higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ENGINEERING FABRICATION - BOILERMAKING
NQF LEVEL 3

(6031013)

7 December 2020 (X-paper)
09:00–12:00

REQUIREMENTS: 1 sheet of A4 drawing paper

Drawing instruments may be used.

This question paper consists of 13 pages.

345Q1N2007

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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. QUESTION 5.2 must be answered on a separate sheet of A4 drawing paper. Ensure that your EXAMINATION NUMBER is written on the drawing paper.
6. Write neatly and legibly.

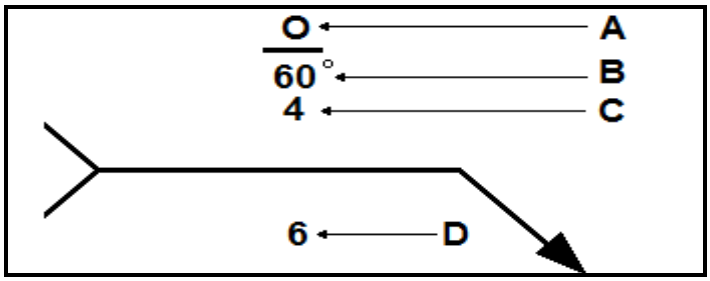
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SECTION A

QUESTION 1

1.1 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 (1.1.1–1.1.5) in the ANSWER BOOK.

1.1.1 Which one of the following welding symbols represent the *number of spots/tacks* on the weld symbol?



A O
B 60°
C 4
D 6

1.1.2 … is an *advantage* of GMAW.

A Porosity
B Burnback
C All positions capability
D Metal hardening

1.1.3 The following formula can be used to calculate the length of any side of a right-angle triangle:

A $A = ½b \times h$
B $V = l \times b \times h$
C $V = \pi r^2$
D $a^2 = b^2 + c^2$

1.1.4 Choose the method of development that is used to develop the normal round pipe from the options given below:

A Parallel method
B Radial-line method
C Triangulation method
D Pyramid development

1.1.5 The purpose of the pickling process is to …

A harden the material.
B soften the material.
C remove oxides from the material surface.
D apply a corrosion resistance film on the material surface.

(5 × 1) (5)

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

1.2.1 The minimum elements needed for a complete weld symbol would be: Reference line + … + basic welding symbol.

1.2.2 The GMAW process uses a consumable electrode during the process that is fed from a …

1.2.3 Inside the plasma torch, gas is directed through an electric arc to form superheated gas or …

1.2.4 Electrodes are classified and gauged according to their … and other characteristics.

1.2.5 The … is the exact length of a line.

(5 × 1) (5)

1.3 Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–J) next to the question number (1.3.1–1.3.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.3.1	It is a material which contains specific metallic properties and is composed of two or more chemical elements.	A	GMAW
		B	alloy
		C	unsafe act
1.3.2	The purpose of this document is to safeguard you and to help with the control of the job.	D	work permit
		E	transition fabrication
1.3.3	Versatility is one of the major benefits of this welding process and is capable of joining most types of metals and can be performed in most positions.	F	TIG
		G	job card
		H	unsafe condition
1.3.4	Putting a scriber in your pocket after marking-off	I	pipe development
1.3.5	This process is used to manufacture a metal fitting that changes size or shape from one end to the other	J	ferrous metals

(5 × 1) (5)

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1.4 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (1.4.1–1.4.5) in the ANSWER BOOK.

1.4.1 A vernier calliper can be used to measure the depth of a hollow workpiece.

1.4.2 To scribe a line parallel to the edge of a plate, jenny callipers can be used.

.

1.4.3 A water cooler serves as additional equipment for the GMAW process.

1.4.4 Measuring an I-section, the flange width and the depth size are the same.

1.4.5 You must check that the working area's temperature is constant when verifying the thickness of the material to be used.

