higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ENGINEERING FABRICATION – BOILER MAKING
NQF LEVEL 3

(6031013)

10 March 2020 (X-paper)
09:00–12:00

This question paper consists of 9 pages.

387Q1S2010

Copyright reserved

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.

Copyright reserved

QUESTION 1

Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–T) next to the question number (1.1–1.14) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.1	Foundation for weld symbol	A	access way
1.2	Finding the centre on the face of a round workpiece	B	allowance
1.3	Checking squareness of large plate diagonal over corners 	C	chills
1.4	Semi-automatic welding process	D	divider
1.5	Reducing pressure in cylinders	E	flanges
1.6	Assisting with minimising of distortion	F	flow meter
1.7	Denotes mild- or low-alloy steel electrode	G	GMAW
1.8	Side opposite a right angle in a triangle	H	hypotenuse
1.9	Extra material for bending	I	jenny callipers
1.10	Pressure-vessel entrance	J	letter E on welding rod
1.11	Difference between maximum and minimum sizes	K	opposite 
1.12	Triangulation development 	L	radial line development
1.13	Manufacturing techniques for a bending template	M	reference line
1.14	Connecting pipes to transition pieces	N	regulator
		O	seam allowances
		P	SMAW
		Q	tape measure
		R	tolerance
		S	square-to-round fitting
		T	gas cutting

(14 × 1) **[14]**

Copyright reserved

QUESTION 2

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (2.1–2.8) in the ANSWER BOOK.

2.1 The welding term *pitch* refers to the …

A reference line.
B intermittent spacing of the welds.
C length of the weld.
D joint type.

2.2 A backing weld is made … a groove weld is applied.

A while
B before
C after
D only when

2.3 … is used as a shielding gas during the GMAW process.

A Oxygen
B Acetylene
C Argon and carbon-dioxide mixture
D LPG

2.4 To control the flow of shielding gas, one will use a …

A flashback arrestor.
B regulator.
C wire feeder.
D flowmeter.

2.5 To calculate the circumference of a tank, the ... must be considered.

A mean diameter
B volume
C density
D grade of material

2.6 Which ONE of the following machines does not form part of cutting equipment used during boiler making processes?

A Straight-line cutting machine
B Profile cutting machine
C Water-jet cutting machine
D Plasma welding machine

Copyright reserved

2.7 A … is a direct-measurement measuring instrument.

A tape measure
B divider
C template
D chalk line

2.8 Pickling and passivation cleaning processes must be applied to …

A cast iron.
B stainless steel.
C mild steel.
D brass.

