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Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

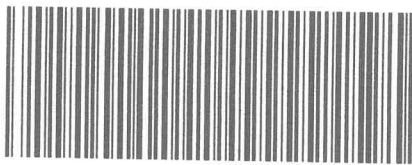
**NATIONAL CERTIFICATE (VOCATIONAL)**

**MACHINE MANUFACTURING  
NQF LEVEL 3**

(7601034)

**23 November 2023 (X-paper)  
09:00–12:00**

**This question paper consists of 9 pages.**



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261Q1N2323

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**DEPARTMENT OF HIGHER EDUCATION AND TRAINING**  
**REPUBLIC OF SOUTH AFRICA**  
**NATIONAL CERTIFICATE (VOCATIONAL)**  
**MACHINE MANUFACTURING**  
**NQF LEVEL 3**  
**TIME: 3 HOURS**  
**MARKS: 100**

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**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.
- 



**QUESTION 1**

1.1 Choose a term 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	Contact with radiation	A green
1.1.2	Contact with moving parts	B accidents
1.1.3	The ON button is normally the colour ...	C safety hazard
1.1.4	When an infra-red beam is used on a guard it is classified as a ...	D automatic guard
1.1.5	Using a machine without correct training can cause ...	E health hazard
		F trip guard

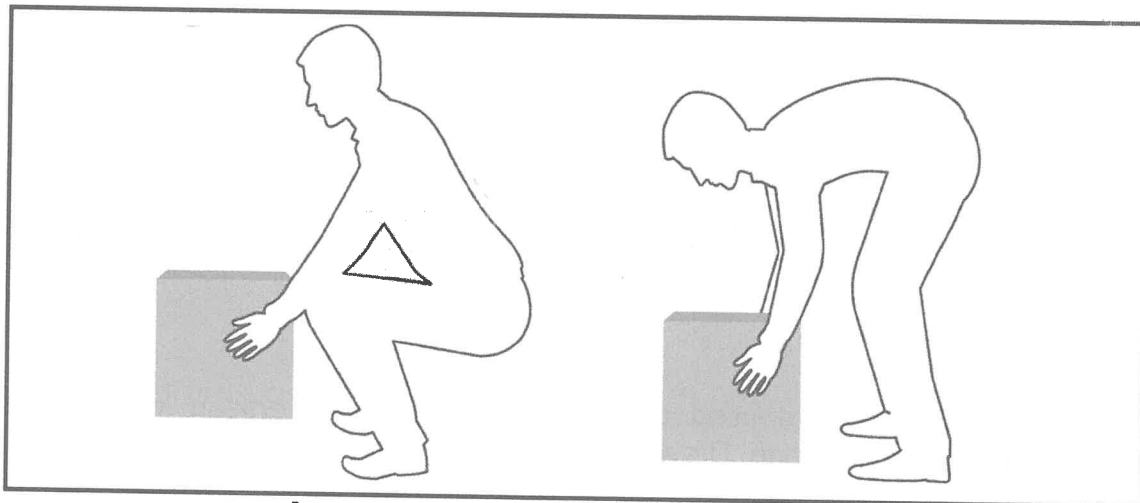
(5 × 1)

(5)

1.2 Different types of guards are used in the industry. Explain the difference between an *interlocking guard* and an *automatic guard*.

(4)

1.3 FIGURE 1 below shows two methods of lifting a heavy object. Which ONE is the correct lifting method? Choose the correct picture and give a reason for your answer.



A

B

**FIGURE 1**

(3)

1.4 When writing an accident report, certain information is needed. Name any THREE pieces of information required to write the report.

(3)


**[15]**



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**QUESTION 2**

2.1 Explain the difference between a *freehand drawing* and an *engineering drawing*. (2 × 2) (4)

2.2 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.2.1–2.2.5) in the ANSWER BOOK. 

2.2.1 Basic size can be measured with a steel ruler to the nearest millimetre.

2.2.2 Actual size can be measured with a tape measure to the nearest hundredth of a millimetre.

2.2.3 The upper limit is the maximum size a hole or shaft can be.

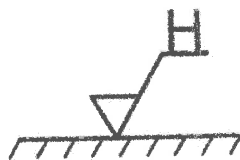
2.2.4 The lower limit is the minimum size of a hole or shaft can be.