(5 × 1) (5)

1.5 Choose a word/term for each of the following descriptions by choosing a word/term from the list below. Write only the word/term next to the question number (1.5.1–1.5.5) in the ANSWER BOOK.

sharpness; ensure the tyre pressure; flowmeter; arcs; spaced; long; straight lines; cylinder valve; exceed the maximum load limit; thickness

1.5.1 Intermittent welds are short and …

1.5.2 A divider can be used to mark …

1.5.3 The … must be shut first after using the GMAW process.

1.5.4 A crane driver should not …

1.5.5 You must allow for the … of the metal when using the bar folder.

(5 × 1) (5)

1.6 Choose the correct option from those given in brackets. Write only answer next to the question number (1.6.1–1.6.5) in the ANSWER BOOK.

1.6.1 A jig will form part of the (erecting/setting-out) process.

1.6.2 A (fillet weld/butt weld) will be done when welding a thin plate against a thick plate.

1.6.3 The diameter of the wire electrode varies, depending on the (material thickness/speed of weld).

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1.6.4 When a rigger gives the hand signal, forearm vertical, with small horizontal circles of the hand, it means, (lowering/hoisting) the load.

1.6.5 Allowances for the thickness of the metal thinner than 0,6 mm are (necessary/not necessary).

(5 × 1) (5)
[30]

TOTAL SECTION A: 30

SECTION B

QUESTION 2

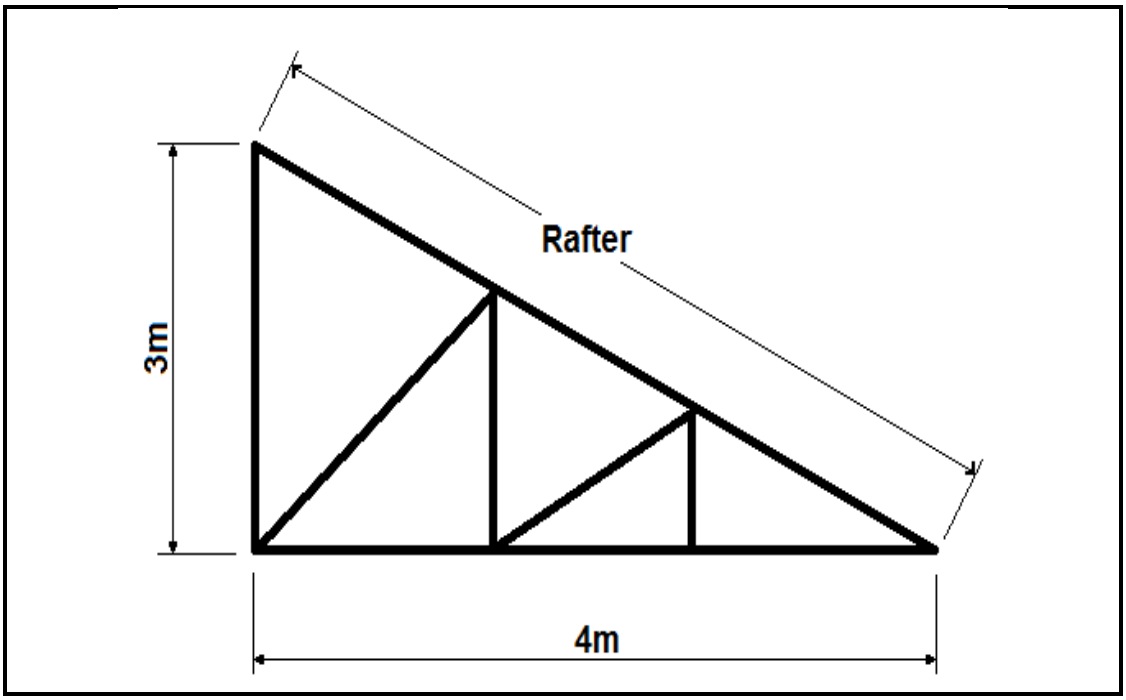
2.1 Draw sectional views of the following welding joints, indicating the weld in position:

2.1.1 Edge joint

2.1.2 Fillet joint

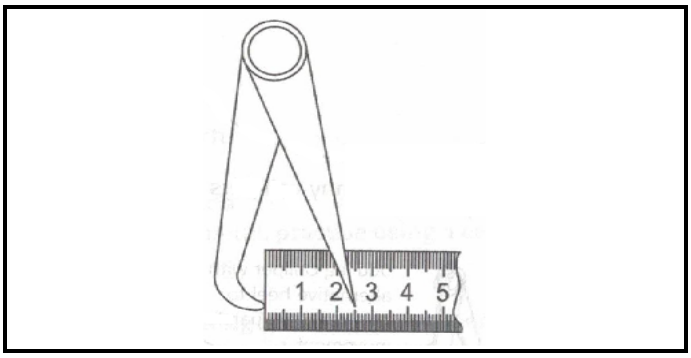
(2 × 2) (4)

2.2 Calculate the length of the rafter as indicated in the figure of the roof truss. Indicate the formula used and give the answer in metres, rounded off to three decimal places.



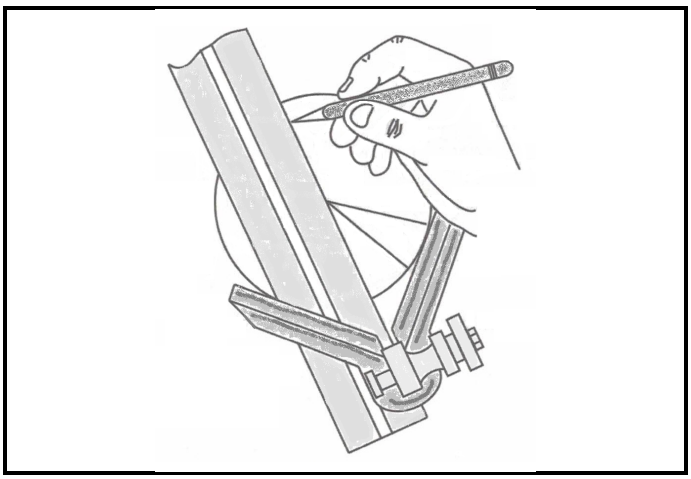
(4 × 1) (4)

2.3 The following figure illustrates a certain process, performed by means of a marking-off tool in conjunction with a ruler.



Name the marking-off tool used and describe the process performed. (2 × 1) (2)

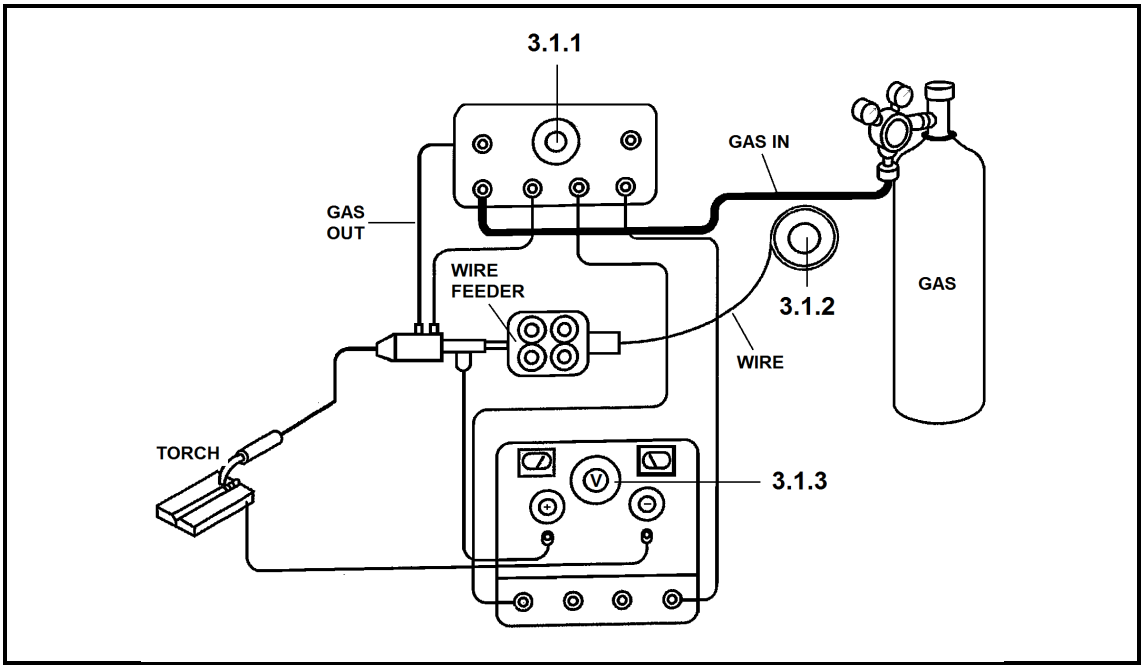
2.4 The following figure illustrates a certain process, performed by means of a marking-off tool in conjunction with a scriber.



