

CSSC FORM TWO AMALI WELDING AND METAL FABRICATION MARKS DISTRIBUTION LIST.

SECTION A (15 MARKS)

- 1(a) (I) $\frac{1}{2}$ mark.
 (II) $\frac{1}{2}$ mark.
- (b) (I) $\frac{1}{2}$ mark.
 (II) $\frac{1}{2}$ mark.
 (III) $\frac{1}{2}$ mark.
 (IV) $\frac{1}{2}$ mark.
- 2(a) (I) $\frac{1}{2}$ mark.
 (II) $\frac{1}{2}$ mark.
 (III) 1 mark.
- (b) (I) 1 mark.
 (II) 1 mark.
- (c) (I) 2 marks.
 (II) 3 marks.
 (III) 3 marks.

SECTION B (70 MARKS)

- 3(a) (I) 3 marks.
 (II) 4 marks.
 (III) 3 marks.
 (IV) 3 marks.
 (V) 2 marks.
 (VI) 3 marks.
- 4(a) 2 marks.
 (b) 4 marks.
- (c) 4 marks.
- 5(a) 3 marks.
 (b) 3 marks.
 (c) (I) 2 marks.
 (II) 2 marks.
 (III) 2 marks.
 (IV) 2 marks.
 (V) 2 marks.
- 6(a) (I) 1 mark.
 (II) 1 mark.
 (III) 1 mark.
 (IV) 1 mark.
 (V) 1 mark.
- (b) 5 marks.
 (c) 2 marks.

7 (a)

- (I) 2 marks.
 (II) 2 marks.
 (III) 2 marks.
 (IV) 2 marks.
- (b) (I) 2 marks.
 (II) 2 marks.
 (III) 2 marks.

SECTION C (15 MARKS)

- 8(a) 8 marks.
 (b) 7 marks.

SECTION A (15 MARKS)

b)

a)

(I)	B
(II)	D

(b) Head protection - is important because it provides protection against falling objects while carrying out welding activities at heights.

(I) Goggles - Provide protection against the harmful Ultra-Violet (U.V.) radiations which are emitted during welding activities. U.V. rays are harmful to the eyes.

(II) Hand protection - Provide protection from harmful burns by hot metal workpieces. Example: leather gloves.

2(a)

(I) The use of faulty machinery, tools or materials can contribute to accidents. Regular maintenance and checks are essential for preventing malfunction.

(II) Task: Lack of proper training can lead to errors, equipment mishandling and an increased risk of accidents.

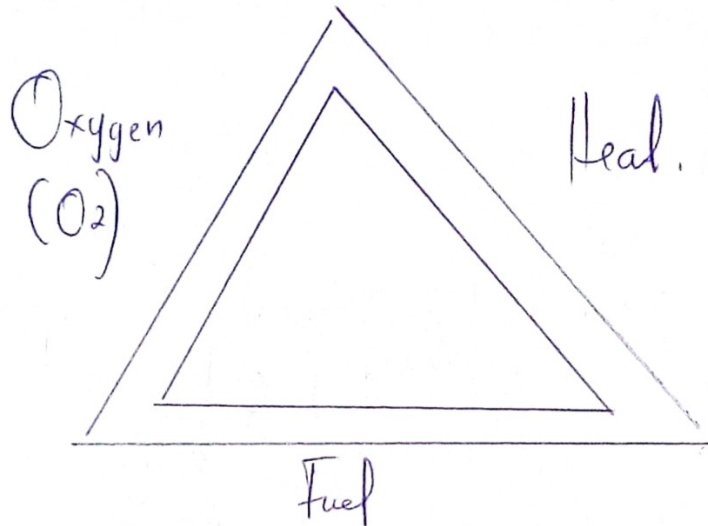
(III) Individual: An individual may contribute to accidents through negligence, lack of awareness or complacency.

(b) (I) Grinding machine: Grinding machines pose inherent mechanical hazards due to their abrasive nature and their high-speed rotation of grinding wheels.

(II) Drilling machine: Drilling machines contribute to mechanical hazards through the rapid rotation of the drill bits. The risks involve contact with moving parts, entanglement, or the projection of materials during drilling operations.

2(c) (I) Fire is the rapid oxidation of fuel in the exothermic chemical process of combustion, releasing heat, light and various reaction products.

(II)



(III)

List A	(I)	(II)	(III)	(IV)	(V)
List B	C	E.	D	A	F

- 2(d)
- To reduce injuries
 - To save life.
 - To promote recovery.
 - To prevent the victim's condition from getting worse.

3a

(I)

Ruler - Sometimes known as a rule, it is a device used in geometry and technical drawing, used to measure distances or draw straight lines.

Tape measure - Is a flexible ruler used to measure length or distance.

Thermometer - Is used to determine temperature.