(8 × 1) **[8]**

QUESTION 3

3.1 FIGURE 1 shows a weld symbol with specific welding information.

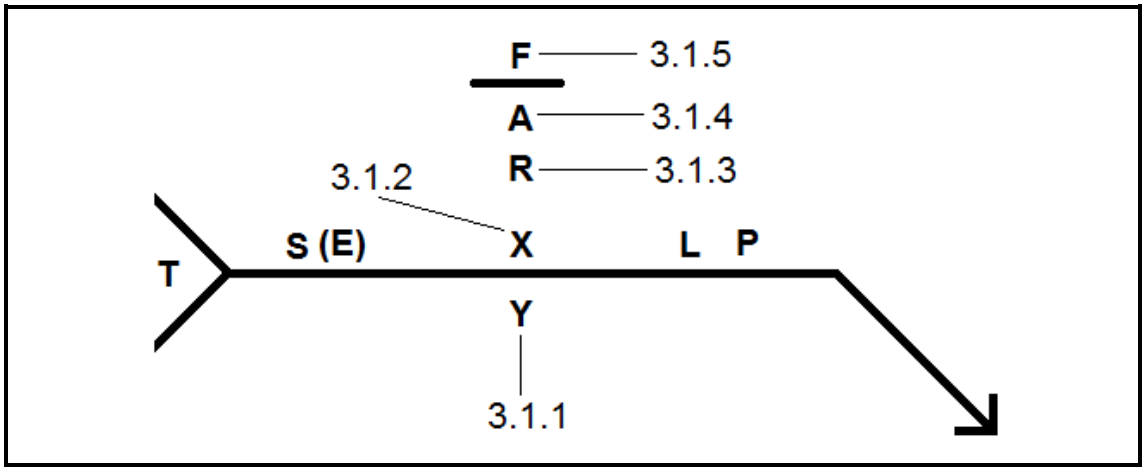


FIGURE 1

Give a full description of the welding information by writing only the answer next to the question number (3.1.1–3.1.5) in the ANSWER BOOK. (5 × 1) (5)

3.2 Give THREE examples of nonferrous metals. (3)

3.3 FIGURES 2, 3 and 4 show certain processes in conjunction with a workpiece.

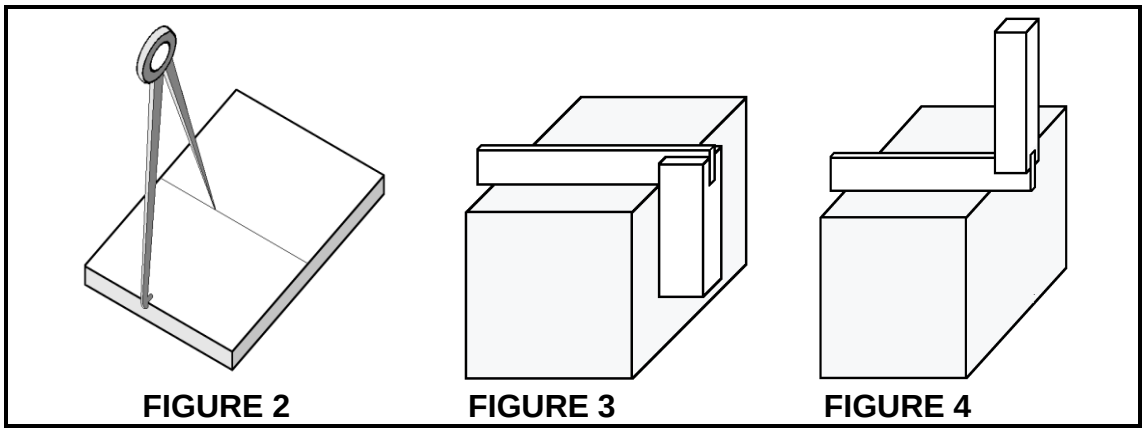


FIGURE 2 **FIGURE 3** **FIGURE 4**

3.3.1 Name the marking-off tool used in FIGURE 2. (1)

3.3.2 Explain the marking-off process performed in FIGURE 2. (2)

3.3.3 Explain the measuring process performed in FIGURE 3. (2)

3.3.4 Explain the measuring process performed in FIGURE 4. (2)

[15]