Name the marking-off tool used and describe the process performed. (2 × 1) (2)
[12]

QUESTION 3

3.1 A GMAW system is shown in the figure below. Name the components indicated by writing only the answer next to the question number (3.1.1–3.1.3) in the ANSWER BOOK.

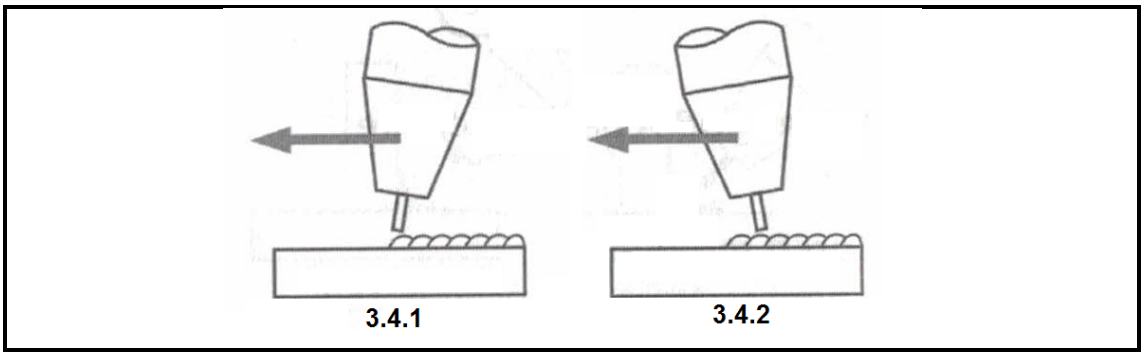


(3 × 1) (3)

3.2 State the THREE steps how the wire feed-speed can be adjusted when welding a piece of scrap metal. (3 × 1) (3)

3.3 Make a neat sketch, illustrating the *curved zigzag* torch movement when welding thin materials. (1 × 1) (1)

3.4 Name the TWO gun movement techniques illustrated in the following sketches, by writing only the answer next to the question number (3.4.1–3.4.2) in the ANSWER BOOK.



(2 × 1) (2)

3.5 There is no voltage or current control during the GMAW process.

Name the ONE factor that determines the welding current. (1)

3.6 With regard to TIG welding:

3.6.1 State TWO advantages

3.6.2 State TWO disadvantages

(2 × 2) (4)

