higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ENGINEERING FABRICATION – BOILER MAKING
NQF LEVEL 3

(6031013)

21 November 2024 (X-paper)
09:00–12:00

REQUIREMENTS: A4 drawing paper

Calculators and drawing instruments may be used.

This question paper consists of 9 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
ENGINEERNG FABRICATION – BOILER MAKING
NQF LEVEL 3
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Use only a black or blue pen.
5. Write neatly and legibly.

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SECTION A

QUESTION 1

1.1 Choose a/an term/item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–F) next to the question number (1.1.1–1.1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.1.1	Point on the centre punch scriber must always be sharp	A	welding shorter lengths
1.1.2	Any crack in the filter glass of a welding helmet	B	a bigger drill bit on drilled holes
1.1.3	Distortion is best minimised when	C	is ground to a 90° angle
1.1.4	It is used to check the linearity of the edges of a metal sheet or plate	D	is two times the radius of a circle
1.1.5	Circumference of a circle	E	can cause arc eyes during welding
		F	straight edge

(5 × 1) (5)

1.2 Complete the following sentences by writing only the missing word or words next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

1.2.1 Minimum elements needed for a complete weld symbol would be reference line + arrow + … .

1.2.2 Tungsten inert gas welding is also known as ... .

1.2.3 The purpose of a work … is to safeguard you and to help with the control of jobs in the work area.

1.2.4 The most commonly used dished end on tanks and vessels is the semi- … shape.

1.2.5 On any drawing, lines that are perpendicular to the viewer's line of vision are true … .

(5 × 1) (5)

[10]

TOTAL SECTION A: 10

SECTION B

QUESTION 2

2.1 The use of hand tools is vital in fabrication. Name the hand tools you will use for the following:

2.1.1 To scribe the lines required on metal surfaces.

2.1.2 To scribe circles that are beyond the capacity of dividers.

2.1.3 To find the centre of a circular workpiece.

(3 × 1) (3)

2.2 Make a neat, labelled sketch showing the difference between a centre punch and a dot or prick punch. (2 × 2) (4)

2.3 A jig is an integral part of the trade, especially when trusses are built.

Define the term *jig*. (2)

2.4 Draw a rafter and name any THREE parts. (3 × 1) (3)

2.5 Draw a sectional steel beam profile ('I' beam) and show the following:

2.5.1 Web

2.5.2 Flange

(2 × 2) (4)

2.6 On completion of its fabrication process, a job must be quality assured by a competent person with an approved plan.

State FOUR qualities of a quality control plan. (4 × 1) (4)

[20]

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QUESTION 3

3.1 Most fabricators prefer to use welding for joining metals in welding shops.

Name any TWO other methods of joining metals together. (2 × 1) (2)

3.2 FIGURE 1 below shows a vernier calliper used in many trades. Which of the two sets of jaws of the vernier calliper is used to measure the following?

3.2.1 Outside measurements

3.2.2 Inside measurements

(2 × 1) (2)

