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# higher education & training

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

T640(E)(A16)T  
APRIL EXAMINATION

**NATIONAL CERTIFICATE**

**FITTING AND MACHINING THEORY N1**

(11021871)

**16 April 2015 (Y-Paper)**  
**13:00–16:00**

**This question paper consists of 8 pages and 1 formula sheet.**

**DEPARTMENT OF HIGHER EDUCATION AND TRAINING**  
**REPUBLIC OF SOUTH AFRICA**  
NATIONAL CERTIFICATE  
FITTING AND MACHINING THEORY N1  
TIME: 3 HOURS  
MARKS: 100

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**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. ALL the questions in SECTION A must be answered, except QUESTION 1 where either QUESTION 1.1 or QUESTION 1.2 must be answered.
  2. Answer ALL FOUR questions from SECTION B.
  3. Read ALL the questions carefully.
  4. Number the answers according to the numbering system used in this question paper.
  5. All the sketches must be neat, fully labelled, reasonably large and in good proportion.
  6. Write neatly and legibly.
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**SECTION A: GENERAL PRACTICE**

Answer ALL the questions in this section, except QUESTION 1, where either QUESTION 1.1 or QUESTION 1.2 must be answered.

**QUESTION 1: OCCUPATIONAL SAFETY**

- 1.1 Colour codes are a safety measure which is used to identify pipelines that carry different contents.

State the content in the pipelines which have the following colours.

- 1.1.1 Golden brown  
 1.1.2 Bright green  
 1.1.3 Silver or aluminium  
 1.1.4 Arctic blue  
 1.1.5 Jacaranda

(5 x 1) (5)

**OR**

- 1.2 1.2.1 Regulation 10.2.4 discusses the use of compressed air.  
 Indicate THREE instances where compressed air shall not be used. (3)
- 1.2.2 Name TWO important surface-protection devices to be used when working in a dangerous mining area. (2)

[5]

**QUESTION 2: MEASURING INSTRUMENTS**

- 2.1 Indicate by means of an enlarged drawing, the reading 65,28 mm on an inside micrometer. A 12 mm distance piece is available as well as one of the following accessories:

- 50–75 mm  
 75–100 mm  
 100–125 mm  
 125–150 mm  
 150–175 mm  
 175–200 mm

Note: Barrel scale: 13 mm only

(5)

2.2 Label the components of the micrometer as shown in FIGURE 1 by writing only the answers next to the letters (A–E) in the ANSWER BOOK.

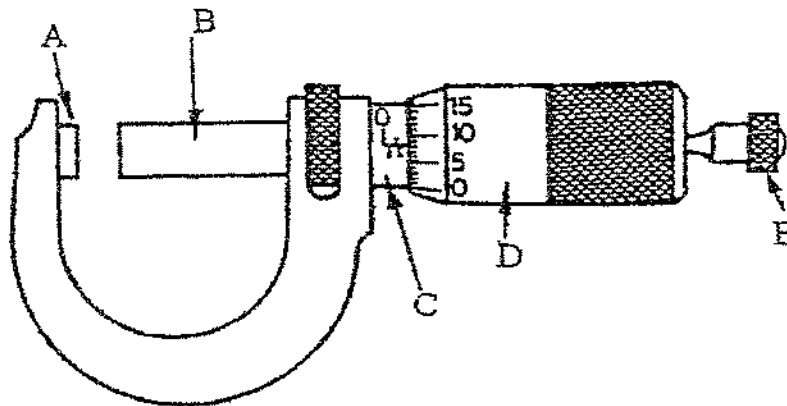


FIGURE 1

(5)

2.3 A feeler gauge is an important instrument used in industry.

State the practical use of a feeler gauge.

(1)

[11]

**QUESTION 3: SCREW THREADS**

3.1 Explain the difference between *external* and *internal threads*.

(2)

3.2 Make a neat drawing of the following screw-thread profiles:

3.2.1 Square thread

3.2.2 Acme thread

Also show the pitch, depth and included angle for each.

(2 x 2)

(4)

[6]

**QUESTION 4: HAND TOOLS**

4.1 Hammers are designed and used for various tasks.

Explain TWO uses of the ball-peen hammer.

(1)

4.2 Punches are used for a wide range of work.

State THREE types of punches used in industry.

