higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T710(**E**)(A4)T

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N1

(11021871)

4 April 2017 (X-Paper)
09:00–12:00

Calculators and drawing instruments may be used.

This question paper consists of 9 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

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 the questions in SECTION A.
2. Answer the FOUR questions in SECTION B.
3. Answer either question 1.1 OR 1.2 of QUESTION 1.
4. Read ALL the questions carefully.
5. Number the answers according to the numbering system used in this question paper.
6. Write neatly and legibly.

SECTION A: GENERAL FITTING

QUESTION 1: OCCUPATIONAL SAFETY

1.1 State FIVE safety measures when using hand tools. (5)

OR

1.2 Explain what is meant by Regulation 10.1.1 of the Minerals Act of 1991 which deals with working in harmful air. Give FIVE important points of information. (5)

[5]

QUESTION 2: MEASURING INSTRUMENTS

2.1 Make a neat drawing of only the reading of the following measuring instrument (Note: Please use half of a single page for your drawing and the necessary extension rod needs not be drawn):

Metric inside micrometer: 98,16 mm (4)

2.2 Give the degree of accuracy of the following measuring instruments

2.2.1 Metric outside micrometer

2.2.2 Vernier protractor

2.2.3 Metric inside micrometer

(3 × 1) (3)

2.3 Label the component parts (2.3.1 – 2.3.5) of the vernier protractor shown in FIGURE 1 below.

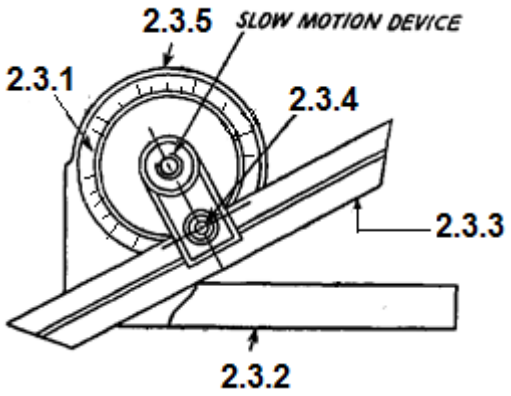

FIGURE 1 (5 x 1) (5)

[12]

QUESTION 3: SCREW THREADS

3.1 Name TWO advantages of the application of an acme thread in machinery. (2)

3.2 Explain the difference between the screw-thread terms *pitch* and *lead*. (2)

3.3 Calculate the depth of a M24 metric screw thread if the distance between the two consecutive threads is 2 mm. (1)
[5]

QUESTION 4: HAND TOOLS

4.1 Label the hand tools (4.1.1–4.1.5) in FIGURE 2 below in the ANSWER BOOK.

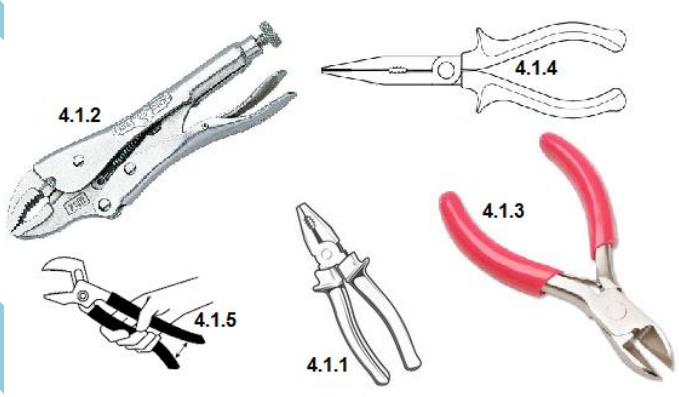

FIGURE 2 (5 x 1) (5)

4.2 Name THREE of the main grades of file types available to the fitter. (Please note: The answer should not include file shapes that are called flat, round, half-round etc.) (3)
[8]

QUESTION 5: METALS AND PLASTICS

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 (5.1–5.7) in the ANSWER BOOK.

5.1 The colour code used to identify low carbon steel is …

A orange
B green
C black
D blue

5.2 The process to reduce the brittleness after the hardening process is called …

A hardening.
B tempering.
C quenching.
D normalising.