QUESTION 4

4.1 FIGURE 5 shows a GMAW system.

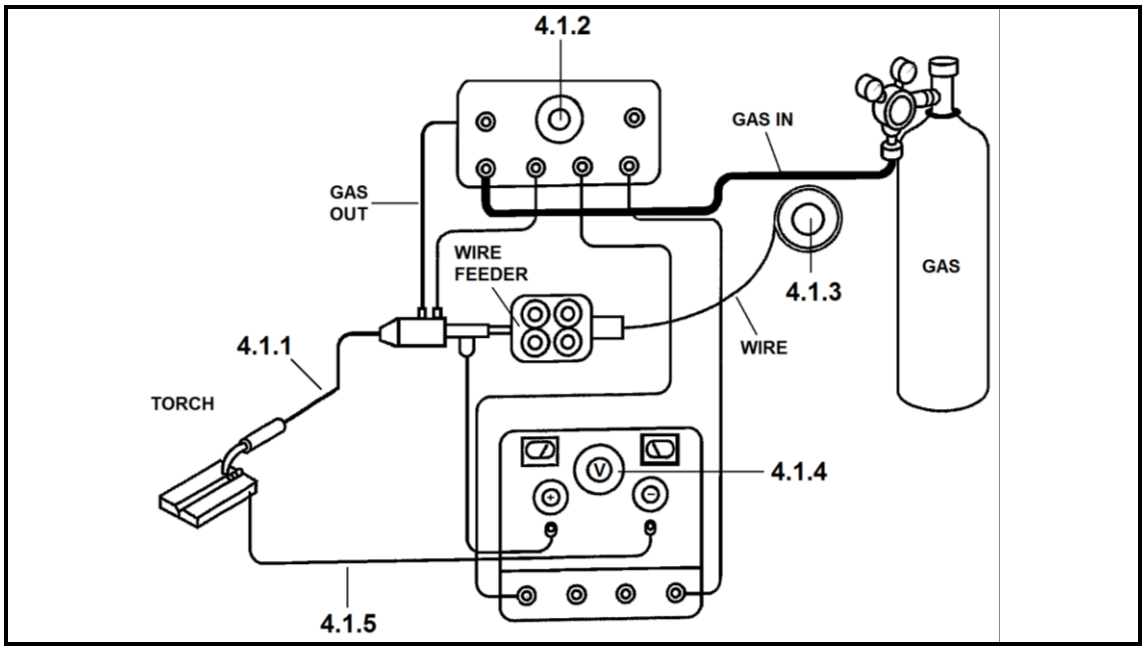


FIGURE 5

Give the names of the components by writing only the answer next to the question number (4.1.1–4.1.5) in the ANSWER BOOK. (5 × 1) (5)

4.2 Give THREE advantages of GMAW. (3)

4.3 FIGURES 6 and 7 show two types of welding joints.

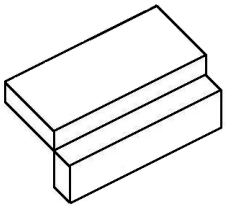


FIGURE 6

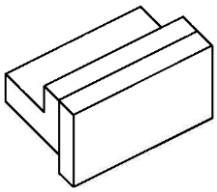


FIGURE 7

4.3.1 Name the welding joint shown in FIGURE 6. (1)

4.3.2 Name the welding joint shown in FIGURE 7. (1)

4.4 List SEVEN GMAW shutdown procedures. (7)

4.5 List THREE values to check when welding is completed. (3)

4.6 Name TWO types of penetrants used for testing cracks and porosity. (2)

4.7 Give a solution for each of the following problems that may occur during the GMAW process:

4.7.1 Unstable arc

4.7.2 No feed of electrode

4.7.3 Electrode wire bends

(3 × 1) (3)

[25]

QUESTION 5

5.1 FIGURE 8 shows a welded tank. The material is 12 millimetres thick. The tank is sealed with a top lid and bottom base. The dimensions are outside measurements.