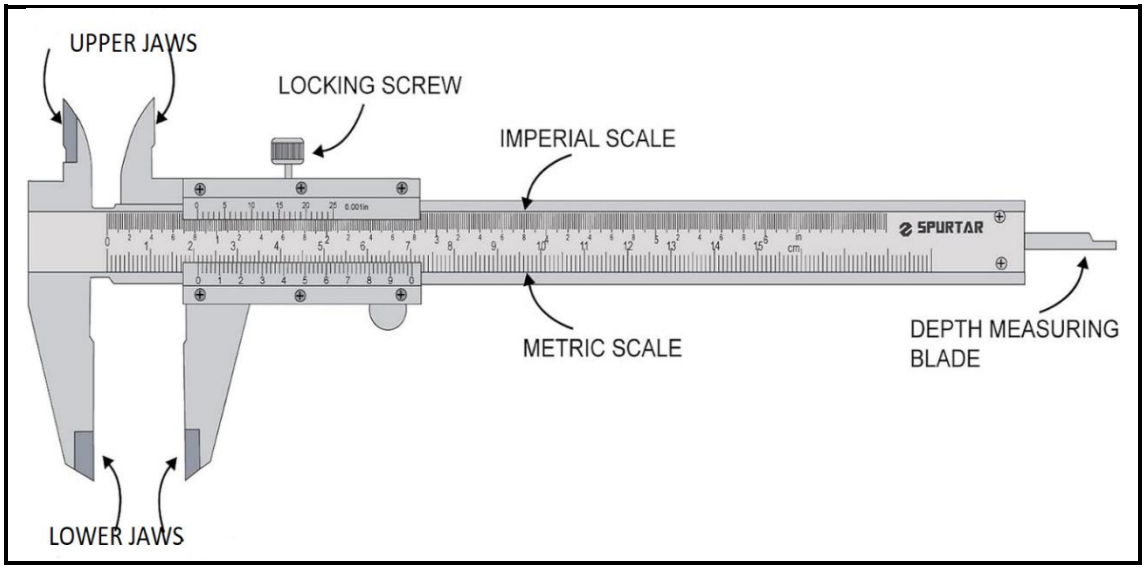


FIGURE 1

3.3 Before you start welding, it is advisable to test your wire speed and voltage on a scrap metal.

State the THREE main steps to be taken as a quick way for this test.

(3 × 1) (3)

3.4 Splatters on a work piece need some grinding.

State THREE ways to prevent splatters on a welding joint. (3 × 1) (3)

3.5 FIGURE 2 below shows a typical GMAW process. Name the parts by writing the name next to the letters (A–E) in your ANSWER BOOK.

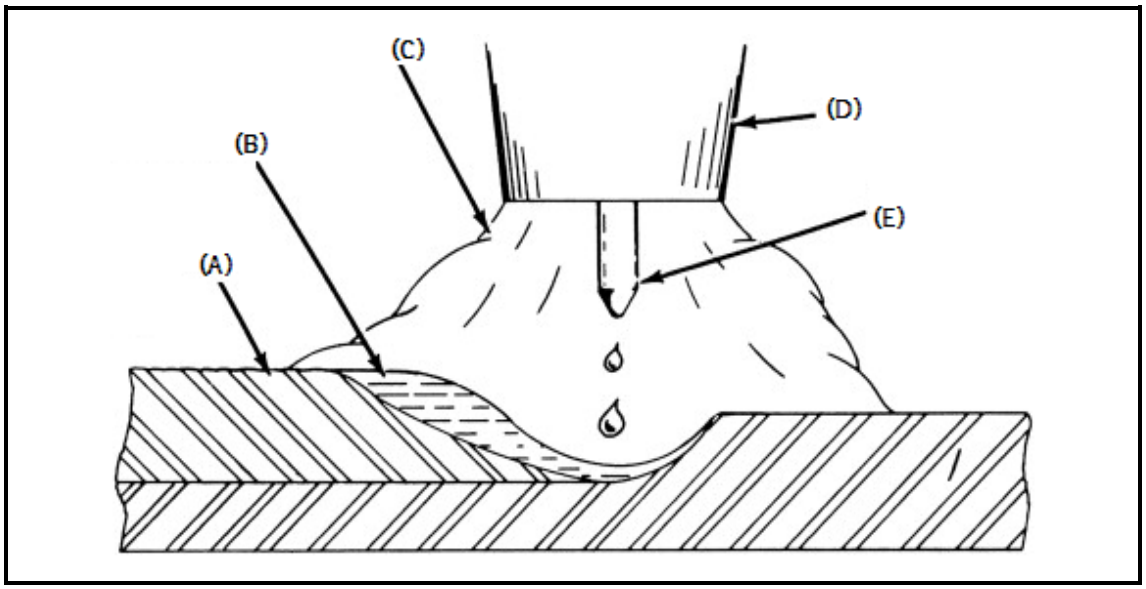


FIGURE 2

(5 × 1) (5)

3.6 Suggest solutions to the following problems that may occur during the welding process:

3.6.1 No shielding gas

3.6.2 No feeding of electrodes

3.6.3 The electrode wire bends

(3 × 1) (3)

3.7 State FIVE points that must be considered when the surface coating is applied. (5 × 1) (5)

3.8 Define the term *chill* and state its function. (3)

3.9 State FOUR steps to avoid distortion. (4 × 1) (4)

[30]

