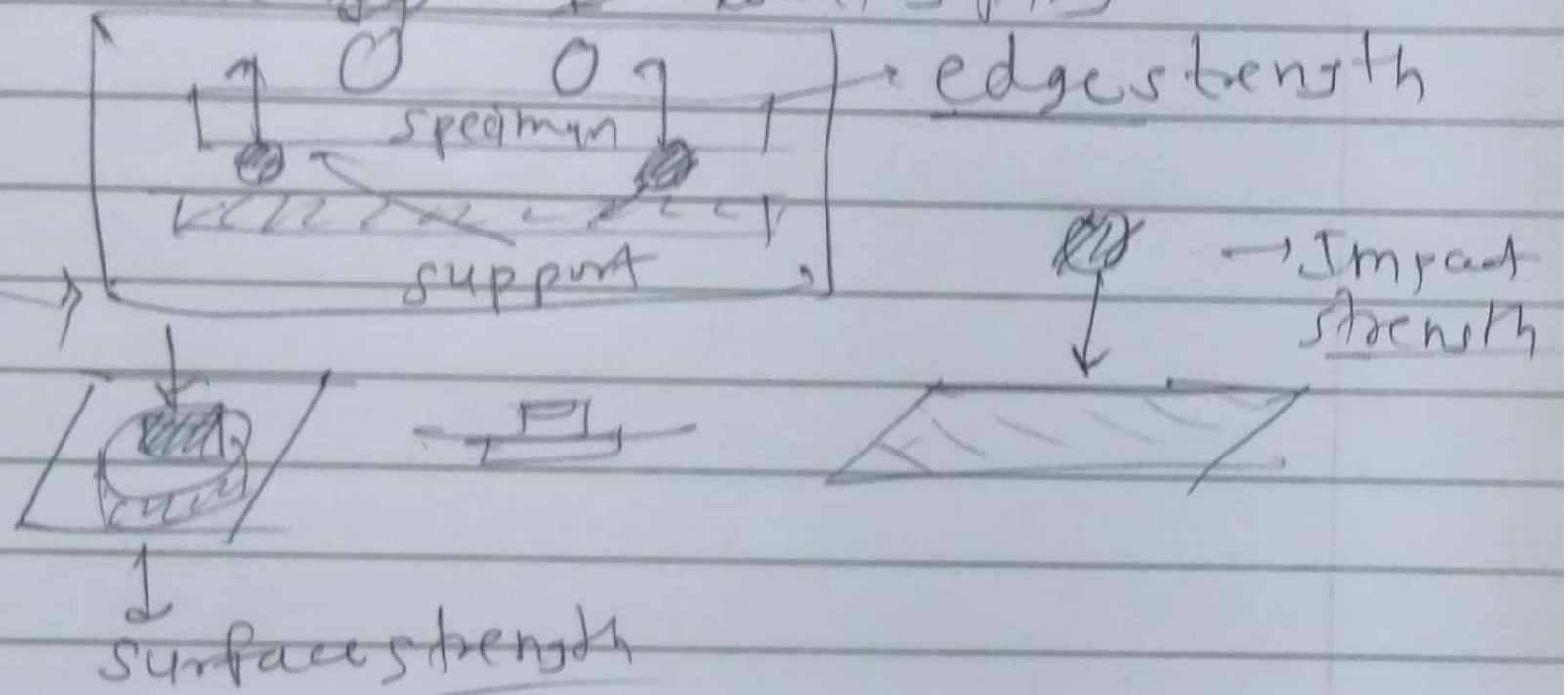
* Test of Measuring Glass Strength.
→ 4 point Bending
→ Ring to Ring
→ Ball drop



