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Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T630**(E)**(A4)T

APRIL EXAMINATION

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N1

(11021871)

4 April 2016 (X-Paper)
09:00–12:00

Calculators and drawing instruments may be used.

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

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
FITTING AND MACHINING THEORY N1
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer either QUESTION 1.1 or 1.2 QUESTION from SECTION A.
2. Answer 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. Write neatly and legibly.

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SECTION A

QUESTION 1: OCCUPATIONAL SAFETY

NOTE: Answer ONLY QUESTION 1.1 OR QUESTION 1.2

1.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and 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.

1.1.2 Color codes can be used to identify fire-fighting equipment.

1.1.3 The colour code used on pipelines containing air is green.

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

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

(5 x 1) (5)

OR

1.2 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

1.2.1 If your balance is good, you may carry a toolbox and loose material up a ladder.

1.2.2 Every drill-sharpening shop shall be kept clean and ventilated from dust.

1.2.3 Before going home, it is always good to clean your clothes by using compressed air.

1.2.4 Safety hats need not to be worn by visitors, only by the workers working in that area.

1.2.5 To make a fire underground to warm up your food is a time-saving plan.

(5 x 1) (5)

[5]

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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:

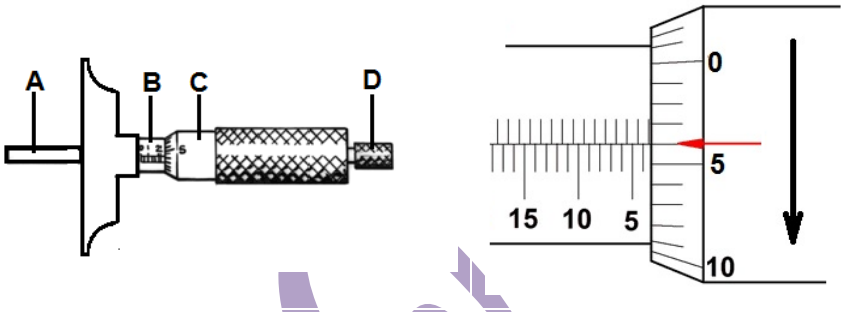

FIGURE 1

2.1.1 Name the components of the micrometer A–D by writing only the answers next to (A–D) in your ANSWER BOOK. (4)

2.1.2 Name the type of micrometer. (1)

2.1.3 State the reading on the micrometer in FIGURE 1. (2)

2.2 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (2.2.1–2.2.4) in the ANSWER BOOK.

2.2.1 The dial test indicator can be used for setting up the work pieces in a machine.

2.2.2 The feeler gauge can be used to check the clearance between a nut and a bolt.

2.2.3 The thread-pitch gauge can be used to measure the radius on the point of a screw-cutting tool.

2.2.4 The telescope gauge is a very accurate measuring instrument.

(4 x 1) (4)

[11]

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QUESTION 3: SCREW THREADS

3.1 Screw threads are used when it is necessary to assemble and dismantle components quickly and easily.

Explain the meaning of each of the following screw-thread terms:

3.1.1 Pitch

3.1.2 Lead

3.1.3 Included angle

3.1.4 External thread (4 x 1) (4)

3.2 Calculate the depth of a M24 x 2.5 V-screw Thread, if the depth formula is 0,613 x the pitch. (2)
[6]

QUESTION 4: METALS AND PLASTIC

4.1 Name TWO types of cast iron known to you and state where they are used. (2)

4.2 Compare the outcomes in properties and the heat-treatment processes, between hardening and case hardening**.** (4)

4.3 State the composition, ONE property and ONE use of each the following non-ferrous alloys:

4.3.1 Brass

4.3.2 Bronze (3 x 2) (6)
[12]

QUESTION 5: MARKING-OFF

5.1 Give TWO reasons why it is necessary to do marking-off on a work piece. (2)

5.2 Describe the function of each of the following marking-off tools:

5.2.1 Engineer's square

5.2.2 Angle plate

5.2.3 Measuring tape (3 x 1) (3)
[5]

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QUESTION 6: KEYS AND KEYWAYS

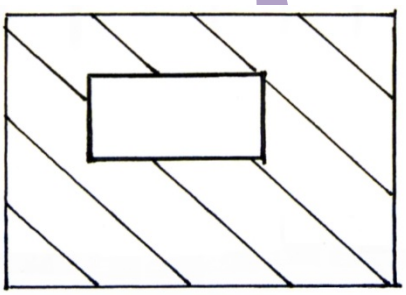
6.1 Briefly discuss FOUR methods of cutting internal keyways. (4)

6.2 State TWO uses for a rectangular key in industry. (2)
[6]

QUESTION 7: HAND TOOLS

7.1 Name TWO types of screwdrivers commonly used in practice. (1)

7.2 Study the drawing and explain the filing method you will use to file the inside hole perfectly square.



(4)

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

QUESTION 8: FASTENERS

8.1 There are various types of fasteners available that are designed to meet the specific requirements to join specific parts in an assembly.