3.7 With regard to MIG welding:

3.7.1 State TWO advantages

3.7.2 State TWO disadvantages

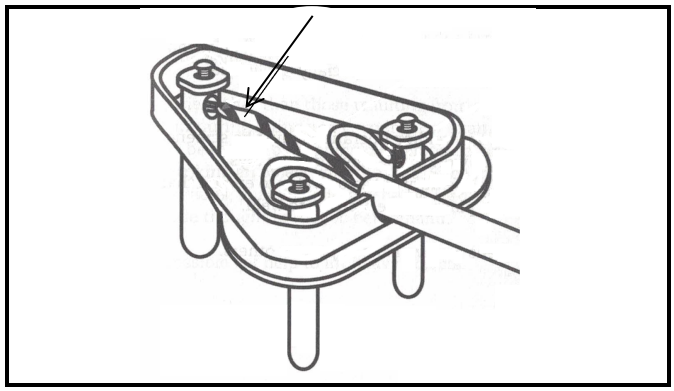
(2 × 2) (4)

3.8 Make a neat sketch to illustrate *undercut* as a welding defect. (2)

3.9 During the GMAW process, you experience a malfunction. There is no feeding of the electrode.

Give ONE reason for the malfunction. (1)

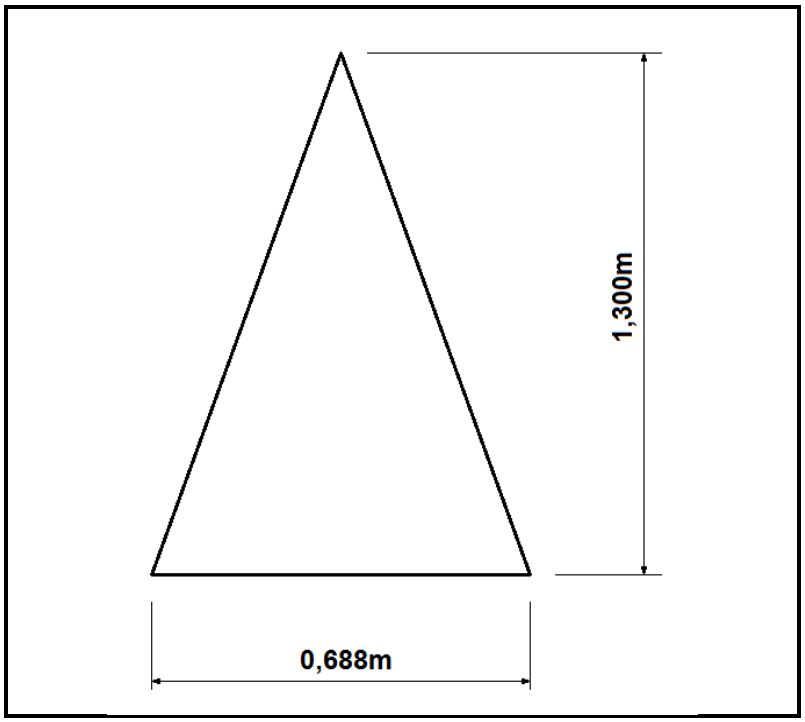
3.10 Name the electrical wire indicated in the sketch below.
(NOTE**:** Colour coding is not acceptable.)



(1)
[22]

QUESTION 4

4.1 Calculate the area of the figure below. Indicate the formula used and give the answer in metres, rounded off to three decimal places.



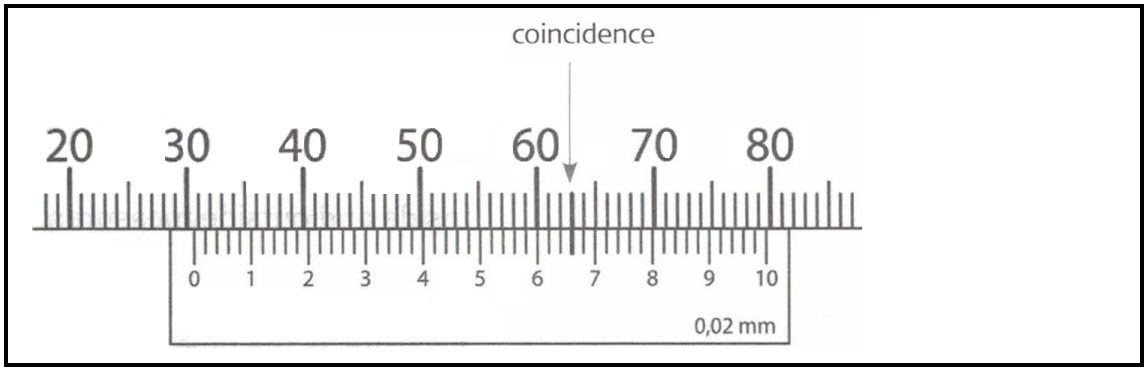
(3 × 1) (3)