2.2.5 The word *fit* does not apply to the relationship between a shaft and a hole. (5 × 1) (5)

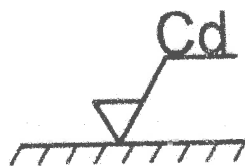


2.3 Identify the following basic symbols that relate to materials:

2.3.1



2.3.2



(2 × 1) (2) 

2.4 Machine symbols are used on drawings so that the artisan knows what machining must be done. Draw the following machine symbols:

2.4.1 Counterboring

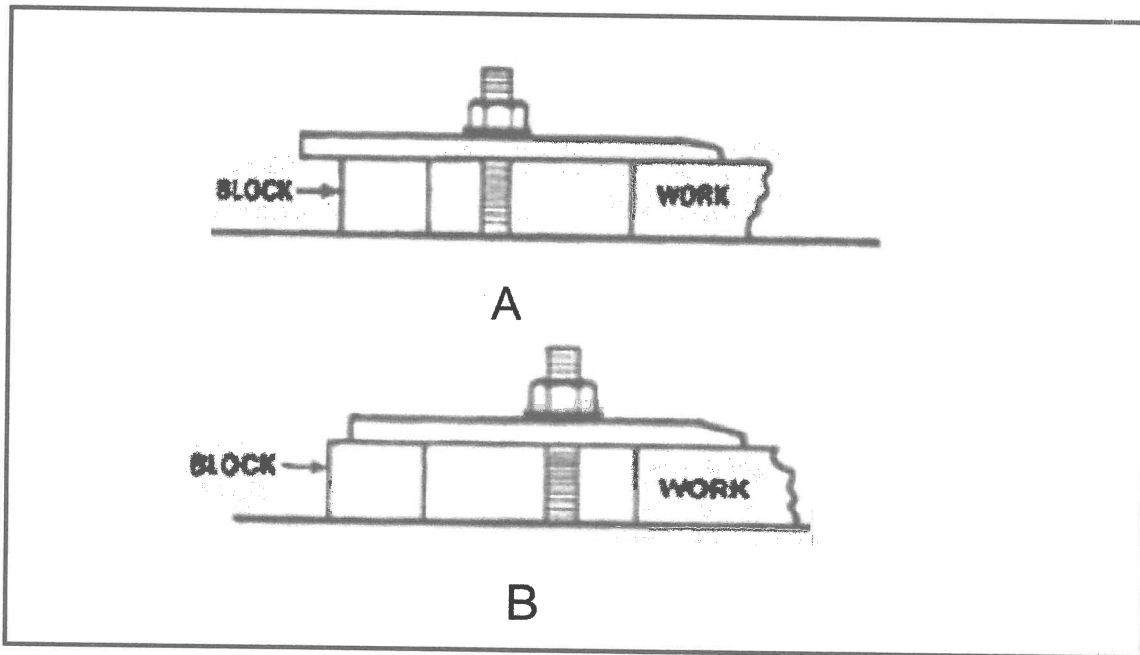
2.4.2 Countersinking

(2 × 2) (4) **[15]**



**QUESTION 3**

3.1 FIGURE 2 below shows how two ways in which a workpiece should be clamped when machining is done. Which ONE is NOT correct? Choose the picture and give a reason for your answer.



**FIGURE 2**

3.2 Show with the aid of a sketch the difference between a *positive rake angle* and a *negative rake angle*.

3.3 A milling cutter is 30 mm in diameter and has four teeth. The cutting speed for the machine is 60 m/min and the feed per tooth is 0,05 mm.

Calculate the rpm and the feed rate.

3.4 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (3.4.1–3.4.3) in the ANSWER BOOK.

