



Province of the
EASTERN CAPE
EDUCATION

DIRECTORATE SENIOR CURRICULUM MANAGEMENT (SEN-FET)

HOME SCHOOLING SELF-STUDY WORKSHEET ANSWER SHEET

SUBJECT	WELDING & METALWORK	GRADE	12	DATE	JULY 2020
TOPIC	Exam – related material	TERM 1 REVISION	(Please tick)	TERM 2 CONTENT	()

QUESTION 1: MULTIPLE-CHOICE QUESTIONS (GENERIC)

1.1 C

1.2 B

1.3 D

1.4 C

1.5 A

1.6 B

1.7 C

1.8 A

1.9 C

1.10 B

1.11 B

1.12 D

1.13 A

1.14 A

1.15 A

1.16 B

1.17 D

1.18 C

1.19 B

1.20 B

QUESTION 2: SAFETY (GENERIC)

2.1 Gas welding (PPE)

- Eye protection
- Overall / leather apron
- Safety boots
- Gloves

2.2 Hydraulic Press

- The predetermined pressure must not be exceeded.
- Pressure gauges must be tested regularly.
- The platform on which the work piece rests must be rigid and square.

- The platform must rest on the supporting pins.
- Place objects to be pressed in or out of the suitable jigs.
- Special tools and holding devices must be used to prevent damage to soft Material.
- Ensure that the direction of pressure is always 90° to the platform.
- Relieve pressure after use by opening the return valve. (Any 3)

2.3 Surface Grinder

- Do not force the work piece into the wheel.
- Do not clean or adjust the machine while it is in motion.
- Avoid large cuts.
- Use coolant.
- Know how to use the emergency stop.
- Keep an eye on the position of the work piece.
- Keep all tools clear of the work table.
- Do not leave the machine while it is in operation.
- Do not lean on the machine.

2.4 Switch off the machine.

2.5 Bench Grinder

- Make sure that there are no cracks or chips on the disc.
- Make sure that the emery disc that is fitted is rated above the revolutions at which it is turned by the motor.
- Make sure that the space between the tool rest and the emery disc does not exceed 3 mm.
- Ensure that guards are in place.
- When switching on the machine, do not stand in front of it until it reaches its full speed.
- Do not force or bump the work piece against the emery disc.

- Grind only on the front surface of the wheel not the sides.
- All grinding machines must have a sign indicating the revolutions which the spindle rotates.

2.6 To protect your eyes from flying sparks.

2.7 Safety: Hand drill:

- Use a sharp drill of the right size for the type of material to be drilled.
- Remove the key from the chuck.
- Never leave the machine running unattended.
- Clamp the work piece securely on the vice or table.
- Never attempt to stop the machine with your hands if it slips.
- Do not force the drill on the work piece.
- Use a brush to remove chips from the drill.

2.8 Handling of gas bottles/cylinders

- Ensure the cylinders are stored in an upright position.
- The cylinders should be colour-coded.
- Full cylinders should be separated from empty ones.
- Keep away from direct sunlight.
- Keep protector cap on for protection

2.9 Band saw:

- Ensure there is no oil or grease around the machine
- Ensure that all guides are in place before work commences
- Ensure that the entire blade is guarded except at the point to cut
- Ensure that the machine is switched off when changing blades or guides
- Wear eye protection
- Ensure that the blade is fitted in the correct cutting direction

- Round material must be clamped in a vice or holding device
- Always use pusher against the work piece whenever possible.

(Any 3)

2.10 Clamp the work piece in the vice or holding device.

QUESTION 3: TOOLS AND EQUIPMENT (GENERIC)

3.1 Function of tap and die set:

Tap is used to cut internal threads and die cuts external threads

3.2 Purpose of extension bar of guillotine.

Lengthens the work surface and supports longer material

3.3 A Pressure gauge.

B Handle

C Hydraulic press cylinder

D Supporting pin

E Adjustment holes

F Plunger

3.4 Functions of equipment

3.4.1 Angle grinder - is used for cutting, grinding and polishing

3.4.2 Rolling machine – used to roll sheet metal

3.4.3 Press machine – press fit or remove parts from each other

QUESTION 4: MAINTENANCE (GENERIC)

4.1 Maintenance of pedestal grinder

Guards- always check that they are clamped before operation and have adequate clearance from the rotating grinding wheel (6 mm)

4.2 Reducing friction when cutting holes

Apply cutting fluid

Apply oil to the tip of drill bit

4.3 Overloading is when the lubrication bearer of oil is squeezed out of the machine-bearing surfaces

4.4 Lack of lubrication in a gear system

- Without lubrication friction between teeth contact surfaces becomes too great, resulting in loss of efficiency
- Excessive noise
- Overheating
- Eventual mechanical failure

QUESTION 5: MATERIALS (GENERIC)

5.1 Raw materials in the production of iron:

- Iron ore
- Fuel (coke)
- Fluxing agent (lime stone)
- Air

5.2 Blast furnace product

Pig Iron

5.3 Electric-arc furnace.

It is useful in the production of stainless steel, other high-alloy steels, or special steels requiring very close metallurgical control of grain or other structural qualities.

