This question paper consists of 10 pages and a 1-page formula sheet.
NOTE: If you answer more than the required number of questions, only the required number of questions will be marked. All work you do not want to be marked, must be clearly crossed out.

INSTRUCTIONS AND INFORMATION

1. Answer ALL questions in SECTION A, except for QUESTION 1, where either QUESTION 1.1 OR QUESTION 1.2 must be answered.

2. Answer any FOUR questions in SECTION B.

3. Read ALL the questions carefully.

4. ALL diagrams must be clear and in good proportion.

5. Number the answers correctly according to the numbering system used in this question paper.

6. Write neatly and legibly.
SECTION A: GENERAL PRACTICE

The entire question in this section must be answered, except for QUESTION 1 where either QUESTION 1.1 OR QUESTION 1.2 could be answered.

QUESTION 1: OCCUPATIONAL SAFETY

1.1 Indicate whether the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number (1.1.1 – 1.1.5) in the ANSWER BOOK.

1.1.1 Tools with sharp edges may be carried in one's pocket, when working in a workshop. (1)

1.1.2 Colour codes can be used to identify fire-fighting equipment. (1)

1.1.3 The colour code used for pipelines containing air, is green. (1)

1.1.4 Persons under the influence of alcohol or drugs may enter any premises where machinery is used. (1)

1.1.5 When you work with flammable gas or liquids, make sure that there is enough ventilation in the workshop or around your work place. (1)

OR

1.2 Briefly describe the following regulation, as applicable to the Minerals Act no. 50 of 1991. Regulation 4.7.1 – Intoxicated person. [5]

QUESTION 2: MEASURING INSTRUMENTS

2.1 FIGURE 1 below gives an indication of a type of micrometer that is used as a measuring instrument in industry. Answer only the following questions:

FIGURE 1
2.1.1 Name the components of the micrometer (A – C) in your ANSWER BOOK. (3)
2.1.2 Name the type of micrometer. (1)
2.1.3 State the reading on the micrometer in FIGURE 1. (1)
2.2 State the degree of accuracy of each of the following measuring instruments:

2.2.1 A vernier height gauge (1)
2.2.2 A vernier protractor (1)
2.3 Indicate whether the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number (2.3.1 – 2.3.4) in the ANSWER BOOK.

2.3.1 The dial test indicator can be used for setting up the work pieces in a machine. (1)
2.3.2 The feeler gauge can be used to check the clearance between a nut and a bolt. (1)
2.3.3 The thread-pitch gauge can be used to measure the radius on the point of a screw cutting tool. (1)
2.3.4 The telescope gauge is a very accurate measuring instrument. (1)

[11]

QUESTION 3: SCREW THREADS

3.1 In practice various types of screw threads are used for specific purposes. Name THREE types of screw threads used in industry. (3)
3.2 Differentiate between a single start thread and a multi-start screw thread. (2)
3.3 Calculate the depth of an M20 x 2,5 screw thread and M20 being the diameter and 2,5 being the pitch in millimeters. (1)
[6]
QUESTION 4: METALS AND PLASTICS

4.1 There are two basic types of cast iron with each having its own functions. Identify the TWO basic types of cast iron used in industry. (2)

4.2 State FIVE alloying elements that can be added to steel to give it a specific property. (5)

4.3 Name the steel which uses the following colour code for identification purposes:
   4.3.1 Orange (1)
   4.3.2 Blue (1)

4.4 Nylon is used extensively in industry because of its specific properties. Name THREE of these properties. (3) [12]

QUESTION 5: MARKING OFF

5.1 Give THREE reasons why it is necessary to do marking off on a work piece. (3)

5.2 Name TWO methods which can be used to find the centre of a solid round shaft. (2) [5]

QUESTION 6: KEY AND KEYWAYS

6.1 Keyways can be cut in different machines using various methods. Name TWO machining processes applied to obtain keyways on shafts and in holes. (2)

6.2 State TWO uses for a feather key used in industry. (2)

6.3 Calculate the height and width of a key to be fitted to a shaft with a diameter of 45 mm. (2) [6]
QUESTION 9: HAND TAPS, STOCKS AND DIES AND REAMERS

9.1 Tapping holes in a work piece is a tricky process and faults can easily occur. State TWO thread cutting faults and explain how you would rectify these faults. (4)

9.2 How would you distinguish between a left-hand tap and a right-hand tap that is used to cut an internal thread in holes of a work piece? (1)

TOTAL SECTION A: 60

SECTION B: MACHINE CUTTING TOOLS AND MACHINES

NOTE: Answer only FOUR questions in this section

QUESTION 10: DRILLING MACHINES

10.1 Before you can operate any drilling machine in the workshop, you must be familiar with the components and their different functions. Write the answer next to the question number (A – E) in your ANSWER BOOK and also the correct drilling machine components as seen in FIGURE 3 below.