3.4.1 The most important ferrous metals used in the industry today are cast iron and carbon steel.

3.4.2 Ferrous metals do not contain carbon steel.

3.4.3 Copper is an example of a non-ferrous metal.

(3 × 1)

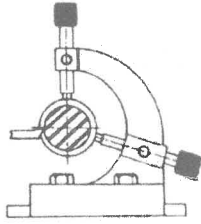
(3)  
[15]



**QUESTION 4**

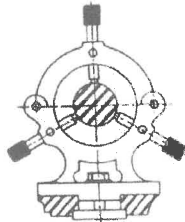
4.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (4.1.1–4.1.4) in the ANSWER BOOK.

4.1.1 What is this accessory called that is used on a lathe?



- A Fixed steady
- B Travelling steady
- C Tool holder
- D Carrier (dog)

4.1.2 What is this accessory called that is used on a lathe?



- A Tool holder
- B Fixed steady
- C Face plate
- D Travelling steady

4.1.3 What is this accessory called that is used on a lathe?



- A Half centre
- B Revolving centre
- C Centre punch
- D Pipe centre



4.1.4 What is this accessory called that is used on a lathe?



- A Pipe centre
- B Centre punch
- C Revolving centre
- D Half centre

(4 × 1) (4)

4.2 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (4.2.1–4.2.4) in the ANSWER BOOK.

4.2.1 When turning between centres, long workpieces can also be turned.

4.2.2 When turning between centres, taper turning is not possible.



4.2.3 When turning between centres, it is easy to get the correct taper.

4.2.4 A carrier (dog) is also used when turning between centres.

(4 × 1) (4)

4.3 Make a neat, labelled drawing showing a chuck rotating in the correct direction when cutting with a knife tool. Your drawing should include the tool, the chuck and the workpiece.

Remember to show the correct rotation by means of an arrow.

(4)

4.4 When turning a workpiece, it is ideal to have a good surface finish.



Name FOUR methods of obtaining a good surface finish.

(4)

4.5 Make a neat, labelled drawing showing the parting process. Your drawing should include a parting tool, a workpiece and a chuck.



Remember to show the direction of the tool.

(6)



4.6 FIGURE 3 below shows a vertical milling machine. Identify the parts of the machine by writing the number (1–5) and the name of the part next to it.