5.4 Functions of furnaces

5.4.1 Blast Furnace: It is used to convert iron ore to pig iron

5.4.2 Bessemer converter furnace

It is used to convert molten pig iron to steel by the Bessemer process

5.4.3 Open hearth furnace

It is used to convert scrap metal and other alloying elements into different kinds of steel

5.5 5.5.1 Blast furnace

5.5.2

- A Small bell
- B Stack
- C Melting zone
- D Iron tap hole
- E Hot air supply hole from stove

- F Steel casing
- G Hopper / Load

5.6 Advantages of rotor plant

- The molten metal is protected by a layer of slag
- The oxidation of iron and other elements is minimised
- The melting loss is lower than that of the cupola furnace.

5.7 Properties of metals

5.7.1 Ductility is the ability of a metal to change shape by stretching it along its length without breaking or drawing it into wire form.

5.7.2 Brittleness is the ability of a metal to break easily and fracture with little or no deformation

5.7.3 Plasticity is the ability of a metal to change shape permanently. It is the reverse of elasticity.

5.7.4 Toughness is the ability of a metal to resist penetration, cracking, bending, breaking or stretching and remain intact after continual bending in opposite directions

QUESTION 6 Definition of terms:

6.1 Fusion zone is the portion of the weld where the parent metal has been fused.

6.2 Weld metal is part of the metal of a welded joint that has been melt during its formation

6.2 Supplementary symbols

6.2.1 M – Machine

6.2.2 G – Grind

6.3 Methods of reducing distortion

- Skip welding method
- Alternate welding method
- Back step welding

QUESTION 7: TOOLS AND EQUIPMENT (SPECIFIC)

7.1 Purpose of oxy-acetylene regulators

- To indicate the pressure inside the cylinders
- To reduce the cylinder pressure to working pressure

7.2 Rolling machine used for bending thick plate

- Vertical roll

7.3 Use of a guillotine

- To cut sheet metal
- To cut plate metal

7.4 Function of punching machine

- To cut steel profiles
- To punch holes into steel plates

7.5 Reasons why plasma cutter is preferred to oxy-acetylene

- High speed
- Precision cutting

- Low cost
- Cuts thin and thick materials
- Cuts smoothly

QUESTION 8: FORCES (SPECIFIC)

8.1

FORCES	8.1.1	8.1.2
	HORIZONTAL COMPONENTS	VERTICAL COMPONENTS
45 N	45 Cos 0 = 45N ✓	45 Sin 0 = 0
50 N	50Cos 90 = 0	50 Sin 90 = 50 N ✓
30 N	30Cos45 OR 30 Cos135 =	30 Sin 45 OR 30 Sin 135 =
TOTAL	-21,21N ✓ 23,79 N ✓	21,21N ✓ 71,21 N ✓

(6)

8.2 **Take moments about RR**

LR x 8 m = (20 x 6 m) + (30 x 4 m) ✓
 8LR = 120 + 120 ✓
 LR = 30 N ✓

Take moments about LR

RR x 8 m = (30 x 4 m) + (20 x 2 m) ✓
 8RR = 120 + 40 ✓
 RR = 20 N ✓

(6)

8.3

$$\text{Stress} = \frac{\text{Force}}{\text{Area}}$$

$$\text{Area} = \frac{\pi(D^2 - d^2)}{4} \checkmark$$

$$= \frac{\pi(0,025^2 - 0,021^2)}{4} \checkmark$$

$$= 1,445133 \times 10^{-4} \text{ m}^2 \checkmark$$

$$\text{Stress} = \frac{1,445133 \times 10^{-4}}{10 \times 10^3} \checkmark$$

$$= 69197801,34 \text{ Pa}$$

$$= 69,2 \text{ MPa} \checkmark$$

(5)

QUESTION 9: MAINTENANCE (SPECIFIC)

9.1 Effects of overloading rolling machine

Limits the life span of components (bearings, gearbox, motor)

9.2 Prevent excessive wear

The specified lubricant is to be applied to the relevant lubricating point in a specified quantity and at a specific time.