Module 4 : CNC & Additive Manufacturing

DATE

→ CNC

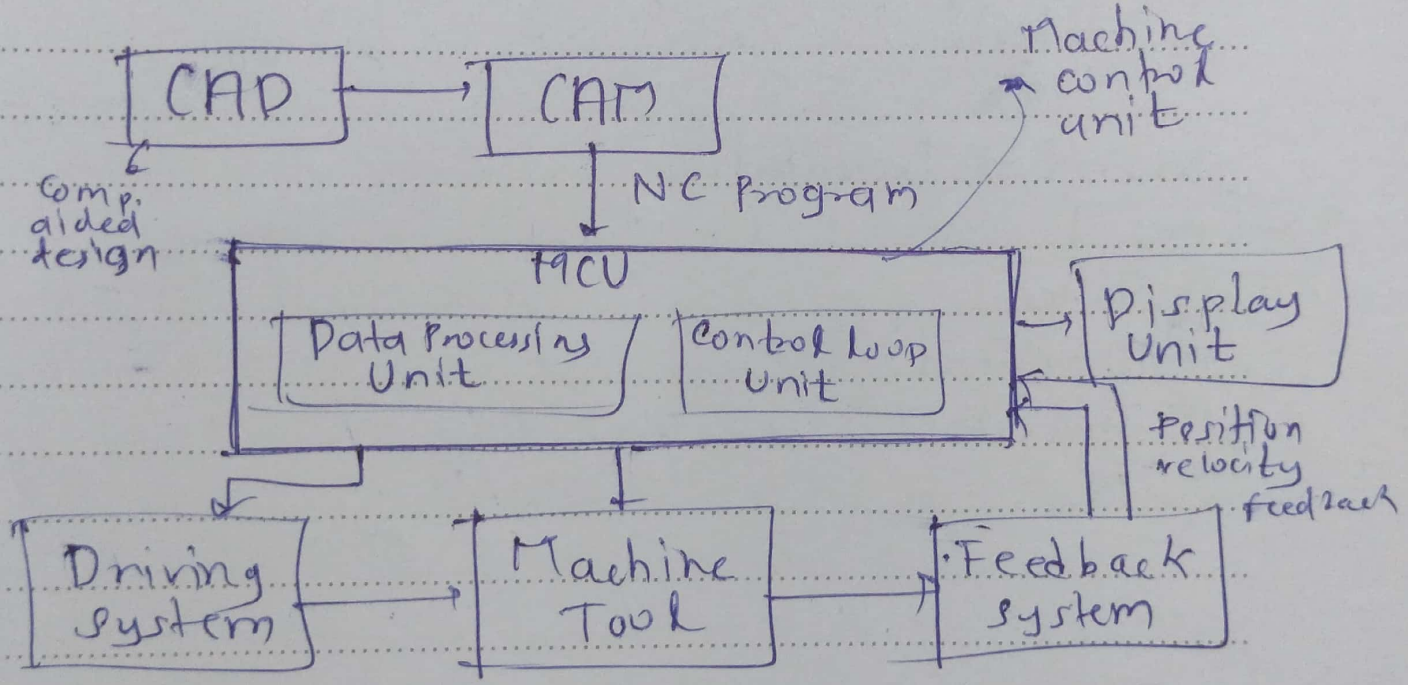
Computer Numeric Control

↳ computerized manufacturing

↳ CNC codes

↳ instructions → Computer Aided Manufacturing [CAM]

↳ Automatic



- Data processing unit → driving tool
- control loop → miscellaneous
- Driving system → actual implementation
  motor will activate cutting tool

- Feedback system → observation of process
  → if any error, instructions to MCU

G00 → Travelling of Drill
G01 → Cutting

DATE

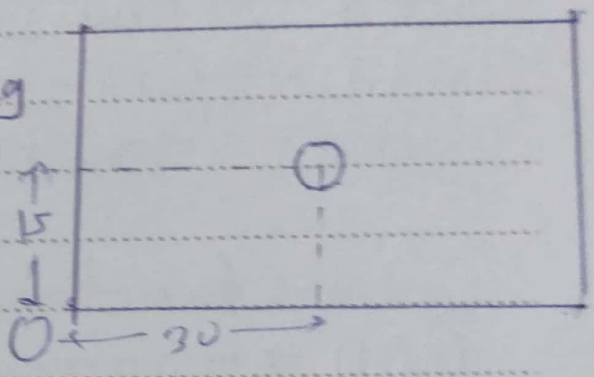
- Two types of Codes:
  → G code
  → M code

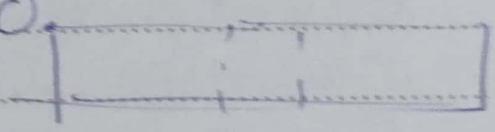
Q Drill hole in center of metal plate

(1) Block 1: G90 → Absolute positioning (0 for point input)

