T661(E)(J28)T
AUGUST 2011

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N1

(11021871)

28 July (X-Paper)
09:00 – 12:00

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

QUESTION 1: OCCUPATIONAL SAFETY

1.1 Occupational safety is essentially important when working in a machine shop. State FIVE safety precautions to bear in mind when using machinery. [5]

OR

1.2 Briefly describe the following regulations as applicable to surface protection devices according to the Minerals Act, 1991 (No. 50 of 1991):

1.2.1 Regulation 5.8.1 – life lines
1.2.2 Regulation 5.8.3 – hard hat [5]
QUESTION 2: MEASURING INSTRUMENTS

2.1 FIGURE 1 below indicates the reading of an outside micrometer. Study the drawing carefully and then answer the questions that follow.

![Micrometer Diagram]

FIGURE 1

2.1.1 Write down the letters A and B in the ANSWER BOOK and indicate the components of the outside micrometer. (2)

2.1.2 Give the correct reading as seen on the micrometer. (1)

2.1.3 State the degree of accuracy of this micrometer. (1)

2.1.4 State ONE practical use of the outside micrometer. (1)

2.2 A vernier caliper is an important measuring instrument you would use when working in a workshop.

![Vernier Caliper Diagram]

FIGURE 2

2.2.1 Indicate the reading of the vernier caliper in the above FIGURE 2. (1)

2.2.2 Indicate the degree of accuracy of the vernier caliper. (1)

2.2.3 State ONE advantage and ONE disadvantage of the vernier caliper. (2)
2.3 Explain TWO practical uses of a feeler gauge when using it in a workshop.

QUESTION 3: SCREW THREADS

3.1 Screw threads are used to assemble and dismantle components quickly and easily. State TWO advantages when using an acme thread.

3.2 Explain the difference between the pitch and the lead of a screw thread.

3.3 Calculate the depth of a metric V-screw thread if the pitch distance between the two consecutive screw threads is 2 mm.

QUESTION 4: METALS AND PLASTICS

Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question number (4.1 – 4.12) in the ANSWER BOOK.

4.1 Machine beds are manufactured from (grey cast iron; white cast iron; low carbon steel).

4.2 The process to reduce brittleness is called (hardening; tempering; case hardening).

4.3 An example of a non-ferrous alloy is (lead; tungsten; solder).

4.4 The colour code that is used for stainless steel is (red; black; blue).

4.5 The colour code that is used for low carbon steel is (orange; white; green).

4.6 Bronze is an alloy of (copper and zinc; copper and tin; copper and lead).

4.7 White metal is commonly used for (tubes; bearing liners; valves).

4.8 An example of a ferrous alloy is (cobalt; brass; tin).

4.9 An example of a non-ferrous metal is (manganese steel; bronze; aluminium).

4.10 Cast iron has a (low ringing sound; dull sound; high ringing sound).

4.11 Nylon is classified as a(an) (metal; alloy; plastic).

4.12 Tufnol can be used for (gears; rivets; valves).
QUESTION 5: MARKING OFF

Marking off tools are used to accurately mark off your work piece before the machine process. Write down the letters (A – E) in the ANSWER BOOK and indicate the correct name of the marking off tool in FIGURE 3 below.

FIGURE 3

QUESTION 6: KEYS AND KEYWAYS

6.1 Different types of keys are available in industry, each having its own specific application. Describe under which circumstances would the following keys be used:

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

6.2 Calculate the height and the width of a feather key, when a 45 mm diameter shaft must be keyed to a pulley.
QUESTION 7: HAND TOOLS

There are various types of hand tools used in industry and each having its own specific function. Identify the use of each of the following hand tools:

7.1 Sledge hammer
7.2 Half-round file
7.3 Round-nose chisel
7.4 Dotting punch
7.5 Long-nose pliers
7.6 Stillson wrench

[6]

QUESTION 8: FASTENERS

8.1 Name the TWO types of circlips commonly used in industry.

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

[4]

QUESTION 9: HAND TAPS; STOCKS AND DIES AND REAMERS

Reamers are used to shape and enlarge a hole accurately. List FIVE types of reamers you can use in the workshop.

[5]

TOTAL SECTION A: 60

SECTION B: MACHINE-CUTTING TOOLS AND MACHINES

Answer only FOUR questions in this section.

QUESTION 10: DRILLING MACHINE

10.1 There are various types of drilling machines available in industry. Identify THREE general drilling machines that can be used in a machine shop.

10.2 Briefly explain how to change the speed on a sensitive drilling machine.

10.3 Identify THREE factors to be taken into consideration when deciding which clamping device to use to clamp workpieces securely.

10.4 A 15 mm diameter hole must be drilled in a piece of metal. The cutting speed is given as 600 mm/second. Calculate the speed of the drill in revolutions per minute.
QUESTION 11: GRINDING MACHINES AND MACHINE-CUTTING TOOLS

11.1 According to the provision Act on the Safety of Machinery, there are mainly three parts which are a necessity on a pedestal grinding machine before you can use the machine. Name the THREE parts.

(3)

11.2 Explain the reason of a left-hand as well as a right-hand screw thread on the spindle of a pedestal machine.

(1)

11.3 Explain the function of a grinding wheel dresser used in a grinding wheel.

(1)

11.4 To have an effective cutting tool, various angles are ground. State the angles of the cutting tools as seen in FIGURE 4 below next to the question number (11.4.1 – 11.4.5) in the ANSWER BOOK.

(5)

FIGURE 4

QUESTION 12: SHAPING MACHINE

12.1 One should know the various parts that make up the shaping machine. Identify the THREE basic components of the ram head.

(3)

12.2 Name the THREE methods that are used in industry when setting the machine vice on a shaping machine.

(3)

12.3 A carbide tipped tool is to be 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.

(4)
QUESTION 13: CENTRE LATHE

13.1 There are different types of lathe beds that can be used on a centre lathe. Identify TWO centre lathe beds known to you that are generally used in industry. (2)

13.2 State THREE advantages of using an independent four-jaw chuck on the centre lathe. (3)

13.3 Briefly explain the purpose of mandrels as used on a centre lathe. (2)

13.4 State TWO main differences between the CNC lathe and the conventional lathe that are generally used in industry. (2)

13.5 What is the main purpose of the face plate when it is used on a centre lathe? (1)

[10]

QUESTION 14: MILLING MACHINE

14.1 Most workshop accidents would simply not occur if the operator had followed basic safety measures. State TWO safety precautions applicable when working on a milling machine. (2)

14.2 Name FOUR components you would find on a milling machine and describe the function of each. (8)

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

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

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