5.3 The mineral which aluminium is produced from is called …

A limestone
B duralumin
C aluminous clay
D bauxite

5.4 White cast iron includes the following elements:

A Phosphorus and sulphur
B Sulphur and manganese
C Phosphorus and manganese
D Manganese and vanadium

5.5 Carbon is added to iron ore in the form of … flakes, making it harder and stronger.

A carbon dioxide
B teflon
C graphite
D phosphorus

5.6 Copper, tin, lead and aluminium are all …

A metals not found on the periodic table
B alloys
C ferrous metals
D non-ferrous metals

5.7 The purpose of quenching a metal after heating it is to … the metal.

A harden
B temper
C soften
D cool

(7 × 1) **[7]**

QUESTION 6: MARKING OFF

6.1 Give a brief explanation of the application of the following marking-off tools:

6.1.1 Scriber

6.1.2 Dividers

6.1.3 Jenny callipers

6.1.4 Centre punch

6.1.5 Dot (prick) punch

(5 × 1) **[5]**

QUESTION 7: KEYS AND KEYWAYS

7.1 Name the key which is used for locating purposes when the drive between the shaft and pulley is transmitted by the taper fit. (1)

7.2 Name the key that use two screws to lift the workpiece out of its keyway. (1)

7.3 Name the key which is provided with a head at the large end of a taper. (1)

7.4 Name the key which has no taper and is uniform in width and thickness for its whole length. (1)

7.5 Give TWO uses for a rectangular key. (2)
[6]

QUESTION 8: FASTENERS

8.1 Name the THREE types of screws which produce their own screw thread. (3)

8.2 State the main use of black bolts. (1)
[4]

QUESTION 9: HAND TAPS, STOCKS AND DIES AND REAMERS

9.1 Explain the difference between a *split die* and a *solid die* when used on external screw threads. (2)

9.2 Briefly explain the difference between a *machine reamer* and a *hand reamer* in THREE important points. (3)

9.3 Give THREE causes of tapping faults. (3)
[8]

TOTAL SECTION A: 60

SECTION B: MACHINES

ANSWER ALL THE QUESTIONS IN SECTION B

QUESTION 10: DRILLING MACHINES

10.1 Explain what you know about the *column drilling machine* (also known as *pillar type*) by describing the method of feed, auto-feed, speed selection, work holding-table and the maximum allowable drill diameter commonly associated with its use. (5)

10.2 Name THREE methods which can be used to clamp a workpiece on a drilling machine table. (3)

10.3 An apprentice must drill TWO holes into a gearbox casing. The diameter of the drill bit is 8 mm and the cutting speed of the steel is 30 m/min.

Calculate:

10.3.1 The rotational speed in rev/min (RPM)

10.3.2 The rotational speed in rev/second

(2 × 1) (2)
[10]

QUESTION 11: GRINDERS AND MACHINE CUTTING TOOLS

11.1 Explain the purpose of *ring testing* a grinding wheel prior to assembly. (1)

11.2 Name the lathe cutting tool used for cutting an accurate internal diameter (hole). (1)

11.3 Give ONE function of guards on a pedestal grinder. (1)

11.4 Explain the function of a key and keyway on a pedestal grinder (1)

11.5 What machining processes are used as indicated in FIGURE 3 below? Write only the answer next to the question number (11.5.1– 1.5.5) in the ANSWER BOOK.

