higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ENGINEERING FABRICATION - BOILERMAKING
NQF LEVEL 4

(6031014)

17 November 2022 (X-paper)
09:00–12:00

Calculators may be used.

This question paper consists of 8 pages.

465Q1N2217

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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. Start each section on a new page.
5. Use only a blue or black pen.
6. All sketches must be neat, clear, labelled and only pencil may be used.
7. Write neatly and legibly.

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SECTION A

QUESTION 1

1.1 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

1.1.1 The fillet weld symbol is a small right-angled triangle.

1.1.2 The symbol 'M' in CNC programming means that the workpiece must be finished by grinding.

1.1.3 Root area = root opening × plate thickness.

1.1.4 CNC machines are being used in the industry since the 1970's.

1.1.5 Air is used for pressure testing vessels because it does not compress.

1.1.6 The programmer of a CNC machine can set the zero point (W) anywhere in the workpiece.

1.1.7 You can use a pressure vessel without a gauge if it is newly constructed and already pressure tested.

1.1.8 Welding symbols are standard symbols used internationally.

1.1.9 Another name for a column is a stanchion.

1.1.10 Pressure testing equipment must be calibrated before using it.

(10 × 1) (10)

1.2 Choose an option from COLUMN B that matches a description in COLUMN A. Write only the letter (A–F) next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.2.1	Scribing large arcs and circles	A	odd-leg callipers
1.2.2	CNC machine codes	B	computer-operated
1.2.3	Mean diameter	C	travel
1.2.4	CNC lathes	D	trammel
1.2.5	One of the piping terms used for sides	E	used when calculating circular forms or shapes
		F	indicate to machine what kind of actions to take

(5 × 1) (5)
[15]

TOTAL SECTION A: 15

SECTION B

QUESTION 2

2.1 Neatly draw a welding symbol representing a double V joint as shown in FIGURE 1.

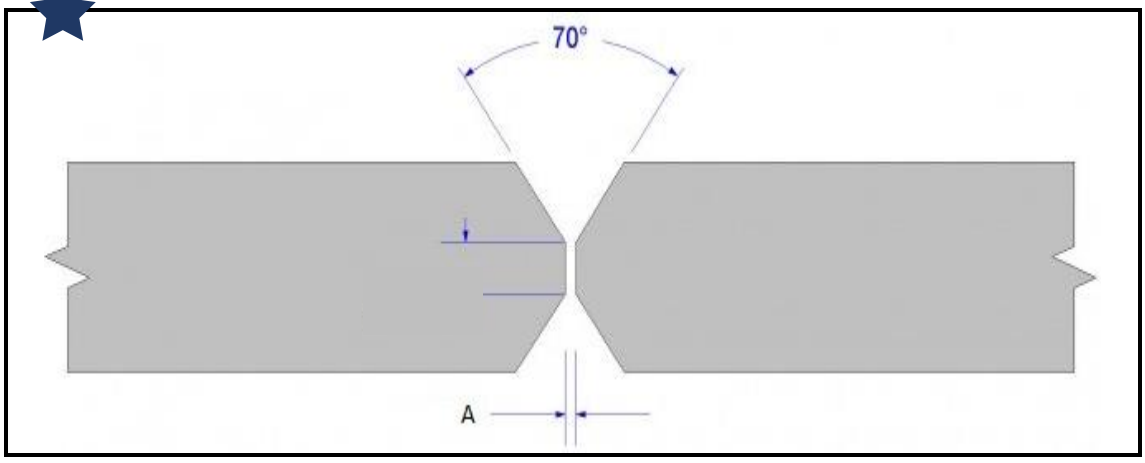


FIGURE 1 (2)

2.2 Briefly explain each symbol of the formula below:

Plate length of part of a circle = Y°/360° × π × Dm

Example: Dm = mean diameter (3)

2.3 The operator must operate the pressure testing equipment according to the specifications.

State THREE requirements that the pressure testing equipment must meet when testing pressure vessels. (3)

2.4 A particular sequence should be followed when using hydraulic and pneumatic leak tests.

Briefly explain the sequence of carrying out these two tests. (2 × 2) (4)

2.5 It is important in marking to establish datum points and setting-out points.

Name FOUR types of datum points for marking off templates that are used in boiler making. (4)
[16]

QUESTION 3

3.1 Define third-angle orthographic projections, referring to the positioning of views. (3)

3.2 FIGURE 2 shows a roof truss.

Name any THREE members of the roof truss indicated. Write only the answer next to the letter (A–E) in the ANSWER BOOK.