G21 → inputs in mm

G94, feed in ~~mm~~ velocity mm/min





M03 – Spindle start
S1100 – rpm speed of spindle
M08 – coolant on

G00 – Rapid travel in Z direction by 5 mm
Z5

G01 – Z5 F90
↳ drill will cut hold by moving 10 mm down with 90 mm/min feed rate

Radiant

DATE

CNC Program
Absolute Positioning

Block 1 - G90 G21 G94
Block 2 - M03 S1100 M08
Block 3 - G00 Z5
Block 4 - G00 X30 Y15
Block 5 - G01 Z-5 F90
Block 6 - G00 Z5
Block 7 - G28
Block 8 - M05 M09 M30

Codes & functions
G00 → movement of drill
G01 → cutting / drilling
G90 → Absolute positioning G91 - Incremental Positioning
G21 → inputs in mm
G94 → feed in mm/min
G28 → Rapid return to origin

M03 → spindle start • S1100 - spindle speed
M05 → spindle stop
M08 → Coolant on
M09 → coolant off
M30 → Program end

X 30 → travelling in X
Y 15 → travelling in Y
Z 5 → travelling in Z

DATE

* Benifits & Limitation of CNC

→ Benifits

- Highly accurate parts with tight tolerances
- Excellent material properties
- Quick turnaround times
- One-off custom parts & prototypes
- small-to-medium production

→ Limitation

- Relatively high start up costs
- Geometric complexity has a high cost
- Tool access & work holding restrictions

* Additive Manufacturing → 3D Printing

{ adding material on workpiece
opposite of machining → reverse engineering

→ RAPID Prototyping → used in both 3P & machining

Radiant

DATE

definition

- Additive Manufacturing
  - 3D Printing
  - Rapid Prototyping
- Substractive Manufacturing
  - Reverse Engineering

* Stereolithography:

→ liquid ultrariolet curable photopolymer "resin" & ultrariolet laser
↓
employment to build party layer by layer

→ tracing cross-section of each layer by lazer

WMP (Liquid, Laser)

→ Exposure to UV Laser Light cured & solidifies the pattern traced on the resin and fuses it to the layer below.
→ Platform comes above

* Selective Laser Sintering (SLS) (Powder Laser)
→ material: powder form
↳ Nylon / Plastic type

→ Laser will melt powder → solidified Layer
→ Layer will move down → next layer
↳ powder spread

* Direct Metal Laser Sintering (DMLS)
→ Material - metal powder
Al, Brass, Cobalt etc
→ process same as SLS → 3D model of Metal

* Fused Deposition Modeling. (FDM)

→ extruding small strings of melted material → harden immediately.
→ Plastic Filament - metal wire.
to pass material
→ nozzle is heated → can move ↑ ↓ → ←
→ Better for customized prod. Not good for large scale

* Polyjet
→ spray photopolymer materials onto tray
→ very thin → UV light → Layer by Layer

* Binder Jetting.
→ No heat
→ platform will get lower by layer
→ Material is deposited by Jet.
→

Additive Manufacturing

**

Thermoplastic ABS PLA PC PVA

Metal ex

Ceramics

Biochemicals

* Benifits of AM
→ cost of entry is affordable
→ easy to change or revisions of a product

→ reduces waste production
→ saves on energy costs

* Application
1] Space Application.
2] Automotive
3] Healthcare
4] Product Development

Q. Explain ATM & explain 1 type with diag.
& diff. between ___ & ___.

Module 4... over

Module 5.

