T700(E)(M28)T
APRIL 2012

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N1
(11021871)

28 March (X-Paper)
09:00 – 12:00

This question paper consists of 11 pages.
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, 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. Number the answers correctly according to the numbering system used in this question paper.

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

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

QUESTION 1 OCCUPATIONAL SAFETY

1.1 Accidents are caused by unsafe conditions of machinery, equipment or surroundings. State FIVE unsafe conditions in the workshop that can lead to accidents to the workers.

OR

1.2 Briefly explain the following regulation as applicable to the Minerals Act, (Act No. 50 of 1991):

Regulation 4.7.1 – Persons in a state of intoxication

QUESTION 2: MEASURING INSTRUMENTS

2.1 The depth micrometer is used for measuring the depths of holes, slots and recesses. Write the letters A – E in the ANSWER BOOK and name the components of the depth micrometer as seen in FIGURE 1 below.

![FIGURE 1]

(5)
2.2 2.2.1 The vernier calliper is an important measuring instrument used in industry. Write the numbers (1 - 4) in the ANSWER BOOK and name the components of the vernier calliper as seen in FIGURE 2 below.

![FIGURE 2](image)

2.2.2 State ONE advantage and ONE disadvantage of the vernier calliper.

QUESTION 3: SCREW THREADS

3.1 Screw threads are used when it is necessary to assemble or dismantle components quickly and easily. Explain the meaning of the following screw thread terms:

3.1.1 Lead
3.1.2 Included angle
3.1.3 Depth
3.1.4 Pitch

3.2 Calculate the depth of an M20 x 2.5 screw thread; M20 being the diameter and 2.5 being the pitch in millimetres.
QUESTION 4: METALS AND PLASTICS

4.1 Indicate THREE general features to be observed when the spark test is executed on a metal.

4.2 Non-ferrous metals contain no iron and are used in industry where ferrous metals would be unsuitable. State ONE property and ONE use of the following non-ferrous metals:
   4.2.1 Aluminium
   4.2.2 Zinc

4.3 Plain carbon steels are usually classified according to their carbon content. List THREE types of plain carbon steels used in industry.

4.4 Plastics are relatively newcomers to the field of engineering materials and the most commonly used plastics in industry are tufnol and nylon. State TWO properties of tufnol.

QUESTION 5: MARKING OUT

5.1 Marking-out is an important operation in the engineering workplace and must be carried out with care and precision using various marking-out tools. Write down the letters (A – E) in the ANSWER BOOK and name the marking-out tools as shown in FIGURE 3 below.

![FIGURE 3](image-url)
QUESTION 6: KEYS AND KEYWAYS

6.1 To enable a key to be fitted between the two parts, the shaft and the hub must be recessed in order to prevent relative movement between them. Indicate under which circumstances will the following keys be used:

6.1.1 Feather key
6.1.2 Woodruff key
6.1.3 Taper key
6.1.4 Rectangular key

6.2 Calculate the height and the width of a feather key, if a 75 mm diameter shaft must be keyed to a pulley.

QUESTION 7: HAND TOOLS

7.1 Hand tools are designed to perform specific tasks and the accuracy of your workpiece will depend on whether you use them correctly. Answer the following questions relating to hand tools used in industry:

7.1.1 Name the type of hammer that can be used to rivet in places which are difficult to get to.

7.1.2 Explain TWO precautions that must be taken into consideration when using an adjustable spanner.

7.1.3 Explain the reason why the one side of a hand file has a safe edge.

7.1.4 Name TWO types of screwdrivers commonly used in practice.

QUESTION 8: FASTENERS

8.1 Machine screws are used in holes which have already been tapped to receive them. Name TWO types of machine screws that are available in industry.

8.2 Explain the difference between a black bolt and a machine bolt.
QUESTION 9: HAND TAPS, STOCKS, DIES AND REAMERS

9.1 Write the letters A – E as shown in FIGURE 4 (below) in the ANSWER BOOK and identify the different types of dies and reamers used in industry.
SECTION B: MACHINE CUTTING TOOLS AND MACHINES

NOTE: Answer only FOUR questions in this section

QUESTION 10: DRILLING MACHINES

10.1 Drilling machines are the most used equipment in the workshop and their main purpose is to grip, revolve and feed crills which make holes in workpieces. FIGURE 5 below shows the drawing of a certain type of drilling machine.

10.1.1 Name the type of drilling shown in the figure below. (1)

10.1.2 Write down the letters A – E as shown in FIGURE 5 below in the ANSWER BOOK and write the name of the correct drilling machine component next to each letter. (5)

10.2 State FOUR causes for a drill to break during a drilling operation. (4)

[10]

FIGURE 5
QUESTION 11: GRINDING-MACHINES AND MACHINE CUTTING TOOLS

11.1 Grinding-wheel dressers are used to true or dress the wheel. Explain the difference between the following:

11.1.1 Truing

11.1.2 Dressing

11.2 State TWO reasons for using compressible washers on a grinding wheel.

11.3 Why is it important for the screw thread to be in opposite direction to the rotation of the spindle?

11.4 Indicate by making use of a line drawing, the necessary cutting rate and clearance angles on a high-speed cutting tool.

QUESTION 12: SHAPING MACHINE

12.1 The shaping machine is designed to produce different surfaces on a workpiece. Write the letters A – E as seen in FIGURE 6 below in the ANSWER BOOK and write the correct name of the components that make up the compensating link of the shaping machine next to each letter.

![FIGURE 6]

12.2 A cast-iron base must be shaped on a shaping machine. The following details are given to an apprentice:

- Stroke length for the workpiece: 300 mm
- Width of the workpiece: 200 mm
- Cutting speed for the material: 24 metres per minute
- Feed for a roughing cut: 0.75 mm per stroke
- Stroke ratio: 3:2
Calculate the following:

12.2.1 The cutting stroke ratio
12.2.2 The number of strokes per minute
12.2.3 The time needed for one rough cut over the width of the workpiece

QUESTION 13: CENTRE LATHE

13.1 The tailstock can be used for taper turning and to support the workpiece at the right-hand end of the centre lathe. Write the letters A – D as seen in FIGURE 7 below in the ANSWER BOOK and write the correct name of the components that make up the tailstock of the centre lathe.

![Figure 7](image)

13.2 Name TWO types of lathe steadies that are used on a centre lathe to support a workpiece.

13.3 State TWO advantages of a workpiece that is held between centres.

13.4 Indicate TWO advantages of a CNC lathe when compared to a conventional centre lathe.

[10]
QUESTION 14: MILLING MACHINE

14.1 The milling machine is a key piece of equipment in any workshop and it produces mainly plain surfaces. Explain FOUR safety precautions which are applicable when working on a milling machine.

14.2 Write the letters A – C as seen in FIGURE 8 below in the ANSWER BOOK and write the correct name of the milling machine components.

A

B

C

FIGURE 8

14.3 State the function of the above components of the milling machine.

TOTAL SECTION B: 40
GRAND TOTAL: 100