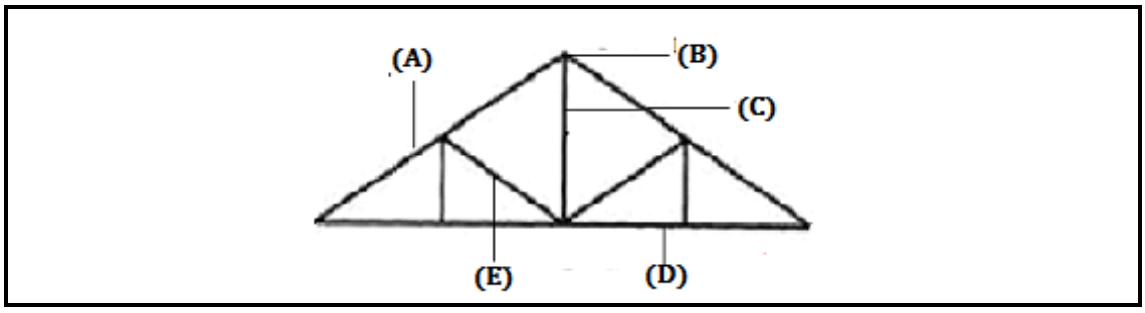


FIGURE 2 (3)

3.3 State FIVE correct methods that you would apply when lifting and carrying heavy material when assembling steelwork. (5)

3.4 When erecting a structure on site it is important to comply with the rules set out by the Occupational Health and Safety Act.

State FIVE rules that must be adhered to. (5)
[16]

QUESTION 4

4.1 Write in full the following abbreviations used in pipework fabrications:

4.1.1 ISO

4.1.2 P&ID

4.1.3 WOG

4.1.3 FE

(4 × 1) (4)

4.2 When you arrive at the workplace, the supervisor took you through the job card and asked you to abide by all the instructions on the job card.

Design a similar job card as the one you used at the workplace and include FIVE necessary details. (5)

4.3 A spirit level is a tool used to indicate/measure how parallel (level) or perpendicular (plumb) a surface is.

Indicate which tube vial (A, B or C) shown in FIGURE 3 would be used for each measurement indicated in the questions below (4.3.1–4.3.3):

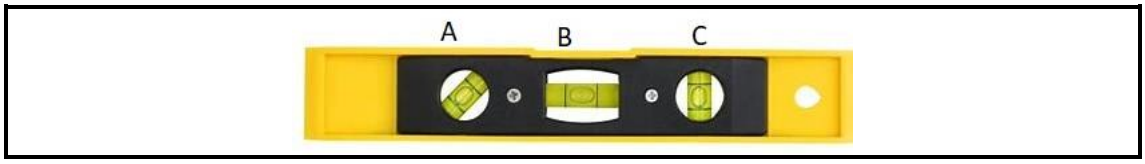


FIGURE 3

4.3.1 True horizontal

4.3.2 True vertical

4.3.3 Find level at 45° angle

(3 × 1) (3)

4.4 Calculate the offset of a pipe if the travel length is 1 500 mm and the advance is 250 mm. (4)

[16]

