NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N1

(11021871)

28 March (X-Paper)
09:00 – 12:00

This question paper consists of 11 pages and a 1-page formula sheet.
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. ALL the diagrams must be neat and in good proportion.

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

QUESTION 1: OCCUPATIONAL SAFETY

Answer either QUESTION 1.1 or QUESTION 1.2.

1.1 Colour coding distinguishes the content in a pipe line. State the content or feature that use the following colours:

1.1.1 Arctic blue (1)
1.1.2 Jacaranda (1)
1.1.3 Signal red (1)
1.1.4 Yellow (1)
1.1.5 Dove grey (1) [5]

OR

1.2 Briefly answer the following questions as applicable to Regulation 4.4.1 in connection with the supplying of a complaint book as described in the Minerals Act No.50 of 1991.

1.2.1 Where must the complaint book be kept? (1)
1.2.2 What kind of complaints are entered into the complaints book? (2)
1.2.3 Who must inspect this book and how often? (2) [5]

QUESTION 2: MEASURING INSTRUMENTS

2.1 Indicate by means of an enlarged drawing, the reading 66.94 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
* 125 – 150 mm
* 150 – 175 mm
* 175 – 200 mm

NOTE: Barrel scale: 13 mm only (4)
2.2 Write the letters (A – E) in the ANSWER BOOK and label the components of the micrometer as seen in FIGURE 1:

FIGURE 1

2.3 A feeler gauge is an important instrument used in industry. State TWO practical uses of a feeler gauge.

QUESTION 3: SCREW THREADS

Indicate whether the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number (3.1 – 3.6) in the ANSWER BOOK.

3.1 The included angle of an ISO metric fine screw thread is 55 degrees.

3.2 The screw thread that is used to reduce backlash or play on a lead screw of a centre lathe is called the square thread.

3.3 Screw threads are used to assemble and dismantle components quickly and easily and are divided into two main categories, namely V-threads and metric screw threads.

3.4 The depth of a 12 mm screw thread with a pitch of 1,75 mm is 1,32 mm.

3.5 Pitch is the distance that a screw thread will move axially forward in one full revolution.

3.6 An ISO metric coarse screw thread is used on a micrometer spindle.
QUESTION 4: METALS AND PLASTICS

4.1 To perform various functions in industry, steel undergoes various heat treatment processes. Describe the purpose of each of the following heat treatment processes that are performed on steel:

4.1.1 Hardening
4.1.2 Annealing
4.1.3 Normalising
4.1.4 Tempering
4.1.5 Case-hardening

4.2 Non-ferrous alloy is a combination of two or more non-ferrous elements. State the composition and ONE use of the following non-ferrous alloy use in industry:

4.2.1 Brass
4.2.2 Bronze

4.3 Plastics are described as a group of non-metallic materials. Identify TWO types of plastics commonly used in industry.

4.4 As an employee in the workshop why is colour coding of metals important to you?

[10]

QUESTION 5: MARKING-OFF

5.1 Marking-off is an important operation for you when working in an engineering workshop. Describe TWO uses of a jenny caliper.

5.2 Identify the type of marking-off fluid or medium which you would use under the following circumstances:

5.2.1 An unmachined casting with a rough surface
5.2.2 At a machined surface

5.3 State the purpose of a surface gauge that is used in industry for marking-off your work piece.

[5]
QUESTION 6: KEYS AND KEYWAYS

6.1 Keys are used to locate pulleys and couplings on a shaft to prevent movement between them. Identify FOUR different types of keys used in industry.

6.2 In order to make a feather key in the workshop, you need to calculate the height and the width of the feather key. If a 30 mm diameter shaft must be keyed to a pulley, calculate the dimensions.

QUESTION 7: HAND TOOLS

7.1 Hammers are designed and used for various tasks. Explain what you will use a ball peen hammer for.

7.2 Punches are used for a wide range of work. State THREE types of punches used in industry.

7.3 Identify TWO safety precautions to be observed after working with a hacksaw in the workplace.

QUESTION 8: FASTENERS

8.1 Locking devices or nuts are used to prevent screwed fasteners from working loose. Explain the difference between positive locking and frictional locking.

8.2 State TWO types of screws that produce their own thread.

QUESTION 9: HAND TAPS, STOCKS AND DIES AND REAMERS

9.1 Taps are used to cut an internal thread in a hole. Explain TWO methods that can be used to remove a broken tap from a hole.

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

9.3 Dies are used to cut external threads on a shaft. State TWO types of dies used in industry.

TOTAL SECTION A:
SECTION B: MACHINE CUTTING TOOLS AND MACHINES

Answer any FOUR questions in this section.

QUESTION 10: DRILLING MACHINES

10.1 Drilling machines are the most used equipment in the machine shop. State the function of the following components found on a drilling machine:

10.1.1 Spindle
10.1.2 Table
10.1.3 Chuck

10.2 Identify FOUR causes for a drill to break during the drilling operation on a workpiece.

10.3 The cutting speed for mild steel is 30 meters per minute and the diameter of the drill is 12 mm. Calculate the drilling machine spindle speed in revolutions per second to drill the hole.

[10]

QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS

11.1 When you are replacing a grinding wheel, compressible washers are used and form part of the grinding wheel assembly. Explain TWO reasons for using compressible washers on a grinding wheel.

11.2 What is the purpose of a left-hand as well as a right-hand screw thread on the spindle of a pedestal machine?

11.3 Differentiate between the following TWO terms when working on a grinding machine:

11.3.1 Trueing
11.3.2 Dressing

11.4 State the centre lathe tool that you would use to cut off the completed workpiece.
11.5 When working in a machine shop you will use the various types of cutting tools. Identify the following machine cutting tools in FIGURE 2 (A – D).

FIGURE 2

QUESTION 12: SHAPING MACHINES

12.1 Write the letters (A – E) in the ANSWER BOOK as seen in FIGURE 3 and label the components of the ram head on a shaping machine.

FIGURE 3
12.2 You are given a task to machine a cast iron base, 295 mm long × 180 mm wide on a shaping machine in the machine shop. The following details are given to you:

- 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/stroke
- Stroke ratio = 2:1
- Finishing cut time = 4 min 48 seconds
- Setting up time = 10 min

Calculate the following:

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 Describe the purpose of a gap bed on a centre lathe in a machine shop. (1)

1.3.2 Write down the letters (A – D) in the ANSWER BOOK and label the parts of the tail stock of a centre lathe as seen in FIGURE 4.
13.3 State the purpose of the half nut and name also the type of screw thread it is made up of when using the centre lathe.

13.4 State TWO disadvantages of the CNC lathe compared to the conventional lathe in a machine shop.

13.5 State ONE function of a pipe centre as used on a centre lathe.

QUESTION 14: MILLING MACHINES

14.1 Write down the letters (A – E) in the ANSWER BOOK and identify the components of the milling machine in FIGURE 5.

14.2 Indicate whether the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number (14.2.1 – 14.2.5) in the ANSWER BOOK.

14.2.1 Table strips are used to stop the automatic feed at pre-set positions.

14.2.2 An air hose can be used to remove the chips from the machine.

14.2.3 Plain and universal milling machines are also known as knee-type machines.
14.2.4 Cams cannot be machined on the horizontal milling machine.

14.2.5 The adjustable tail stock is used to adjust the table upward or downwards.