State the function of locking fluid used in industry. (1)

8.2 Give TWO types of frictional lock nuts that are available in industry. (2)

8.3 Indicate whether the following statement is true or false:

Allen-cap screws are self-tapping screws. (1)
[4]

QUESTION 9: HAND TAPS, STOCK, DIES AND REAMERS

9.1 Taps are used to cut an internal thread in a hole of a work piece.

Name THREE taps that make up a typical set that is used in industry. (3)

9.2 We use a stock and a die together to cut an external thread on the outside surface of shafts, rods or bolts.

Name TWO types of dies used in industry. (2)
[5]

TOTAL SECTION A: 60

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SECTION B: MACHINE-CUTTING TOOLS AND MACHINES

ANSWER ALL FOUR QUESTIONS:

QUESTION 10: DRILLING MACHINES

10.1 State THREE uses of cutting fluids when used on a drilling machine. (3)

10.2 The cutting speed for mild steel is 30 metres per minute and the diameter of the drill is 12 mm.

Calculate the drilling machine speed in revolutions per second to drill the hole. (3)

10.3 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (10.3.1–10.3.4) in the ANSWER BOOK.

10.3.1 The process that makes provision for a 60- degree screw head to be flushed with the surface of a work piece is known as counter-boring.

10.3.2 The feed of the drill on a sensitive drilling machine is transferred by means of a plain lever on which a pinion is fitted and meshes in with a rack.

10.3.3 To remove a straight-shank drill from a drilling machine spindle, a taper drift is used.

10.3.4 Drills up to 50 mm in diameter may be used on a column drilling machine. (4 x 1) (4)

[10]

QUESTION 11: GRINDING MACHINES AND MACHINE-CUTTING TOOLS

11.1 Grinding machines are more dangerous than any other workshop equipment and care must be taken when operating the machine.

State TWO advantages of the diamond-tipped wheel dresser in contrast to the standard Huntington wheel dresser. (2)

11.2 Give TWO reasons for using compressible washers on the sides of a grinding wheel. (2)

11.3 What is the ratio of the flanges of the wheel assembly to the grinding wheel itself (1)

11.4 For cutting tools to be effective, the tool angles must be ground correctly and accurately.

Explain what is meant by positive rake and negative rake when working with cutting tools. (2)

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11.5 Describe the term chip breaking as applicable to machine cutting tools. (2)

11.6 What is the purpose of a boring bar? (1)
[10]

QUESTION 12: CENTRE LATHE

12.1 The centre lathe is probably one of the most versatile machines in a workshop.

Indicate TWO lathe beds that are used on a centre lathe in industry. (2)

12.2 Name THREE advantages of using a three-jaw self-centering chuck on the centre lathe. (3)

12.3 State THREE methods that can be used on the centre lathe for cutting tapers. (3)

12.4 Indicate TWO advantages of the CNC lathe when compared to the conventional lathe. (2)
[10]

QUESTION 14: MILLING MACHINE

13.1 The milling machine is key piece of equipment in any modern workshop and it produces mainly flat surfaces.

Indicate THREE distinguishing factors between the plain and universal milling machine. (3)

13.2 Describe the function of each of the following components on and with a milling machine.

13.2.1 Table trips

13.2.2 Graduated dial handle

13.2.3 Arbor support

13.2.4 Adjustable Footstock/tailstock

13.2.5 Arbor

13.2.6 Dividing head

13.2.7 Boring head

(7 x 1) (7)
[10]

TOTAL SECTION B: 40
TOTAL: 100

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FITTING AND MACHINING THEORY N1

FORMULA SHEET

Any applicable formula may also be used

1. $S=\frac{\Pi DN}{60}$
2. $S= \Pi D$
3. $N =\frac{1\ 000\ S}{\pi D}$
4. $h = \frac{D}{6}$
5. $w = \frac{D}{4}$
6. $depth = D/12$
7. $Length = 1,5\ D$

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