9.3 Lack of lubrication – Punch and shear machine

Components (moving parts) will cause excessive wear and result in the journals seizing in the bearings/bushes.

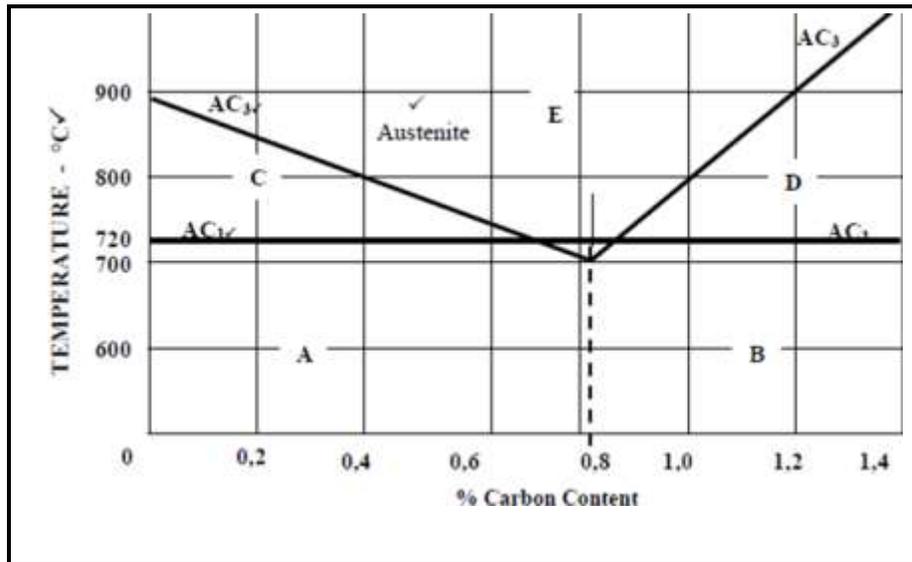
9.4 Friction not a relevant factor in machine

Guillotine

Punch

QUESTION 10: JOINING METHODS (SPECIFIC)

10.1



10.2 Purpose of normalising

To soften steel above its critical range and to cool it in still air.

10.3 MIGS – Metal inert gas shielded.

10.4 Undercutting – Causes

- Faulty electrode manipulation
- Current too high
- Arc length too long
- Speed of weld too fast

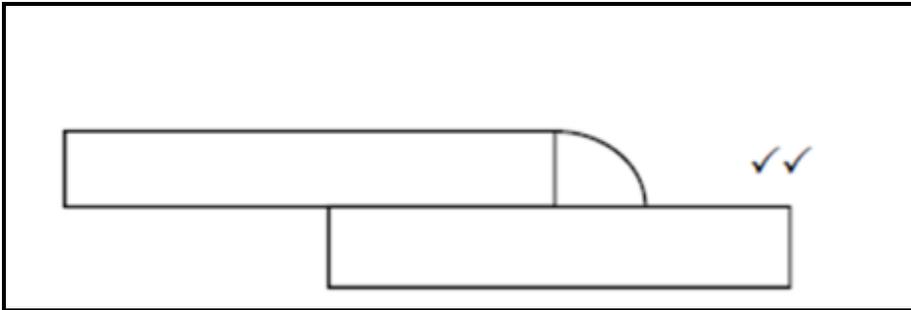
- Improper welding parameters

Remedies for Undercutting

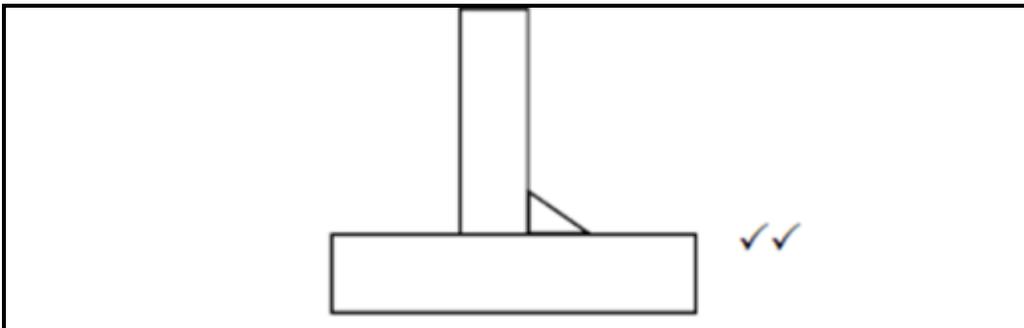
- Do not use too large electrodes.
- Use moderate current.
- Hold electrode at correct angle.