4.2 Calculate the area of the plate needed to manufacture a round cylinder with the following dimensions in metres:

Vertical height: 1,2 m
Outside diameter: 2,1 m
Plate thickness: 0,012 m

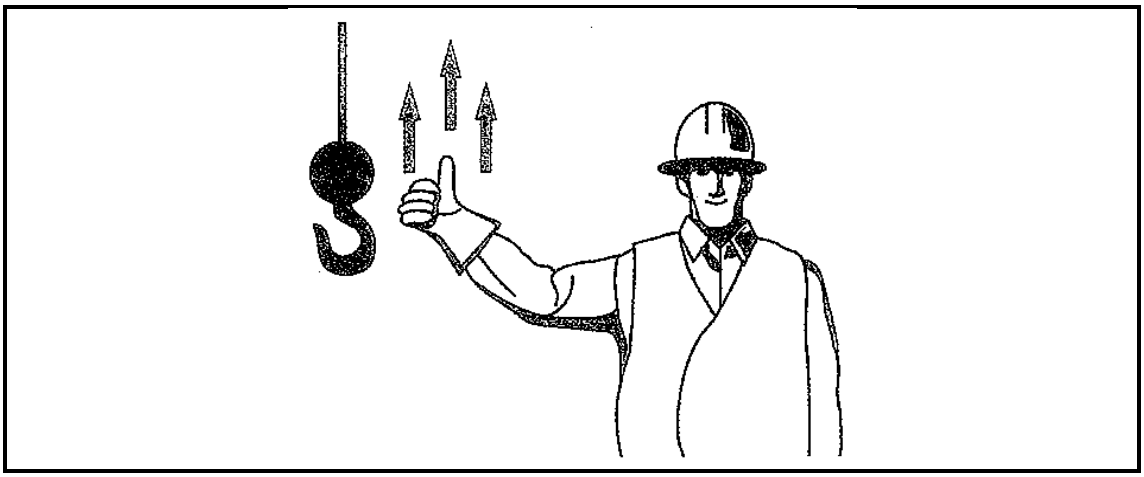
Indicate the formulas used and give the answer in metres, rounded off to three decimal places. (3 × 3) (9)

4.3 Write down the vernier reading shown in the following figure.



(3 × 1) (3)

4.4 Name the rigging hand signal shown in the following figure.



(1)

