higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T921(E)(N23)T
NOVEMBER 2010

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N1

(11021871)

23 November (X-Paper)
09:00 – 12:00

This question paper consists of 8 pages and a 1-page 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. ALL the questions in SECTION A must be answered, except for QUESTION 1 where either QUESTION 1.1 and QUESTION 1.2 or QUESTION 1.3 and QUESTION 1.4 must be answered.
2. Answer any FOUR questions in SECTION B.
3. Read ALL the questions carefully and thoroughly before answering them.
4. ALL sketches must be neat, reasonably large and in good proportion.
5. ALL sketches must be labelled.
6. 1 mark = 1%
7. Write neatly and legibly.

SECTION A: GENERAL PRACTICE

QUESTION 1: OCCUPATIONAL SAFETY

Answer QUESTION 1.1 and QUESTION 1.2 or QUESTION 1.3 and QUESTION 1.4/

1.1 Name THREE methods which you will apply to promote safe working conditions in a workshop. (3)

1.2 State TWO reasons for wearing gloves in a machine workshop. (2)
[5]

OR

1.3 State THREE facts that must be taken into account when working with compressed air. (3)

1.4 Name TWO of the most important surface protection devices used when working in a dangerous mining area. (2)
[5]

QUESTION 2: MEASURING INSTRUMENTS

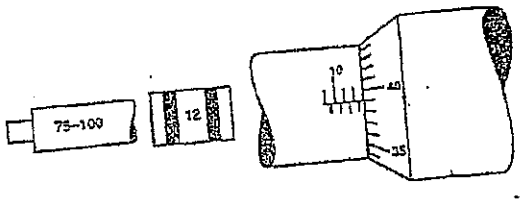

FIGURE 1

2.1 FIGURE 1 indicates a reading as seen on a metric inside micrometer.

2.1.1 Write the correct reading as seen in FIGURE 1. (1)

2.1.2 Name the degree of accuracy of the measuring instrument in FIGURE 1. (1)

2.1.3 How long is the main scale on the inside micrometer? (1)

2.1.4 What is the purpose of the handle supplied with the inside micrometer? (1)

2.2 Make a neat, enlarged drawing of only the reading of the following measuring instruments:

2.2.1 A metric depth micrometer: 18,24 mm (4)
2.2.2 A vernier protractor: 26° 55' (3)
[11]

PTO

QUESTION 3: SCREW THREADS

Make a neat drawing and also indicate the included angle of the following screw threads profiles:

3.1	V-screw thread	(2)
3.2	Square screw thread	(2)
3.3	Acme screw thread	(2)
		[6]

QUESTION 4: HAND TOOLS

4.1	Files can be identified by their different types of file cuts. Name the different types of file cuts.	(2)
4.2	Name TWO different types of chisels that can be used in industry for a specific purpose.	(2)
4.3	What advantages does the extension piece give the socket and the ratchet wrench?	(1)
4.4	Explain how the tension is adjusted on a hacksaw blade.	(1)
		[6]

QUESTION 5: METALS AND PLASTICS

5.1	Name the TWO basic types of cast iron used in industry.	(2)
5.2	Give FIVE alloying elements that can be added to steel to give it a specific property.	(5)
5.3	Name the steel which has the following colour code used as identification:	
5.3.1	Orange	(1)
5.3.2	Blue	(1)
5.4	We use nylon in engineering because it has specific properties. Name THREE of these properties.	(3)
		[12]

QUESTION 6: MARKING OFF

Write the question number 6A – 6E in FIGURE 2 underneath each in the ANSWER BOOK and give the name of the correct marking off tool next to each question number.