10.5 Welding joints

10.5.1



10.5.2

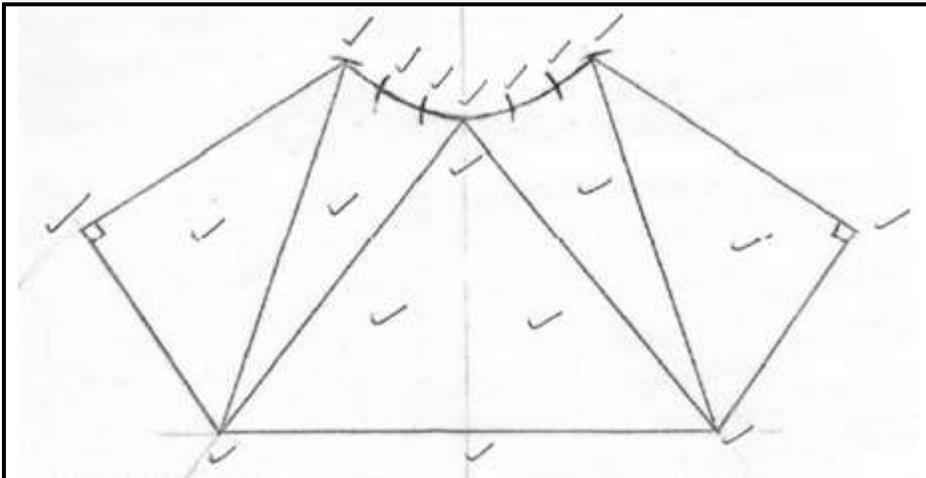


10.6 Inert gases for MIG/MAGS welding:

- CO₂
- Argon
- Helium
- Teral (Argon + CO₂)

QUESTION 11: SYSTEMS AND CONTROLS (SPECIFIC)

11.1 Develop the square to round transition piece shown in FIGURE 11.1.



QUESTION 12: TERMINOLOGY (STEEL SECTIONS) (SPECIFIC)

12.1 Steel bars

12.1.1



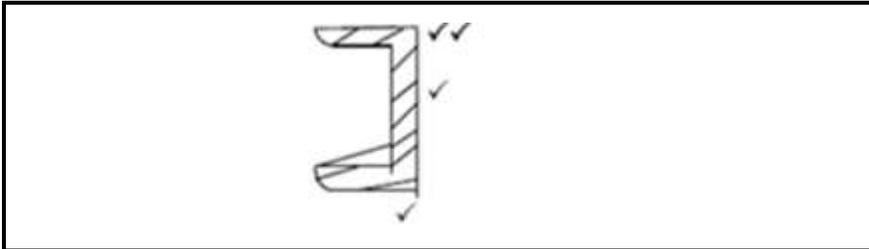
12.1.2



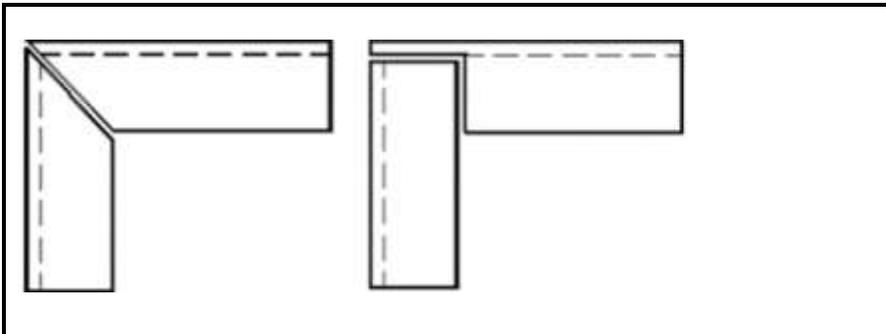
12.2 Purpose of an assembly jig.

- To hold parts in position so that a number of identical items can be tack welded and easily removed before final welding is done

12.3 Channel iron



12.4 TWO preparation methods.



Methods of the ends of two equal angle iron bars that have to be welded at 90° to each other.

12.5 **I- Beam** is a rolled steel joist (RS) that is used in heavier, structural steel construction.

12.6 Disadvantage of welding steel section.

Components are permanently joined and sometimes difficult to transport due to size constrains