QUESTION 4

4.1 FIGURE 3 below shows a tank or vessel and its components.

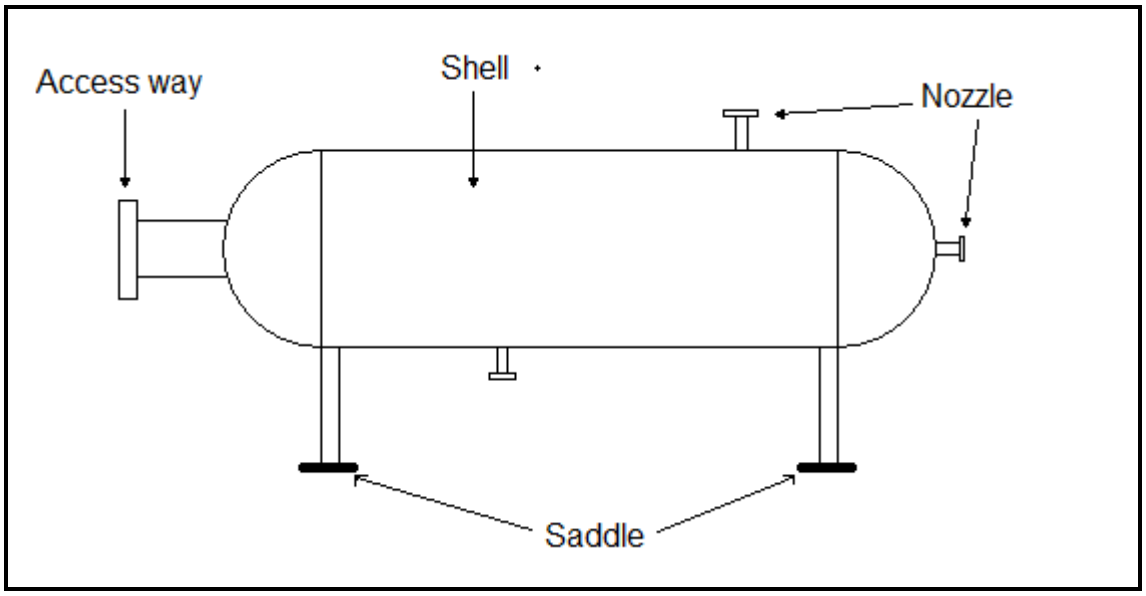


FIGURE 3

Choose a component of the vessel that matches a description below. Write only the name of the component next to the question number (4.1.1–4.1.4) in the ANSWER BOOK.

4.1.1 Steel or concrete supports for horizontal vessels or tanks.

4.1.2 A large opening in a vessel for easy maintenance.

4.1.3 A short pipe with a flange to permit piping to be connected to the pressure vessel.

4.1.4 The walls of a container that are thick enough to contain a fluid as per the description.

(4 × 1) (4)

4.2 FIGURE 4 below shows a steel tank that must be manufactured using a 12-mm plate. A stiffening ring must be manufactured using a 12 × 80 mm flat bar.

Calculate the following measurements. Answers must be converted to meters.

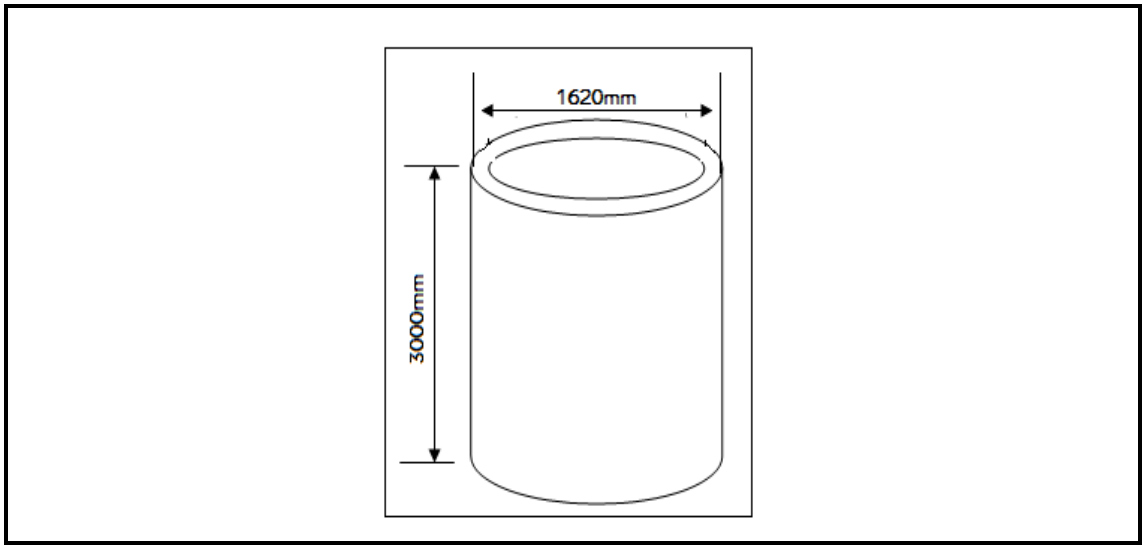


FIGURE 4

4.2.1 The length of the flat bar required for the stiffening ring on the outside of the tank. (3)

4.2.2 The total internal volume of the tank. (3)

4.3 Name FOUR types of cranes used in the engineering industry. (4 × 1) (4)

4.4 To feed a plate into rolls, clamping tools must be used.

State FOUR points to be considered when feeding a plate into rolls. (4 × 1) (4)