QUESTION 5

5.1 CNC machines can be used for many different purposes.

5.1.1 Can a CNC machine be used for welding? State only 'Yes' or 'No'. (1)

5.1.2 Support your answer by giving ONE example or ONE reason. (1)

5.2 Name EIGHT types of CNC cutting machines used in the industry. (8)

5.3 State the cost difference between *conventional systems* and *CNC systems*. (4)

5.4 Answer the following questions with regard to FIGURE 4.

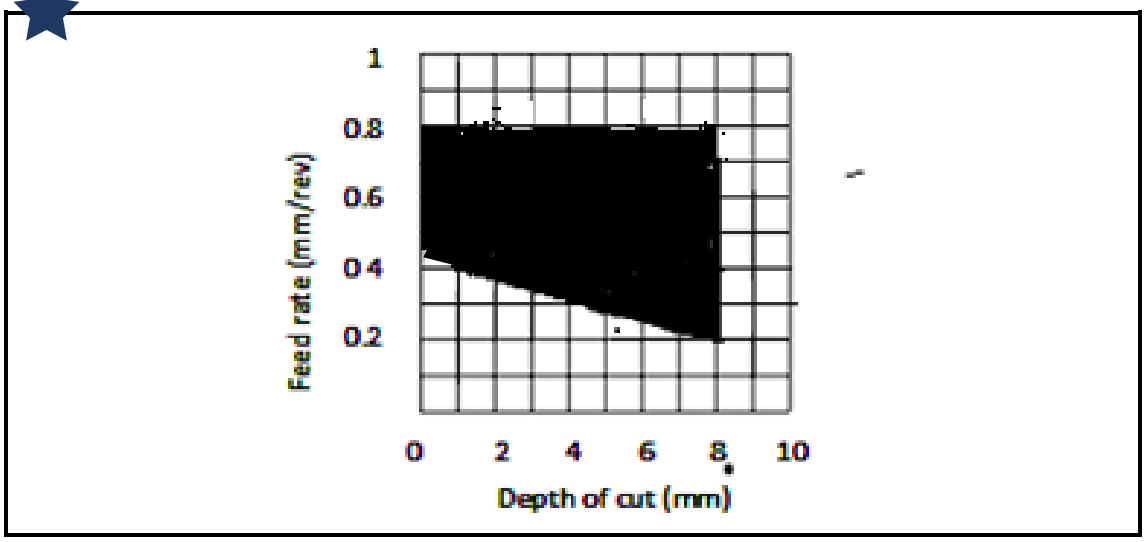


FIGURE 4

5.4.1 State the maximum depth that this insert can cut. (1)

5.4.2 State the feed rate range for this insert. (2)

5.4.3 If the depth cut is 1 mm what would the range of the feed rate be? (2)

5.5 FIGURE 5 represents a CNC milling machine.

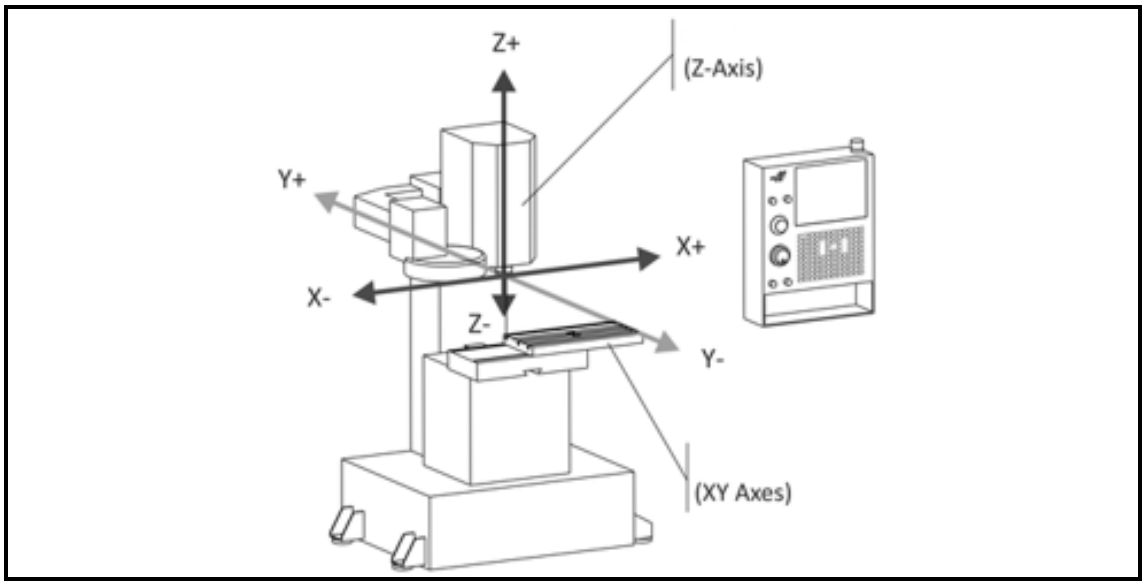


FIGURE 5

To comply with the right-hand rule for motion if your thumb is represented by 'X':

5.5.1 Which fingers will represent 'Z' and 'Y'? (2)

5.5.2 Name ONE part of the milling machine that is shared by two co-ordinates. (2)

5.6 Give THREE reasons why it is important to simulate the program. (3)

5.7 State THREE factors to consider when deciding how much material should be removed during machining. (3)

5.8 5.8.1 State the meaning of the F-code.

5.8.2 State the meaning of the S-code.

(2 × 2) (4)

5.9 State FOUR causes of tool wear on the machine. (4)

[37]

TOTAL SECTION B: 85
GRAND TOTAL: 100

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