4.5 Tanks are constructed with a variety of tops depending on the process and fluids used.

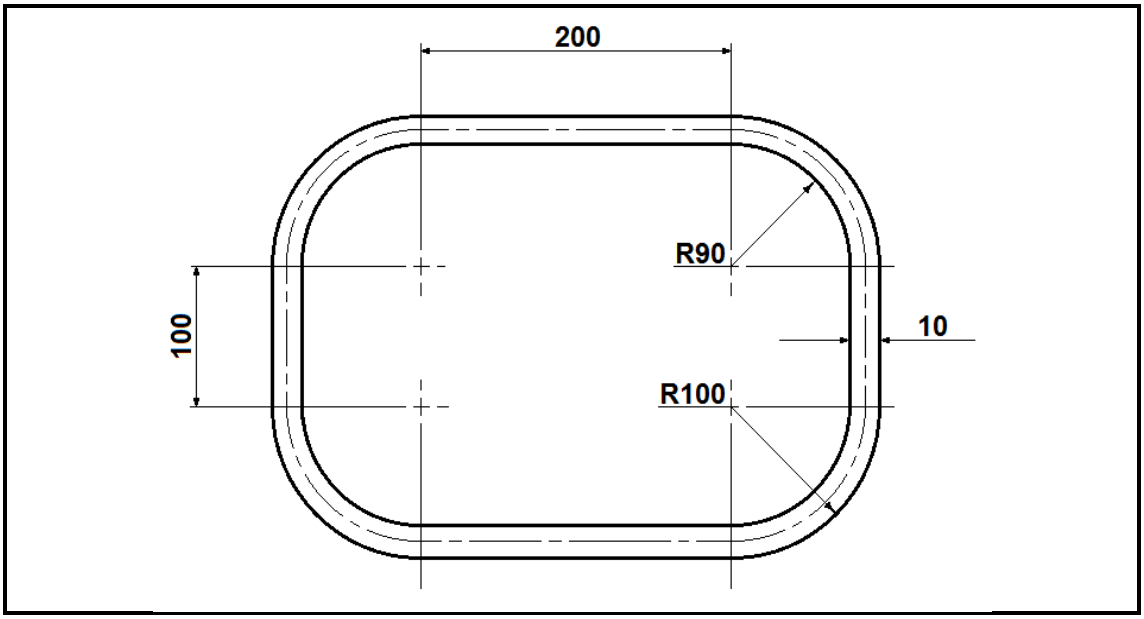
Name TWO types of tops that can be used on tanks. (2 × 1) (2)

[18]

QUESTION 5

5.1 The following figure illustrate a frame, manufactured from 10 mm × 50 mm flat bar.

Calculate the total length of the material needed to manufacture the frame. Indicate all calculation steps and formulas used. Give the answer in millimetres and rounded off to three decimal places.

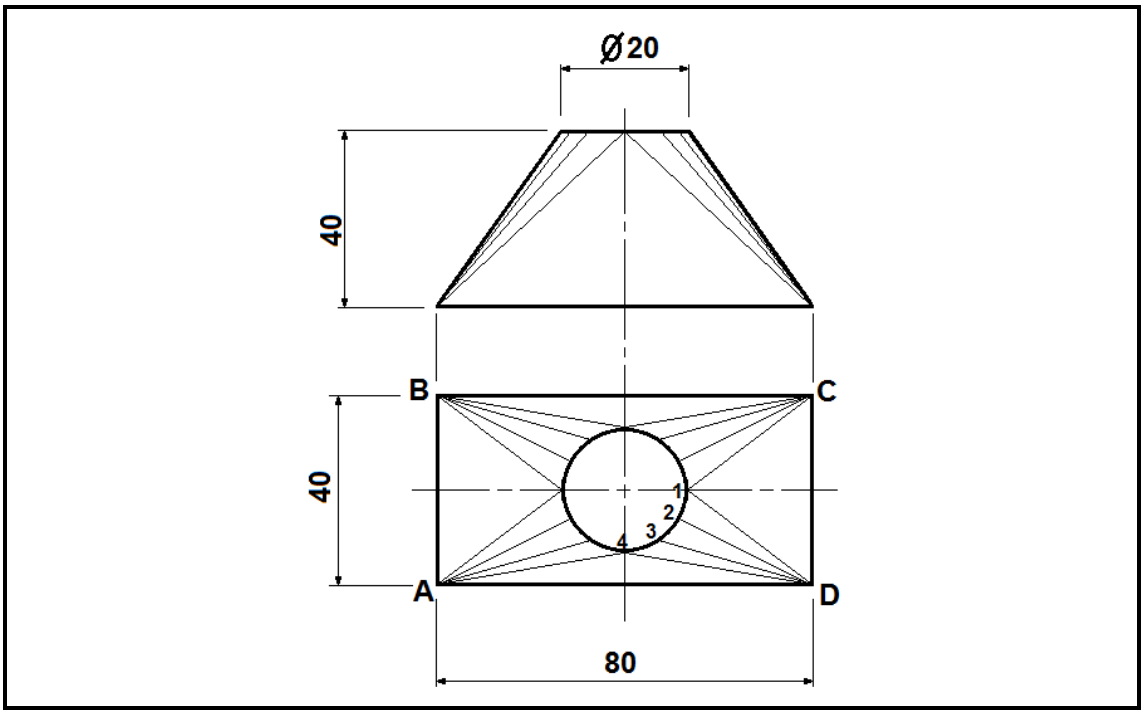


(9 × 1) (9)