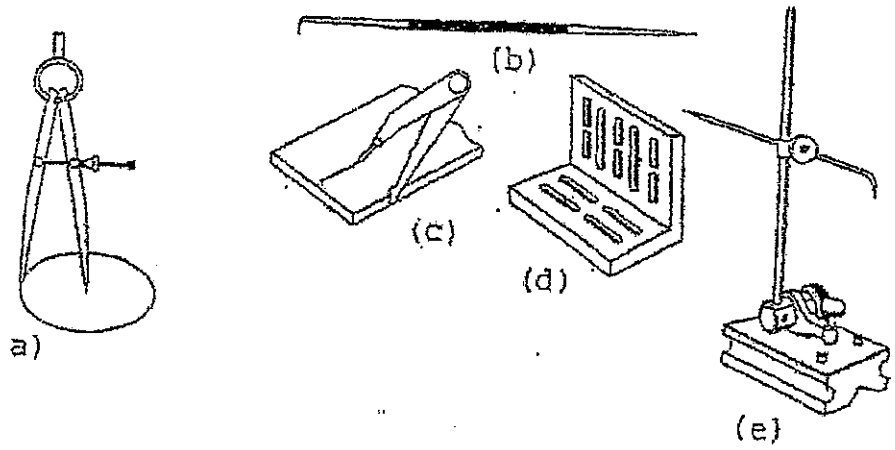

FIGURE 2 **[5]**

QUESTION 7: KEYS AND KEYWAYS

7.1 Name FOUR different 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 30 mm diameter shaft must be keyed to a pulley. (2)
[6]

QUESTION 8: FASTENERS

Indicate whether the following statements are TRUE or FALSE. 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. (1)

8.2 We use drive screws to connect drive between two machines. (1)

8.3 The nylon nut is a positive locking nut. (1)

8.4 Flat washers spread the tightening load of a nut over a larger area. (1)
[4]

QUESTION 9: HAND TAPS, STOCKS, DIES AND REAMERS

9.1 Name any THREE different types of reamers which can be used in a workshop to enlarge a hole. (3)

9.2 Explain the function of stocks and dies. (1)

9.3 When is a plug tap used? (1)
[5]

TOTAL SECTION A: 60

SECTION B: MACHINE CUTTING TOOLS AND MACHINES

NOTE: Only FOUR questions in this section must be answered.

QUESTION 10: DRILLING MACHINE

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 work piece must be shown. (3)

10.3 Give ONE reason why the drill point of a drill is ground to an obtuse point when a thin plate is drilled. (1)

10.4 A 15 mm diameter hole must be drilled in a piece of metal. The cutting speed is given as 600 mm/sec. Calculate the speed of the drill in revolutions per minutes. (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 FIGURE 3 indicates certain centre lathe cutting tools. Write the letters underneath each other in the ANSWER BOOK and name the cutting tool next to the letter.

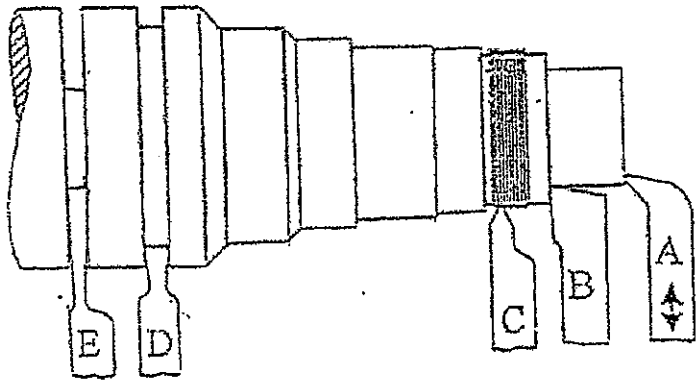

FIGURE 3 (5)
[10]

QUESTION 12: SHAPING MACHINE

12.1 Name the THREE basic components of the ram head. (3)

12.2 Name the THREE methods that are used in industry when setting the machine vice on a shaping machine. (3)

12.3 A carbide-tipped tool is used to machine a cast-iron block of 450 mm long and 200 mm wide. A feed of 5,5 mm per stroke is used. The cutting speed is 30 meters per minutes and the stroke ratio is 3:2. Calculate the time it would take to cut across the width of the block. (4)
[10]

QUESTION 13: CENTRE LATHE

13.1 Name TWO centre lathe beds known to you that are used in practice. (2)

13.2 State THREE advantages of using a three jaw self-centring chunk on the centre lathe. (3)

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

13.4 State TWO disadvantages of the CNC lathe when compared to the conventional lathe. (2)
[10]

QUESTION 14: MILLING MACHINE

14.1 State TWO safety precaution applicable when working on a milling machine. (2)

14.2 Name FOUR components you would find on a milling machine and describe the function of each. (8)
[10]

TOTAL SECTION B: 40
GRAND TOTAL: 100

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FORMULA SHEET

Any applicable formula may also be used.

1. $V = \pi \times D \times N$

2. $w = feed/stroke \times strokes/min \times t$
   $w = toevoer/slag \times slae/min \times t$

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

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

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

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