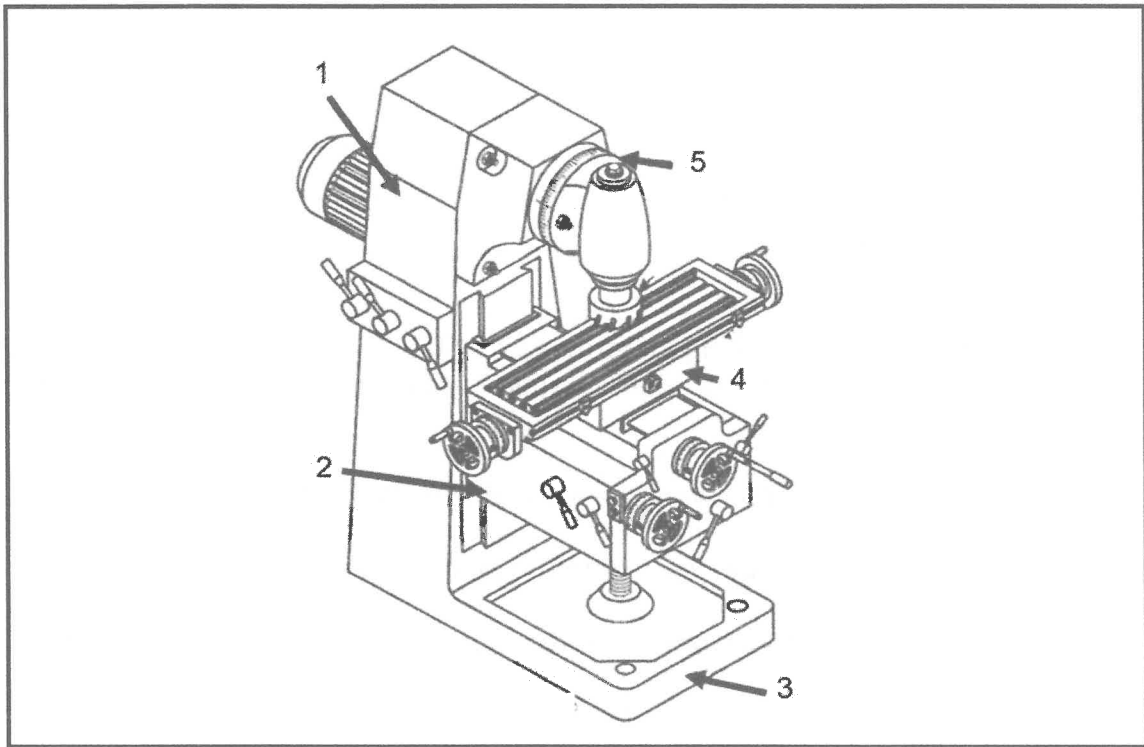


FIGURE 3

(5 × 1)

(5)

4.7 You are required to machine three slots on a shaft by using a milling machine. The slots must be separated at an angle of 120°. Use the Brown and Sharp dividing head to calculate the required indexing.



The details of the Brown and Sharp dividing head are as follows:

Plate 1: 15, 16, 17, 18, 19 and 20 holes

Plate 2: 21, 23, 27, 29, 31 and 33 holes

Plate 3: 37, 39, 41, 43, 47 and 49 holes

(5)

4.8 Charlie works for an engineering company as a tool and die maker. He is given a job instruction sheet to machine an engine part on a milling machine.

Develop a SIX-point work plan that he can follow to complete the job.

(6)





4.9 There are many different cutters used on milling machines. What is the name of the cutter in FIGURE 4 below?

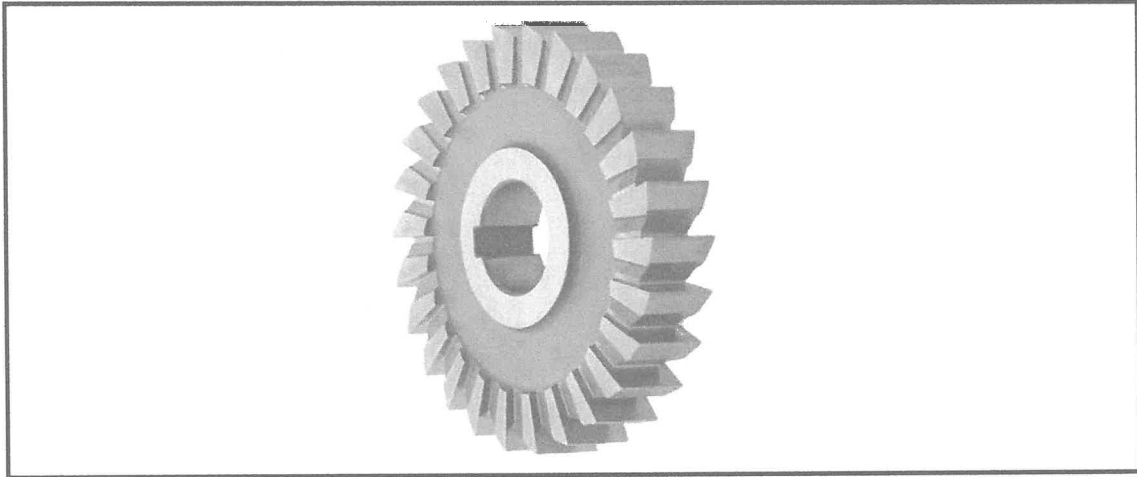


FIGURE 4

(2)  
[40]



**QUESTION 5**

5.1 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (5.1.1–5.1.4) in the ANSWER BOOK.

5.1.1 The abbreviation of computer-aided design is CAD.

5.1.2 Some CAD packages can be used for 3D printing and CNC.

5.1.3 The abbreviation CAM stands for computer-aided manufacturing.

5.1.4 Electrical circuits cannot be drawn with a CAD package.

(4 × 1) (4)

5.2 To be able to draw a CAD drawing, certain hardware is required. Name SIX such devices. (6)

5.3 Explain the function of the following CAD commands:

5.3.1 Ortho mode

5.3.2 OSNAP

(2 × 2) (4)

5.4 Draw the symbol to show diameter.



(1)  
[15]

**TOTAL: 100**





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