4.5 One must check if a tank complies with the job specification and drawings.

State FIVE procedures to check if a tank complies with the job specification and drawings. (5 × 1) (5)

4.6 Dished ends are made in different shapes. State TWO main reasons that influence the installation of dished end in a pressure tank. (2 × 1) (2)

[25]

QUESTION 5

5.1 FIGURE 5 below shows two views of a pyramid. Use the triangulation line method and do the construction in your ANSWER BOOK by using the given measurements to determine the true length of XA.

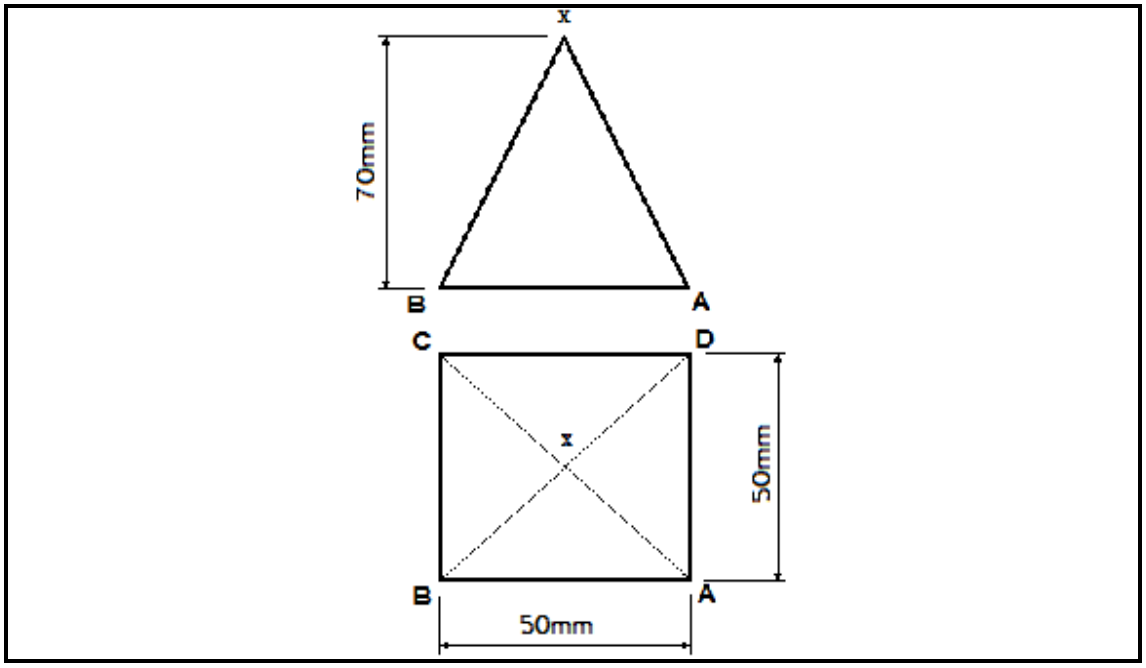


FIGURE 5 (4)

5.2 Explain the difference between *mild steel* and *stainless steel*. (3)

5.3 A measuring tape is one of the most used measuring tools in the engineering industry. State ONE disadvantage of a measuring tape. (1 × 2) (2)

5.4 Good artisans make bending templates using the outside and the inside of the angles or slopes of a transition piece.

State FIVE steps that you would follow to make a bending template. (5 × 1) (5)

5.5 Tack welding of a shell on a marked-out area must be done without any disturbances.

State FIVE points to be considered when tack welding of a shell is done. (5 × 1) (5)

5.6 State SIX roles of the supervisor regarding the laying-out and marking-off of a steel shell transition piece. (6 × 1) (6)

[25]

TOTAL SECTION B: 90
GRAND TOTAL: 100

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