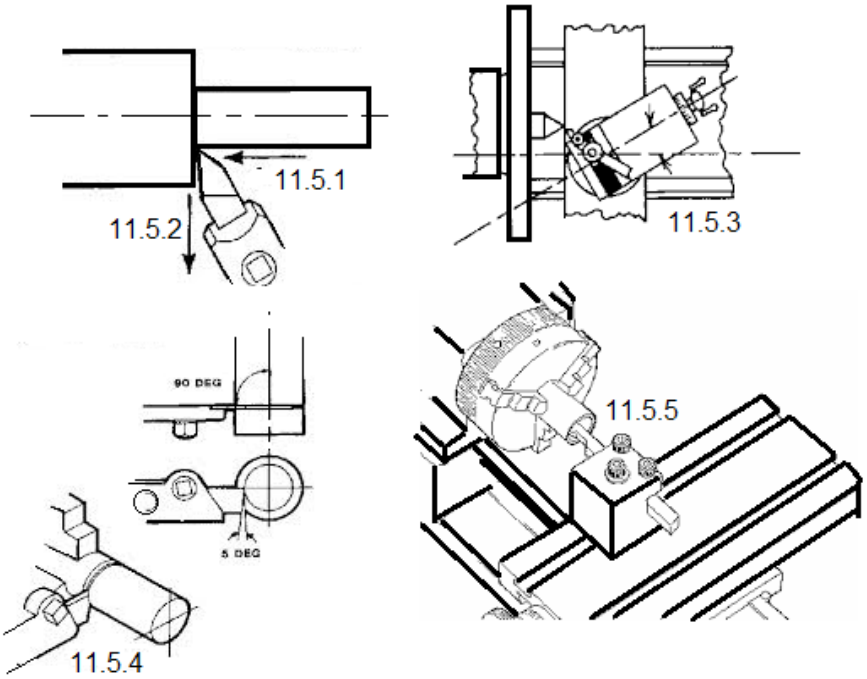

FIGURE 3 (5 x 1) (5)

11.6 Explain what is meant by the term *truing*. (1)

[10]

QUESTION 12: CENTRE LATHE

12.1 Identify the lathe parts/components (12.1.1–12.1.5) in FIGURE 4 below.

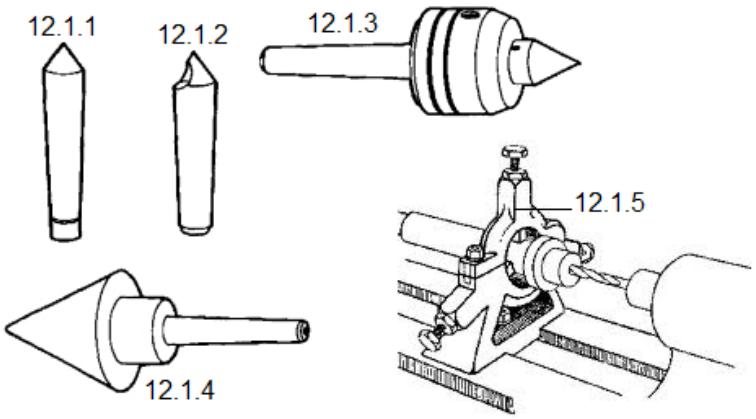

FIGURE 4 (5 x 1) (5)

12.2 Give ONE advantage of the 4-jaw independent chuck. (1)

12.3 Indicate TWO of the main differences between the CNC lathe and the conventional centre lathe. (2)

12.5 Give TWO advantages when machining a workpiece between centres. (2)
[10]

QUESTION 13: MILLING MACHINE

13.1 Label the milling machine parts (13.1–13.10) in FIGURE 5 below.

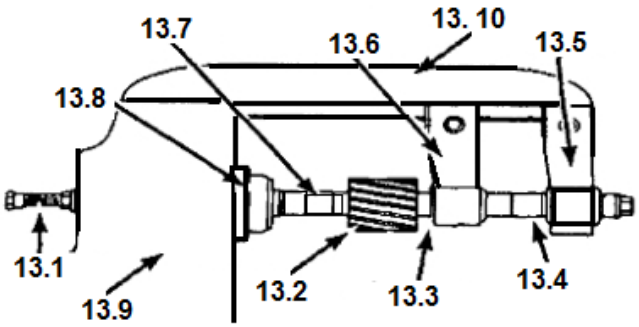

FIGURE 5 (10 x 1) **[10]**

TOTAL SECTION B: 40
GRAND TOTAL: 100

FITTING AND MACHINING THEORY N1

FORMULA SHEET

Any applicable formula may also be used

1. $S = \frac{\Pi DN}{60}$

2. $N = \frac{1000 \times S}{\Pi \times D}$

3. *W = Feed/stroke x strokes per minute x t*
   W = Toevoer/slag x slae/minuut x t

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

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

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

7. *t =D/12 (keyway)*
8. *L = 1.5 x D*

9. *Depth of thread = 0,65 x P (Steek)*