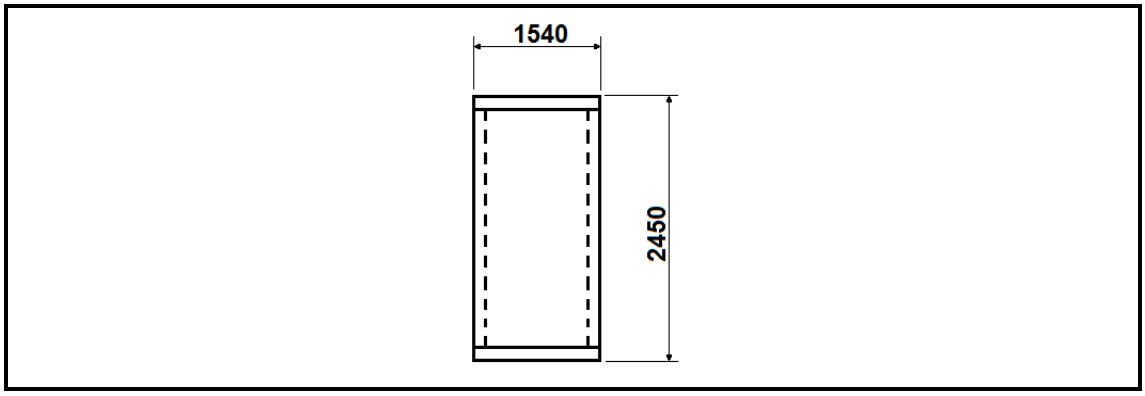


FIGURE 8

5.1.1 Calculate the total area of material needed to manufacture the tank. Give the answer in m^2 and round off to THREE decimals. (9)

5.1.2 Calculate the volume of the tank. Give the answer in m^3 and round off to THREE decimals. (7)

5.2 List the THREE inspections to check tool accuracy. (3)

[19]

QUESTION 6

6.1 FIGURE 9 shows the front and top views of a square cone.

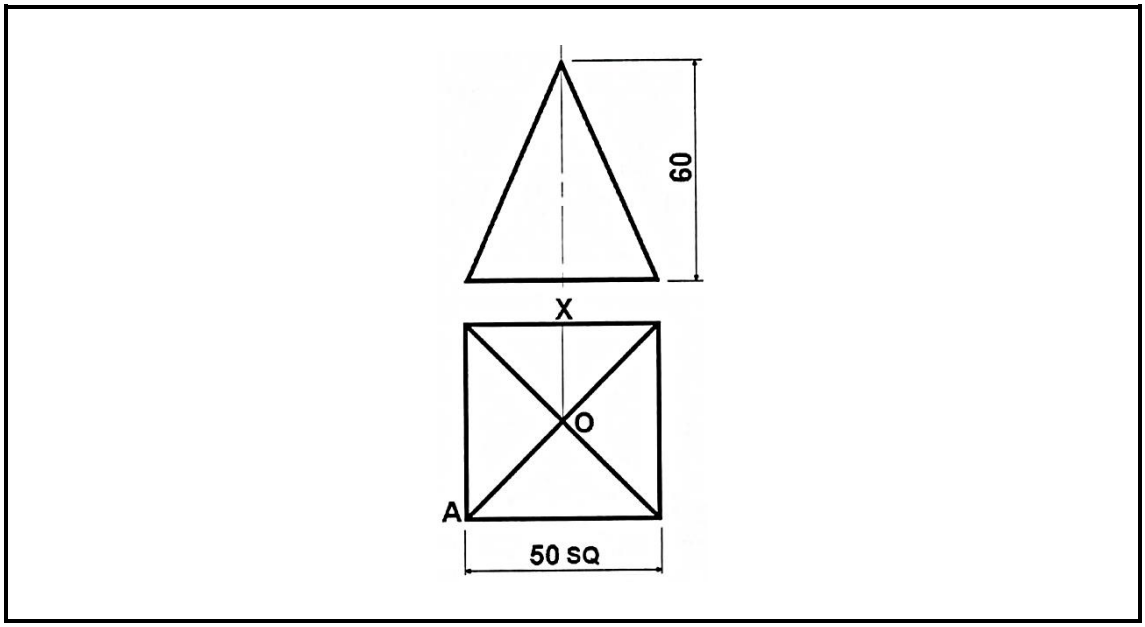


FIGURE 9

Redraw the drawing to scale 1:1 in the ANSWER BOOK and construct a scale to determine the true lengths of corner line 'OA' and middle seam line 'OX'. Use the triangulation method to determine the true lengths. (7)

6.2 List FOUR precautions to take during a measuring process. (4)

6.3 List THREE safety precautions to take when operating a bending machine. (3)

6.4 Explain TWO functions of a flange related to pressure vessels. (4)

6.5 Name the process used to remove surface oxides from metals with chemicals or electrochemical processes. (1)

[19]

TOTAL: 100

Copyright reserved