Pressure gauge - Is used to determine pressure in gases or liquids.

Multimeter - Used to measure electrical properties like current, voltage and resistance.

3.

(II)

① Direct measurement method is the type of measurement method which involves measuring instruments such as Vernier calipers, micrometers and coordinate measuring machines. They are used to measure the dimensions of the target directly. These measurements are also known as absolute measurements.

② Optical measurement method: This is a measurement technique that uses light to gather data about the physical properties of objects.

(III)

- Cool down heated tools. Overworking a tool puts a lot of stress on its motor and can cause it to overheat.
- After using a tool, clean it thoroughly with a damp cloth.
- For a tape measure, wipe down the tape after each use with a clean, lint-free cloth.
- When not in use, the T-square is preferably hung by inserting the hole to a nail.

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(D) Bevel protractors.

Clinometers.

Protractors.

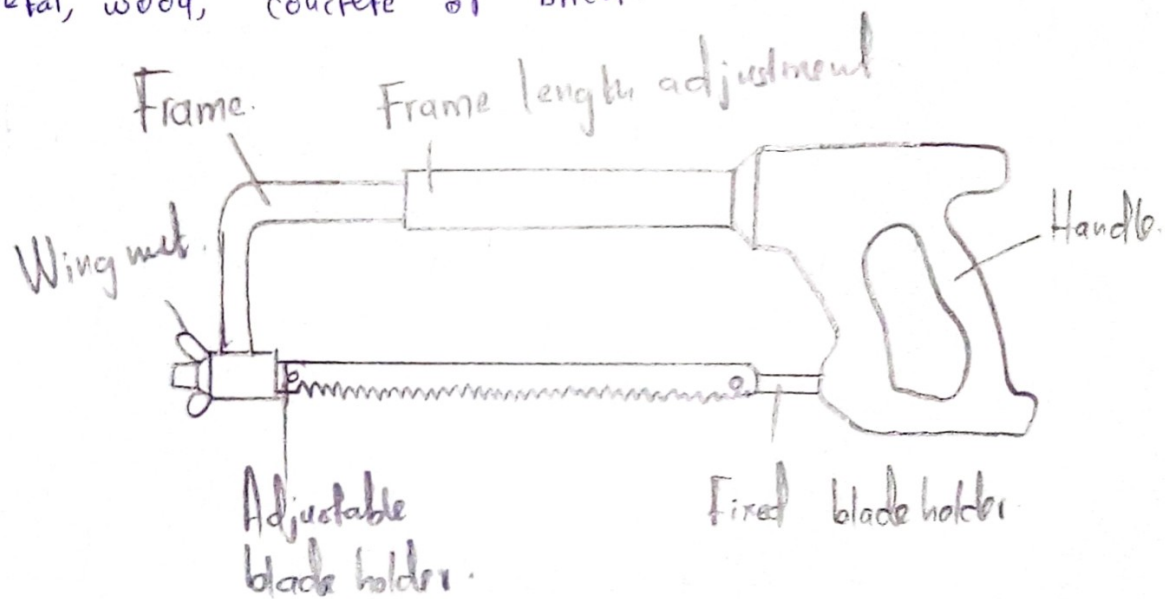
Sine bar.

3a

(F)

Hand sawing is a specialized cutting technique used in construction and engineering projects. This technique involves using a handheld saw with a diamond-tipped blade to cut through hard materials or soft ones such as metal, wood, concrete or bricks.

(H)



4(a) Welding is a fabrication process by which two or more parts are fused together by means of heat, pressure or both, forming a joint as the parts cool.

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4(b) Fusion welding: Sometimes referred to as non-pressure welding, it is the type of welding where the materials at the joint are heated to a molten state, fused together and allowed to solidify. Examples of fusion welding include gas welding and arc welding.

Non-fusion welding: Sometimes referred to as pressure welding, it is a type of welding in which the pieces of metal to be joined are heated to a plastic state and forced together by external pressure. Examples of non-fusion welding are resistance and forge welding.