(3)

4.3 Explain by means of a drawing why the set of a hacksaw blade is so important.

(2)

[6]

**QUESTION 5: METALS AND PLASTICS**

5.1 To perform various functions in industry, steel undergoes various heat treatment processes.

Describe the purpose of each of the following heat-treatment processes that are performed on steel:

5.1.1 Hardening

5.1.2 Annealing

5.1.3 Normalising

5.1.4 Tempering

5.1.5 Case-hardening

(5 x 1) (5)

5.2 Non-ferrous alloy is a combination of two or more non-ferrous elements.

State the composition and ONE use for each of the following non-ferrous alloys used in industry:

5.2.1 Brass

5.2.2 Bronze

(2 x 2) (4)

5.3 Plastics are described as a group of non-metallic materials.

Identify TWO types of plastics commonly used in industry.

(2)

5.4 As an employee in the workshop why is colour-coding of metals important to you?

(1)

[12]

**QUESTION 6: MARKING OFF**

6.1 Name FOUR main components of a combination set.

(4)

6.2 For what purpose are V-blocks used during a marking-off operation?

(1)

[5]

**QUESTION 7: KEYS AND KEYWAYS**

7.1 Name FOUR types of keys used in practice to prevent rotation between mating machine parts.

(4)

7.2 Calculate the height and the width of a feather key if a 30 mm diameter shaft must be keyed to a pulley.

(2)

[6]

**QUESTION 8: FASTENERS**

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (8.1–8.4) in the ANSWER BOOK.

- 8.1 Allen screws are self-tapping screws.
- 8.2 We use drive screws to connect drives between two machines.
- 8.3 The nylon nut is a positive locking nut.
- 8.4 Flat washers spread the tightening load of a nut over a larger area.
- (4 x 1) (4)  
[4]

**QUESTION 9: HAND TAPS, STOCKS, DIES AND REAMERS**

- 9.1 Taps are used to cut an internal thread in a hole.  
Explain TWO methods that can be used to remove a broken tap from a hole. (2)
- 9.2 Explain the function of a reamer when used in a workshop. (1)
- 9.3 Explain the function of stocks and dies. (1)
- 9.4 State ONE type of die used in industry. (1)  
[5]

**TOTAL SECTION A: 60**

**SECTION B: MACHINE CUTTING TOOLS AND MACHINES**

NOTE: Answer ALL FOUR questions from this section.

**QUESTION 10: DRILLING MACHINES**

- 10.1 Name THREE general drilling machines used in industry. (3)
- 10.2 Explain with the aid of a drawing what is meant by counter boring.  
The drill profile and the workpiece must be shown. (3)
- 10.3 Give ONE reason why the drilling point of a drill bit is ground to an obtuse point when thin plate is drilled. (1)
- 10.4 A 15 mm diameter hole must be drilled in a piece of aluminium. The cutting speed is given as 60 m/min.  
Calculate the speed of the drill in revolutions per minutes (r.p.m.). (3)  
[10]

**QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS**

- 11.1 State FIVE factors to be considered before selecting a grinding wheel for a specific job. (5)
- 11.2 Name the centre-lathe cutting tool that is used to cut off the completed workpiece. (1)
- 11.3 Explain the difference between a positive rake angle and a negative rake angle. (2)
- 11.4 In industry, boring bars are used on certain machines.  
Explain by means of a freehand drawing the purpose of a boring bar. (1)
- 11.5 What is the function of a chip breaker? (1)
- [10]

**QUESTION 12: CENTRE LATHE**

- 12.1 Name TWO taper turning methods used in practice. (2)
- 12.2 State THREE advantages of using a three-jaw self-centring chuck on the centre lathe. (3)
- 12.3 Before cutting a screw thread on a lathe with a 60° toolbit, certain prerequisites need to be taken into account.  
State THREE of these prerequisites. (3)
- 12.4 State TWO disadvantages of the CNC lathe when compared to the conventional lathe. (2)
- [10]

**QUESTION 13: MILLING MACHINE**

- 13.1 State THREE distinguishing factors between the plain and the universal milling machine. (3)
- 13.2 Name TWO uses of a milling machine. (2)
- 13.3 Describe the functions of the following components on a milling machine.
  - 13.3.1 Machine vice
  - 13.3.2 Dividing head
  - 13.3.3 Arbor
  - 13.3.4 Adjustable tailstock
  - 13.3.5 Ripping cutter

(5 x 1) (5)  
[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.  $w = \text{feed/stroke} \times \text{strokes/min} \times t$   
 $w = \text{toevoer/slag} \times \text{slae/min} \times t$

3.  $\text{Strokes/min} = \frac{S}{\text{Length of stroke}} \times \text{Ratio}$

$$\text{Slae/min} = \frac{S}{\text{Lengte van slag}} \times \text{Verhouding}$$

4.  $h = \frac{D}{6}$

5.  $w = \frac{D}{4}$