T670(E)(N22)T
NOVEMBER EXAMINATION
NATIONAL CERTIFICATE
FITTING AND MACHINING THEORY N1
(11021871)
22 November 2013 (X-Paper)
09:00–12:00

This question paper consists of 11 pages and 1 formula sheet.
INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. ALL work you do not want to be marked must be clearly crossed out.
5. ALL drawings must be neat and large.
6. Write neatly and legibly.
QUESTION 1

1.1 Hand tools are used for various tasks in the workshop. Explain FIVE safety precautions to bear in mind when using hand tools. (5)

1.2 Give the name of the marking-off tool. Write only the answer next to the letter (A–E) in FIGURE 1 in the ANSWER BOOK. (5)

1.3 Hand tools are designed to perform specific tasks and are safe to work with if you use them correctly. Explain the use of each of the following hand tools:

1.3.1 Soft-faced hammer
1.3.2 Square file
1.3.3 Cross-cut chisel
1.3.4 Hollow punch
1.3.5 Chain tongs
1.3.6 Ring spanner (6 x 1)
QUESTION 2

2.1 Measuring instruments are all precision instruments and should be used for their intended purpose only.

Illustrate by making a neat enlarged drawing of only the reading of the following measuring instruments:

2.1.1 A metric outside micrometer: 22.64 mm
2.1.2 A vernier protractor: 50° 55'

(4 × 2) (8)

2.2 Indicate the degree of accuracy of the following measuring instruments that are used in industry:

2.2.1 A metric depth micrometer
2.2.2 A dial test indicator
2.2.3 A vernier height gauge

(3 × 1) (3)

2.3 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (2.3.1–2.3.12) in the ANSWER BOOK.

2.3.1 Copper, lead, tin and aluminum are all ...
   A metals.
   B alloys.
   C non-ferrous metals.
   D plastics.

2.3.2 Brass is an alloy of ...
   A copper and tin.
   B copper and zinc.
   C copper and lead.
   D lead and zinc.

2.3.3 Bronze is an alloy of ...
   A copper and tin.
   B copper and zinc.
   C copper and lead.
   D lead and zinc.
2.3.4 The mineral from which aluminum is manufactured, is ...
A limestone.
B duralumin.
C aluminous clay.
D bauxite.

2.3.5 The purpose of annealing is to ... the metal.
A harden
B temper
C soften
D cool

2.3.6 The process to reduce brittleness, is called ...
A hardening.
B tempering.
C quenching.
D normalising.

2.3.7 The colour code that is used for stainless steel is ...
A grey.
B green.
C black.
D blue.

2.3.8 The colour code that is used for low-carbon steel is ...
A grey.
B orange.
C black.
D blue.

2.3.9 White metal is commonly used for ...
A tubes.
B bearing liners.
C valves.
D lathe centres.

2.3.10 Tufnol can be described as a type of ...
A metal.
B plastic.
C alloy.
D carbon steel.
2.3.11 Cast steel produces ... during the sound test.
   A  very dull sound
   B  medium metallic sound
   C  high ringing sound
   D  lower ringing sound

2.3.12 Grey cast iron is commonly used for ...
   A  cams.
   B  engine blocks.
   C  cold chisels.
   D  punches.

QUESTION 3

3.1 A screw thread is a helical groove that is cut in a cylindrical rod as shown in FIGURE 2. Write only the screw thread next to letter (A–D) in the ANSWER BOOK.

![Figure 2](image)

3.2 Identify the correct type of screw thread that is used on the following components:
   3.2.1 Ram head of a shaping machine
   3.2.2 Micrometer spindle
3.3 Keyways can be cut in different machines using different methods.

Name TWO types of machines used to cut each of the following keyways:

3.3.1 An internal keyway

3.3.2 An external keyway

(2 x 2) (4)

3.4 Calculate the height and the width of a feather key, when a 48 mm diameter shaft must be keyed to a pulley.

(2)

3.5 State the use of a split pin in industry.

(1)

3.6 Positive locking is essential for critical joints where failure could cause serious accidents.

Give TWO types of positive locking nuts that are available in industry.

(2)

3.7 Cir-clips are circular spring steel with a lug at each end.

State the use of an external cir-clip.

(1)
3.8 Name the different types of dies and reamers used in industry. Write only the dye or reamer next to letter (A–E) in FIGURE 3 in the ANSWER BOOK.

![Diagram of dies and reamers with labels A, B, C, D, E.]

FIGURE 3
**QUESTION 4**

4.1 Be sure you clamp work pieces firmly to prevent movement during drilling operations. Write only the clamp that is used on drilling machines next to the letter (A–C) in FIGURE 4 in the ANSWER BOOK.

4.2 To be able to produce work pieces economically, you must determine the most efficient feed and cutting speeds.

Give THREE important factors you would take into consideration when determining the cutting speed.

4.3 State the function of each of the following components found on a drilling machine:

4.3.1 Chuck

4.3.2 Spindle

4.4 A mandrel is a shaft or tube which holds work pieces accurately in position.

State THREE advantages of using mandrels.

4.5 State THREE disadvantages of the CNC lathe in contrast with the conventional centre lathe.
4.6 The method you use to machine any specific taper will depend on the length of the taper, the taper angle and the number of pieces to be machined.

Name TWO ways that can be used on the centre lathe for cutting tapers. (2)

4.7 For a cutting tool to be effective, the material it is made of must possess certain properties such as abrasion resistance and toughness.

Explain the function of each of the following tool angles:

4.7.1 Rake angle

4.7.2 Clearance angle (2 x 2) (20)

QUESTION 5

5.1 Give the names for the shaping machine components. Write only the answer next to the letter (A–D) in FIGURE 5 in the ANSWER BOOK.

![FIGURE 5](image)

5.2 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/min and the stroke ratio is 3 : 2.

Calculate the time it would take to cut across the width of the block. (4)
5.3 The milling machine is a key piece of equipment in any workshop and it produces mainly plain surfaces.

Explain the function of each of the following milling machine components:

5.3.1 Arbor
5.3.2 Overarm
5.3.3 Adjustable footstock
5.3.4 Bracing arms

(4 × 2) (8)

5.4 Identify the components of the grinding machine. Write only the answer next to the letter (A–D) in FIGURE 6 in the ANSWER BOOK.

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FITTING AND MACHINING THEORY N1
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. \[ w = \frac{D}{4} \]