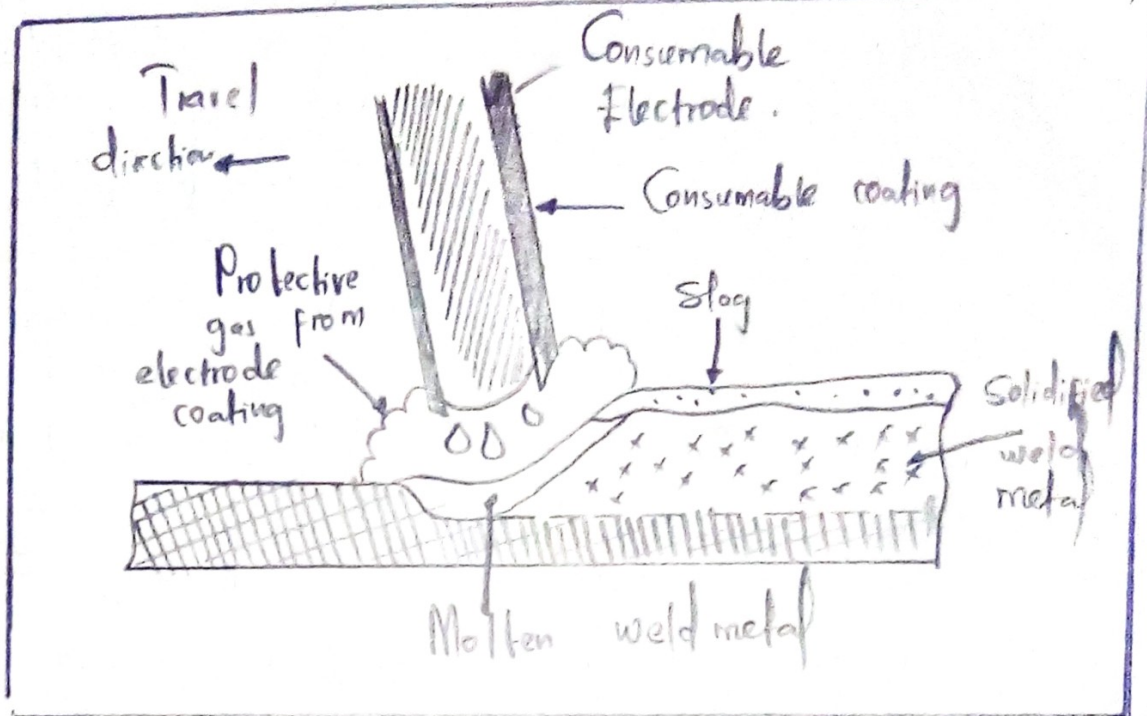
(c) Shielded Metal Arc Welding (S.M.A.W.) - This process uses an electric arc to coalesce materials. Shielding is obtained from the decomposition of the electrode coating which melts and produces gases that protect the molten metal from atmospheric gases such as oxygen and nitrogen.

Gas Metal Arc Welding (G.M.A.W.) - This process forms a direct current (DC) electric arc between a consumable wire electrode and work-piece materials, which melts them together and causes them to fuse. MIG welding refers to using metal inert gas as a shielding gas, whereas the MAG welding technique uses metal active gas.

Flux-Cored arc Welding (F.C.A.W.) - Is a similar process to MIG, but instead of a shielding gas, it uses a flux-filled hollow electrode wire.

Gas Tungsten Arc Welding (G.T.A.W.) - This method uses a non-consumable tungsten electrode and constant current ~~wire~~ power source to create a plasma arc between metals and can be conducted with or without a filler material.

S. M. A. W. PROCESS



- (b) - It is the most efficient and cost-effective method for joining metals.
- It is the lowest-cost joining technique, providing significant savings in materials and labour.
 - It allows for lighter-weight structures by better utilization of materials.
 - The process is versatile and capable of joining all commercial metals.
 - It offers a great design flexibility.

(c) (I) Electrode holder - Is a device used to mechanically hold the electrode and conduct current through it.

(II) Earth clamps - Are essential welding tools that, via the earth cable, ensure that the electrical welding circuit is closed between the welding power source and the metal to be welded.

(III) Chipping hammer - Is a chisel-shaped tool with a pointed end, used to remove slag from the weld bead.

5(c) (IV) Wire brush - Is a tool used to remove small particles of slag from the weld bead.

(V) Fire tongs - Are used to grip and lift objects instead of holding them directly with hands.

6 (a) (I) Butt joint.

(II) Tee joint

(III) Lap joint.

(IV) Corner joint.

(V) Edge joint.

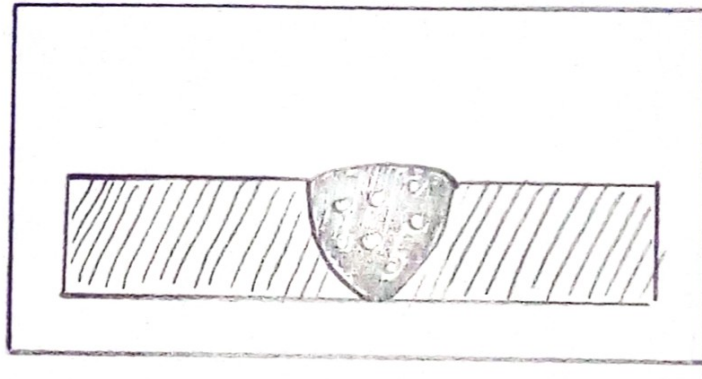
- (b)
- ① Move a fume extractor over the welding area.
 - ② Attach the ground clamp to the workpiece.
 - ③ Determine the welding settings such as adjusting the voltage and current.
 - ④ Attach the electrode to the electrode holder.
 - ⑤ Strike an arc.
 - ⑥ Weld the components together.

