T810(E)(A5)T
APRIL 2006

NATIONAL CERTIFICATE
FITTING AND MACHINING THEORY N1
(11021871)
5 April (X-Paper)
09:00 – 12:00

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

Questions: 1, 2, 4, 7, 8

Total =
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 where the candidate must answer either QUESTION 1.1 AND 1.2 or QUESTION 1.3. Answer any FOUR questions in SECTION B.

2. Read the questions carefully before answering them.

3. ALL the drawings must be neat, reasonably large and in good proportion.

4. ALL the drawings must be labelled.

5. One mark = 1%

SECTION A: GENERAL PRACTICE

QUESTION 1: OCCUPATIONAL SAFETY ✓

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

1.2 Name TWO safety precautions which are applicable when using the chuck on a centre lathe.
1.3 Briefly describe the following regulations as applicable to the Minerals Act, 1991 (Act 50 of 1991):

1.3.1 Regulation 3.12 deals with disobedience. What does it state?

1.3.2 Regulation 10.2.4 discusses the use of compressed air. What can you not use compressed air for?

QUESTION 2: MEASURING INSTRUMENTS

2.1 Give the reading on the vernier protractor in FIGURE 1.

2.1.1 Give the degree of accuracy of the vernier protractor.

2.1.3 State ONE practical use of the vernier protractor in the industry.

2.2 State the function/purpose of the following measuring instruments:

2.2.1 Telescopic gauge

2.2.2 Thread pitch gauge

2.3 Indicate, by means of an enlarged drawing, the reading 168.84 mm on an inside micrometer.

A 12 mm distance piece is available, as well as the following accessories:

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

NOTE: Barrel scale: 13 mm only

2.4 Name TWO practical uses of a feeler gauge.
QUESTION 3: SCREW THREADS

3.1 Explain the difference between a left-hand screw thread and a right-hand screw thread.

3.2 In practice various types of screw threads are used for a specific purpose. Name THREE of these different screw threads known to you and also name the included angle of each.

3.3 Calculate the depth of an M20 × 2.5 screw thread. M20 being the diameter and 2.5 the pitch in millimetres.

QUESTION 4: METALS AND PLASTICS

4.1 Name the TWO main groups into which metals are divided.

4.2 Certain workshop tests can be performed on metals to distinguish them from each other. Name THREE such tests used to distinguish between cast steel and cast iron.

4.3 Describe the purpose of each of the following heat treatment processes when performed on steel:

   4.3.1 Hardening
   4.3.2 Annealing
   4.3.3 Normalising
   4.3.4 Tempering
   4.3.5 Case hardening

4.4 Give TWO examples of objects used in industry which are made of nylon.

QUESTION 5: MARKING OFF

5.1 Name the FOUR main components of a combination set.

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

QUESTION 6: KEYS AND KEYSWAYS

6.1 Make neat drawings of the following key profiles:

   6.1.1 Taper gibhead key
   6.1.2 Woodruff key

6.2 Name TWO different machining processes applied to obtain keyways in shafts and in holes.
QUESTION 7: HAND TOOLS

7.1 Files can be identified by the different types of file cuts. Name the different cuts that one gets on a file.

7.2 Give TWO reasons for hacksaw blade breakage.

7.3 Name the use of each of the following hand tools as used in the industry:

7.3.1 Diamond - point chisel
7.3.2 Pin punch

QUESTION 8: FASTENERS

8.1 Name TWO types of machine screws that are available in the industry.

8.2 Explain the difference between a black bolt and a machine bolt.

QUESTION 9: HAND TAPS, STOCKS DIES AND REAMERS

9.1 Name THREE different types of dies used in industry.

9.2 Explain the function of a reamer when used in a workshop.

9.3 When would one use a plug tap?

TOTAL SECTION A: 60

SECTION B: MACHINE CUTTING TOOLS AND MACHINES

NOTE: Answer only FOUR questions in this section.

QUESTION 10: DRILLING MACHINES

10.1 Name THREE reasons why a drill breaks during a drilling operation.

10.2 Explain, with the aid of drawings, what is meant by counter boring. The drill profile and workpiece must be shown.

10.3 What is the purpose of an angle plate when used on a drilling machine?

10.4 The cutting speed for mild steel is 30 m/min. Calculate the speed, in revolutions per second, of the machine spindle for the drilling of a hole with a diameter of 12 mm.
QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS

11.1 Name FIVE factors to be considered before selecting a grinding wheel for a specific job.

11.2 Make neat drawings of the following shaping machine cutting tools to indicate where they are used:
   11.2.1 Roughing tool
   11.2.2 Grooving tool
   11.2.3 Finishing tool

11.3 Explain what is meant by positive rake and negative rake when working with cutting tools.

QUESTION 12: SHAPING MACHINE

12.1 Write the following letters, as seen in FIGURE 2 below, underneath each other in the answer book and write the correct name of the shaping machine components next to each other.
A cast iron base 295 mm long x 180 mm wide be shaped on a shaping machine. The following details were given to an apprentice:

Stroke length for the work piece - 320 mm
Cutting speed for the material - 12 m per minute.
Feed for roughing cut - 3 mm per stroke
Feed for finishing cut - 1.2 mm per stroke
Stroke ratio - 2:1
Finishing cut time - 4 minutes 48 seconds
Setting-up time - 10 minutes

Calculate:
12.2.1 The strokes per minute
12.2.2 The roughing cut time
12.2.3 The total time to complete the work piece

QUESTION 13: CENTRE LATHE

13.1 Give TWO advantages of workpieces that are held between centres.

13.2 Lathe steadies are used on a centre lathe mostly to support a workpiece for various reasons. Name TWO types of steady known to you.

13.3 The centre lathe can be used to perform various types of operations. State THREE of these operations that you know of.

13.4 Give TWO advantages of a CNC lathe when compared to the conventional lathe.

13.5 Give ONE application of a ball centre in practice.
QUESTION 14: MILLING MACHINE

14.1 Name FOUR main uses of a milling machine.

14.2 Write the following letters, as seen in FIGURE 3 below, underneath each other, in the answer book and write the correct name of the milling machine components next to each other.

FIGURE 3

14.3 Describe the function of the above components on a milling machine.

TOTAL SECTION B: GRAND TOTAL:

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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. \[ \frac{\text{Strokes/min}}{\text{Length of stroke}} = \frac{S}{\text{Ratio}} \]
   \[ \frac{\text{Slae/min}}{\text{Lengte van slag}} = \frac{S}{\text{Verhouding}} \]

4. \[ h = \frac{D}{6} \]

5. \[ w = \frac{D}{4} \]