Welding & Brazing

1] welding
2] Filler Material
3] Heterogeneous Welding
4] Fillet weld
5] Heat Affected Zone

Advantages

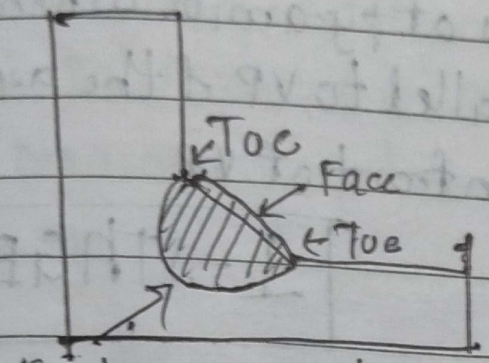
Disadvantages

- Innovative exam:
→ EGD: Report → first
↳ copy main part & insert
Conclusion: ~~Adv~~ Advantages
→ Disadvantages
→ S-G slides
→ .
objective ✓
design ✓
problem ✓ if (any)
benifits ✓ specifications → adv & dis. Future scope

→ Intro ✓
→ Theory Back ✓
→ Lit survey
↳ Research on product ✓
Conclusion

* Terminologies

→ Fillet Weld:



☆☆☆☆☆

(1) Face: exposed surface of the weld.
(2) Toe: junction between the weld face & joint.