(c) Consumable electrodes are the ones that would have significant changes in their structure when they are used.

Non-consumable electrodes are the ones that are not consumed during the welding process.

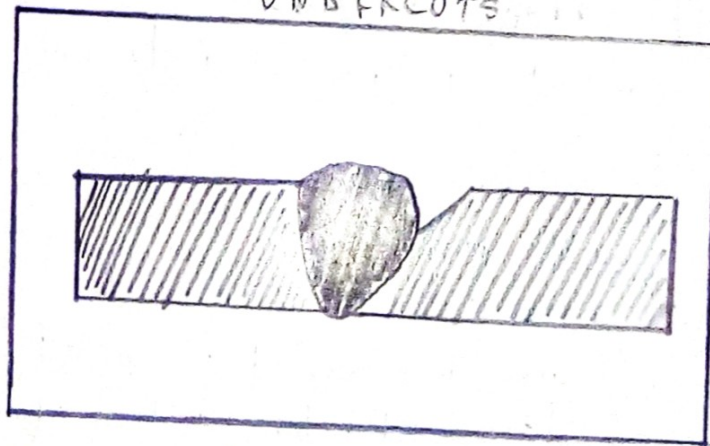
- 7(a) (I) Porosity refers to cavity formation in welds, which can vary in shape and size. Poor joint preparation, improper shielding gas usage and excessive welding speed are some of the causes of porosity in welding.

POROSITY



- (II) Undercuts - Are a type of a welding defect that are caused when an unwanted groove is formed along the weld bead. It reduces the thickness and strength of the weld, usually because the base metal and weld metal didn't properly fuse.

UNDERCUTS

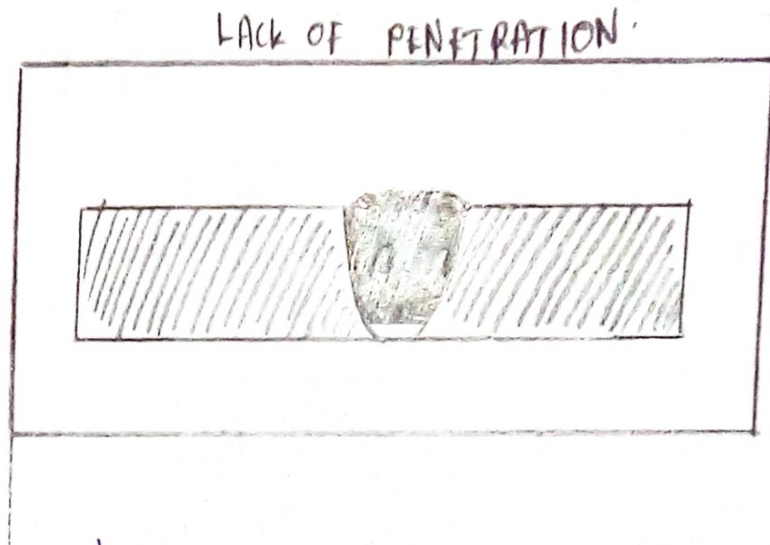


- (III) Cracks - Are a local discontinuity produced by a fracture which can ~~cause~~ arise from the stresses generated on cooling or acting on the structure.

CRACKS



7(a) (i) Lack of penetration — Is the type of a welding defect that happens when both sides of the root fail to fuse to the weld.



7b 1 G welding position, also known as the flat position, is a welding position in which the workpiece is placed horizontally, and the welder performs the weld from above.

(ii) The 1 G welding position is important in metal fabrication because it is suitable for creating fillet welds in a flat orientation.

(iii) Proper surface preparation is important because it ensures optimal weld quality and prevents the formation of defects like porosity or lack of fusion.

SECTION C : (15 MARKS)

8. (a) (1) Surface preparation by cleaning the edges of both plates. Remove rust, oil, paint and scale by means of a wire brush.
- (2) Align the plates edge-to-edge on a flat surface.
- (3) Select the correct electrode for the welding process to be performed. (e.g. S.M.A.W., G.M.A.W., T.I.G.).
- (4) Perform tack welds at intervals along the joint in order to prevent movements during welding.
- (5) Begin welding from one end. Use proper travel speed and electrode angle to ensure penetration.
- (6) Continue with fill passes to build up the weld, followed by the cap pass to complete the weld profile.
- (7) Inspect and clean the weld.

- (b) Electrode holder.
Tie tongs.
Wire brush.
Chipping hammer
Angle grinder.