T700(E)(J27)T
AUGUST 2012

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N1
(11021871)

27 July (X-Paper)
09:00 – 12:00

This question paper consists of 8 pages and a 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 and QUESTION 1.2 or QUESTION 1.3 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

QUESTION 1: OCCUPATIONAL SAFETY

1.1 Most accidents happen because people are negligent and do not know how to prevent accidents. Explain THREE methods which you will apply to promote a safe working condition in the workshop. (3)

1.2 The purpose of chucks are to locate and hold workpieces in their correct positions on a centre lathe. Indicate TWO safety precautions which are applicable when using the chuck on a centre lathe. (2)

OR

1.3 Briefly describe the following regulations as applicable to the Minerals Act No 50 of 1991:

1.3.1 Regulation 3.12 deals with disobedience, explain how does it affect people in the mining industry. (3)

1.3.2 Regulation 10.2.4 discusses the use of compressed air. Indicate TWO ways where compressed air shall not be used. (2)

QUESTION 2: MEASURING INSTRUMENTS

2.1 Measuring instruments are precision instruments and should be treated with care. Make a neat, enlarged drawing of only the reading of the following measuring instruments:

2.1.1 A metric outside micrometer: 18.67 mm (4)

2.1.2 A vernier protractor: 50° 55’ (4)

2.2 State the function of the following measuring instruments:

2.2.1 Telescopic gauge (1)

2.2.2 Thread-pitch gauge (1)

2.2.3 Vernier calliper (1)
QUESTION 3: SCREW THREADS

3.1 In practice various types of screw threads are used for a specific purpose. Name THREE types of screw threads used in industry. (3)

3.2 Explain the difference between a single-start thread and a multistart screw thread. (2)

3.3 Calculate the depth of a M20 × 2.5 screw thread. M20 being the diameter and 2.5 being the pitch in millimetres. (1)

QUESTION 4: METALS AND PLASTICS

4.1 All engineering parts and components are made from either metal or plastics that are used in industry. Name TWO types of cast iron and indicate where they are used in industry. (4)

4.2 Heat treatment is a process by which the properties of plain carbon steel may be changed. Explain the difference between hardening and case hardening. (2)

4.3 Indicate the composition, one property, and one use of the following non ferrous alloys:

   4.3.1 Brass (3)

   4.3.2 Bronze (3)

   [12]

QUESTION 5: MARKING OFF

5.1 Marking off may be defined as the scribing of lines which serves as a guide for setting up the workpiece on a machine. State the type of surface where you would use the following marking-off fluid or medium:

   5.1.1 Whitewash or chalk and water (1)

   5.1.2 Marking blue (1)

5.2 Explain the function of the following marking-off tools:

   5.2.1 Angle plate (1)

   5.2.2 Measuring tape (1)

   5.2.3 Jenny calliper (1)

   [5]
QUESTION 6: KEYS AND KEYWAYS

6.1 Different types of keys are available in industry each having their own specific application. Describe the function of a key and keyway as used in industry. (1)

6.2 Name THREE methods that can be used to cut an internal keyway. (3)

6.3 Calculate the height and the width of a key to be fitted to a shaft with a diameter of 75 mm. (2) [6]

QUESTION 7: HAND TOOLS

7.1 Hand tools are designed to perform specific tasks and they are safe to work with provided you use them correctly. Explain the use of the following hand tools used in industry:

7.1.1 Soft-faced hammer (1)
7.1.2 Second cut file (1)
7.1.3 Flat chisel (1)
7.1.4 Centre punch (1)
7.1.5 General purpose pliers (1)
7.1.6 Chain tongs (1) [6]

QUESTION 8: FASTENERS

8.1 There are various types of fasteners available that are designed to meet the specific requirements of the joint in a component or 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 screws are self-tapping screws. (1) [4]

QUESTION 9: HAND TAPS, STOCKS, DIES AND REAMERS

9.1 Taps are used to cut an internal thread in the holes of workpieces. State TWO methods to ensure a tap is at right angle to the workpiece before tapping is done. (2)

9.2 Name THREE types of reamers used in industry to shape and enlarge holes. (3) [5]

TOTAL SECTION A: 60
SECTION B: MACHINE CUTTING TOOLS AND MACHINES

Answer only FOUR questions in this section

QUESTION 10: DRILLING MACHINES

10.1 The main purpose of drilling machines is to grip, revolve and feed drills which make holes in workpieces. Explain THREE factors to be taken into consideration when deciding which clamping device to use. (3)

10.2 Indicate with the aid of a drawing what is meant by spot facing by showing the drill profile and the workpiece. (3)

10.3 Write down the letters A and B in FIGURE 1 in your answer book and indicate the name of this clamp that is used on drilling machines. (2)

FIGURE 1

10.4 The following details are known to an apprentice:
The drill diameter  - 14 mm
The number of holes to be drilled  - 6
Spindle speed  - 228 r/min
Calculate the correct drill speed in millimetres per second to drill the six holes. (2)

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 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.

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

11.6 What is the purpose of a boring bar?

QUESTION 12: SHAPING MACHINE

12.1 The shaping machine uses a single-point tool with a reciprocating motion and the tool cuts on the forward stroke only. Explain step by step how the position of the ram in relation to the workpiece may be adjusted on the shaping machine.

12.2 State TWO uses of a shaping machine.

12.3 A carbide tipped tool is used to machine a cast iron block 450 mm long and 200 mm wide. A feed of 0.15 mm per stroke is used. The cutting speed is 30 meters per minute and the stroke ratio is 3 : 2. Calculate the time it would take to cut across the width of the block.

QUESTION 13: CENTRE LATHE

13.1 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.

13.2 Name THREE advantages of using a three-jaw self-centering chuck on the centre lathe.

13.3 State THREE methods that can be used on the centre lathe for cutting tapers.

13.4 Indicate TWO disadvantages of the CNC lathe when compared to the conventional lathe.
QUESTION 14: MILLING MACHINE

14.1 The milling machine is a key piece of equipment in any modern workshop. State FOUR main uses of a milling machine. (4)

14.2 Write down the letters A – C as shown in FIGURE 2 in the ANSWER BOOK and indicate the correct name of the milling-machine components. (3)

FIGURE 2

14.3 Describe the functions of the above components on a milling-machine. (3)

[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. \( w = \text{feed/stroke} \times \text{strokes/min} \times t \)
   \( w = \text{toevoer/slag} \times \text{slae/min} \times t \)

3. \( \text{Strokes/min} = \frac{S}{\text{Length of stroke}} \times \text{Ratio} \)
   \( \text{Slae/min} = \frac{S}{\text{Lengte van slag}} \times \text{Verhouding} \)

4. \( h = \frac{D}{6} \)

5. \( w = \frac{D}{4} \)