MMP -

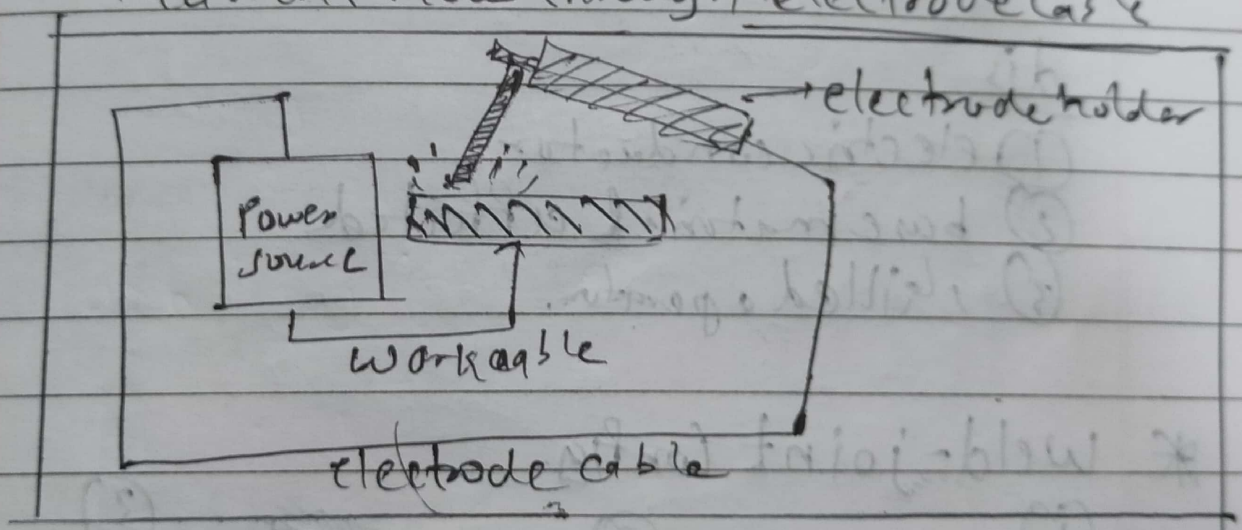
* Module 5

→ Arc Welding
→ Gas Welding

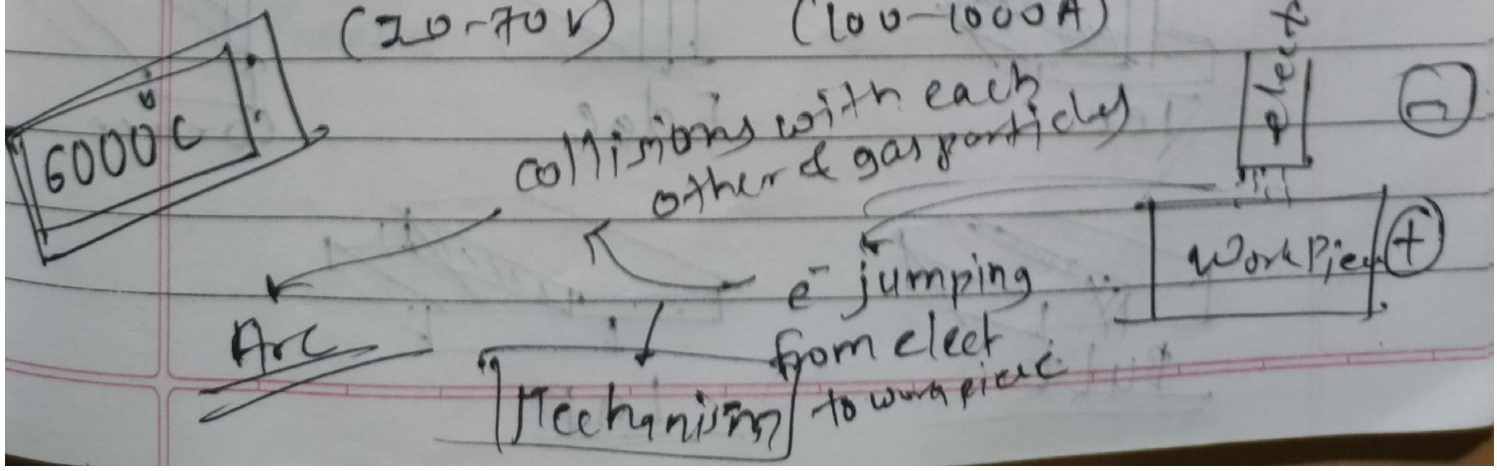
Module 5 continues.

* Arc Welding Setup

(1) Welding Transformer / Welding Powersource
→ To get current
→ current flows through electrode cable



(2) Low Voltage & High Current
(20-70 V) (100-1000 A)

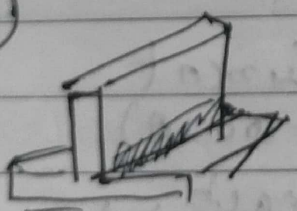


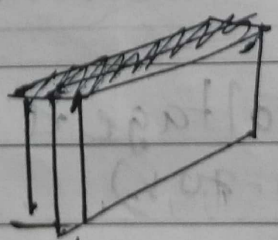
* Types of Arc Welding
(1) Shielded Metal Arc Welding (SMAW)
(2) Submerged Arc Welding (SAW)
(3) Metal Inert Welding (MIG)
(4) Electroslag Welding (ESW)
(5) Tungsten Inert Gas welding (TIG)
(6) Plasma Arc Welding (PAW)

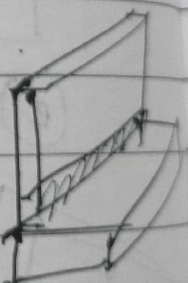
.Adv
(1) Different materials ✓
(2) can be done Anywhere
(3) Very strong joint

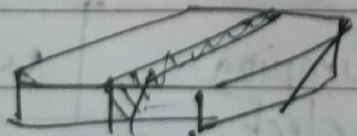
.dis
(1) electric conductor
(2) base material affected
(3) skilled operator

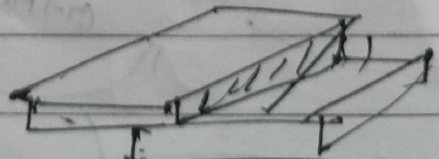
* Weld-joint Config.

(1)

Tee

(2)

Edge

(3)