5.2 The following figure illustrates a *rectangle-to-round* hopper, drawn according to the triangulation method.

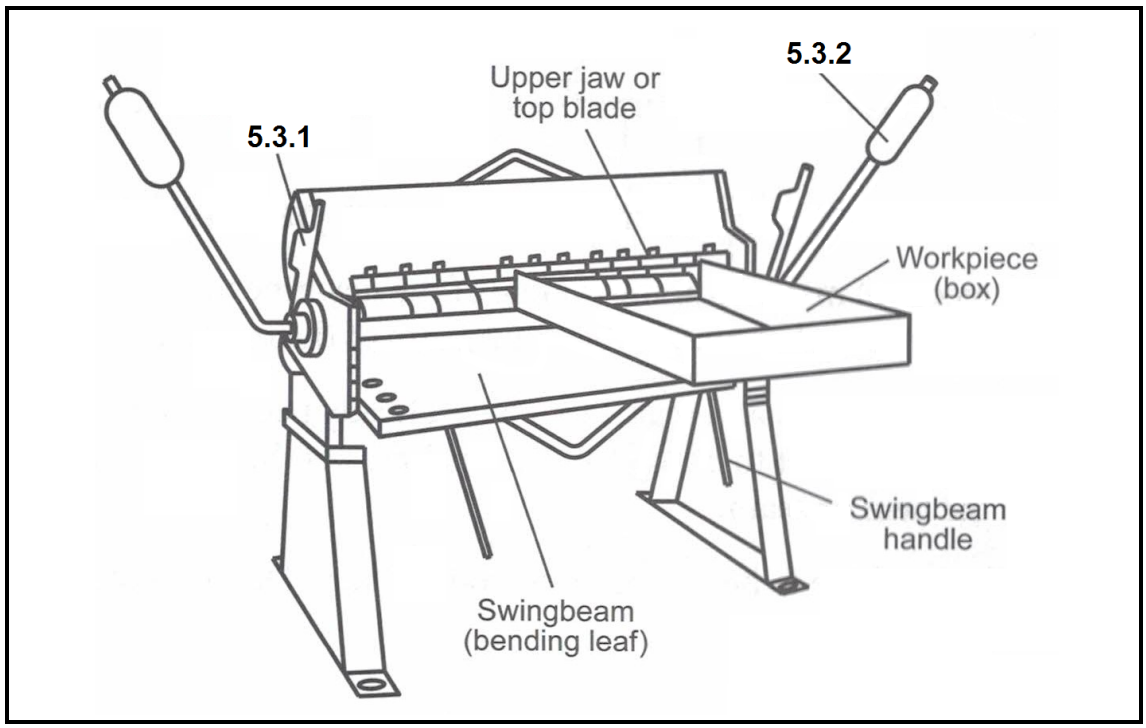
Redraw the figure to scale 1:1 on the A4 drawing paper provided by using drawing instruments. Ensure that your EXAMINATION NUMBER is written on the drawing paper.

Determine ONLY the true length of bending line D1. Clearly indicate the construction lines used.



(7 × 1) (7)

5.3 Name the parts indicated on the pan box folding machine illustrated below, by writing only the answer next to the question number (5.3.1–5.3.2) in the ANSWER BOOK.



(2 × 1) (2)
[18]

TOTAL SECTION B: 70
GRAND TOTAL: 100

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