FIGURE 3 (5)
QUESTION 7: HAND TOOLS

7.1 Name TWO types of screwdrivers commonly used in practice. (2)

7.2 Name THREE different types of chisels that can be used in industry for a specific purpose. (3)

7.3 What is the main use of a long nose plies? (1) [6]

QUESTION 8: FASTENERS

Write the answer next to the question number (A – D) in the ANSWER BOOK. Name the components (A – D) in FIGURE 2 and name the screw thread fastener or auxiliary fastener used in industry.

![FIGURE 2](image_url)
10.2 State THREE uses of cutting fluids when you are using the drilling machine on a work piece.

10.3 You are required to drill four holes on a flange and the following information is given to you:

Diameter of drill : 20 mm
Speed of the drill : 138 r/min

Calculate the following:

10.3.1 The spindle speed in revolutions per second

10.3.2 The cutting speed in millimeters per second

QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS

11.1 Write the answer next to the question number (A – F) in the ANSWER BOOK. When you mount a grinding wheel you must be familiar with the components that make up the assembly. Name the components (A – F) as shown in FIGURE 4 below, in the ANSWER BOOK.
11.2 Explain what is meant by **positive rake angle** and **negative rake angle**, when working with cutting tools in order to have an effective tool in the machine shop. (2)

11.3 Briefly explain what is meant by the term **chip breaking**, as applicable to machine cutting tools. (2)

**QUESTION 12: SHAPING MACHINE**

12.1 Name FOUR main components that are actuated when altering the length of the stroke on the shaping machine in the workshop. (4)

12.2 State the function of the compensating link on the shaping machine. (1)

12.3 The following information was given to you to machine a cast iron block:

- Length of the work piece = 225 mm
- Width of the work piece = 240 mm
- Cutting speed = 15 m/min
- Table feed = 2 mm per stroke
- Total clearance = 25 mm
- Stroke ratio = 2:1

Calculate the following:

12.3.1 The cutting speed ratio (1)

12.3.2 The number of strokes per minute (2)

12.3.3 The total time needed for one cut across the work piece width (2)
QUESTION 13: CENTRE LATHE

13.1 State TWO disadvantages when machining a work piece between centres on a centre lathe. (2)

13.2 State THREE advantages in using mandrels on a centre lathe. (3)

13.3 Explain the function of the following centre lathe components or accessories of a centre lathe in the machine shop:

13.3.1 Tailstock (1)

13.3.2 Independent four-jawed chuck (1)

13.3.3 Half centre (1)

13.4 State TWO differences between a CNC lathe and a conventional lathe. (2) [10]

QUESTION 14: MILLING MACHINE

14.1 State THREE distinguishing factors between the plain and universal milling machine that are commonly used in industry. (3)

14.2 The milling machine is a very versatile machine. State TWO uses of a milling machine. (2)

14.3 State the function of the following components found on a milling machine in the workshop:

14.3.1 Bracing arms (1)

14.3.2 Table trips (1)

14.3.3 Arbor (1)

14.3.4 Adjusting tailstock (1)

14.3.5 Spindle (1) [10]

TOTAL SECTION B: 40
GRAND TOTAL: 100
Fitting and Machining Theory N1

Formula Sheet

Any applicable formula may also be used.

1. \[ V = \pi \times D \times N \]

2. \[ w = \text{feed}/\text{stroke} \times \text{strokes/min} \times t \]
   \[ w = \text{toevoer}/\text{slag} \times \text{slaе/min} \times t \]

3. \[ \text{Strokes/min} = \frac{S}{\text{Length of stroke}} \times \text{Ratio} \]
   \[ \text{Slaе/min} = \frac{S}{\text{Lengte van slag}} \times \text{Verhouding} \]

4. \[ h = \frac{D}{6} \]

5. \[ w = \frac{D}{4} \]