Corner


Butt


Lap

PAGE No.
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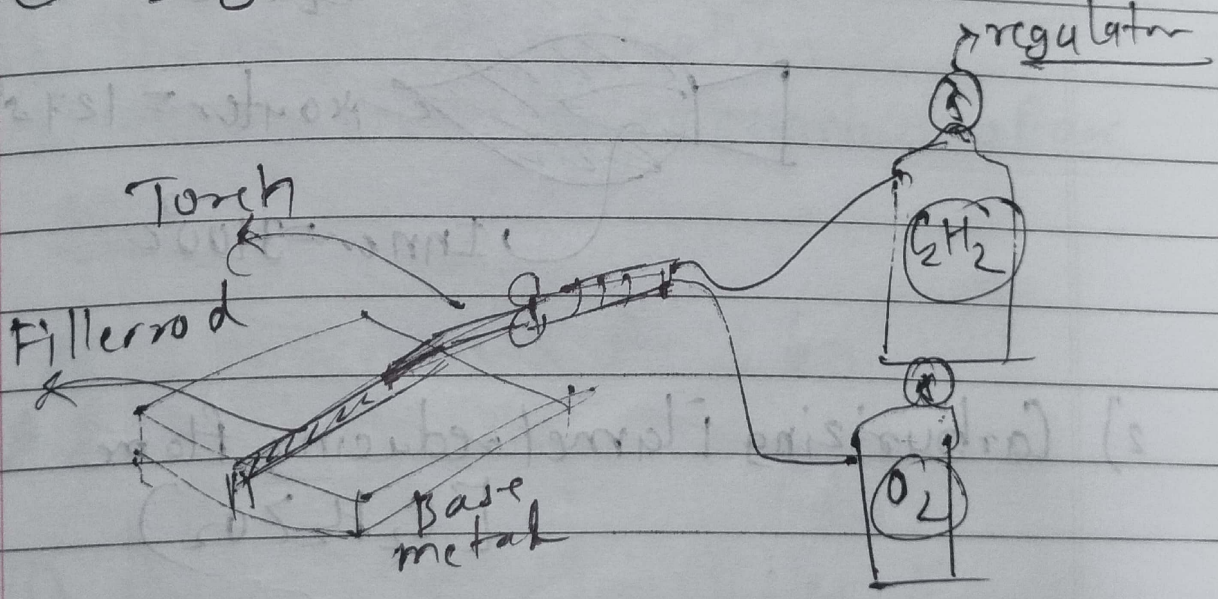
* Fillet Weld

done before

* Gas Welding

- $C_2H_2 + O_2 \longrightarrow 2CO + H_2 + Heat$
  Acetylene
- Setup

(1) O_2 cylinder = 135 bar



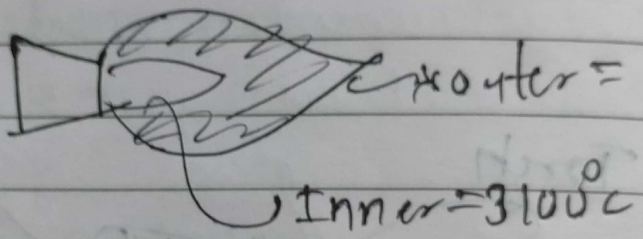
(2) Acety Lene Gas Cylinder = 15 bar
(3) Welding torch
(4) Pressure regulator

* Types of Gas Welding.

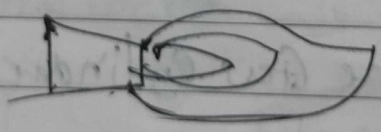
(i) Oxy Acetylene
(ii) Oxy Propane/Butane
(iii) Oxy Gasolene
(iv) Oxy Hydrogen

* Types of flames

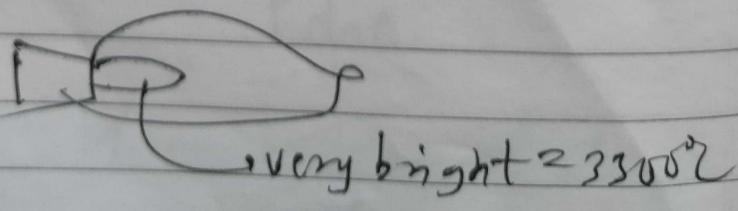
1] Neutral flame : [$C_2H_2 = O_2$] amt equal



2] Carburizing Flame/reducing flame [$C_2H_2 > O_2$]



3] Oxidising Flame [$C_2H_2 < O_2$]



Adv

1. Non-conductive metals ✓
2. No requirment of electricity ✓
3. Specialized Labor not required ✓
4. Portable equipment ✓

disAdv

1. Not suitable for thick sections
2. cannot be used for High Strength steel
3. The slow rate of heating
4. Cannot reach the tempretures of arc welding

★ Diff between ★ Arc & Gas ★★★

Arc	Gas
1. electricity ✓	1. elec. X
2. Temp 6000°.	2. Temp 3300°C
3. stronger bond	3. weaker bond
4. Speed ↑	4. speed Less
5. Only for conductive	5. for both cond & non-co
6. High initial cost	6. Low initial cost

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* Soldering & Brazing

↳ Same as studied before

↳ Difference.

DATE / /

* Soldering & Brazing

↳ Same as studied before

↳ Difference.