higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N1

22 November 2022

This marking guideline consists of 7 pages.

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SECTION A: GENERAL PRACTICE

QUESTION 1: OCCUPATIONAL SAFETY

1.1 1.1.1 The user must report:

- Any fracture or failure of any part of any machine whereby the safety of any person has been or may be endangered
- In connection with the conveyance of goods where persons may pass below the path of conveyance
- The failure of any part to work efficiently, including a winding rope or its attachment or overwinding prevention devices
- The operation of safety catches or overwinding prevention devices under conditions where this should not occur
- The jamming or derailment of the conveyance (Any 3 × 1) (3)

1.1.2

- Where the natural light where using any machinery is inadequate, or where machinery is used at night, the user shall install artificial lighting, so designed that the external moving parts can be clearly distinguished and that no serious stroboscopic effects are produced.
- Artificial light shall be so placed or shaded as to prevent direct light from impinging on the eyes of the person operating a machine, in a manner which interferes with the efficient, safe or convenient performance of his work. (2)

[5]

QUESTION 2: MEASURING INSTRUMENTS

2.1 2.1.1 Vernier callipers (1)

2.1.2 Locknut (1)

2.1.3 C - Fixed jaw
D - Sliding jaw (2)

2.1.4

- Place the vernier callipers over the shaft to be measured.
- Apply light pressure to the movable jaw. With the vernier callipers in place, note where the zero on the vernier scale is relative to the main scale.
- Note where a line on the vernier scale exactly coincides with the line on the main scale. This will give the amount of 1/100's of a millimetre of the item measured.
- Add the two readings to get the thickness of the shaft. (4)

2.2 Feeler gauge (1)

2.3

- An instantaneous reading is obtained without straining the eyes.
- The instrument can be reset to zero at any point.
- This instrument can be linked to a mini processor. (Any 2 × 1) (2)

[11]

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QUESTION 3: SCREW THREADS

3.1 3.1.1
- Effectively transmits power
- Withstands rapid sliding motion
- Can be used on all kinds of machine tool spindles (Any 2 × 1) (2)

3.1.2
- Quick engagement and disengagement of nuts
- Prevents seizing as a result of sagging
- Reduced backlash (Any 2 × 1) (2)

3.2 D = 0,757 × *p*
= 0,757 × 4,5✓
= 3,407 mm✓ (2)
[6]

QUESTION 4: HAND TOOLS

4.1
- Centre punch
- Dotting punch
- Pin punch
- Bell punch (4)

4.2
- Flat head
- Phillips (star) head (2)
[6]

QUESTION 5: METALS AND PLASTICS

5.1 5.1.1
- Tempering occurs when steel is heated to between 230 °C and 300 °C
- depending on the component function and quenched in water or oil. (2)

5.1.2
- The process of annealing is to heat the steel
- and then slowly cooling it in the furnace. (2)

5.2 5.2.1
- Very soft
- Corrosion-resistant
- Good conductor of heat
- Good conductor of electricity
- Ductile
- Malleable (Any 2 × 1) (2)

5.2.2
- Hard
- Brittle
- Malleable
- Corrosion-resistant (Any 2 × 1) (2)

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5.2.3
- Soft
- Low melting point
- Very malleable
- High resistance to corrosion
- Ductile
- Tough (Any 2 × 1) (2)

5.3
- Engine blocks
- Marking-off tables
- Surface plates
- Machine tools (Any 2 × 1) (2)

[12]

QUESTION 6: MARKING-OFF

6.1
- To find the centre of round stock
- To scribe lines parallel with the edge of a workpiece (2)

6.2
- The centre punch is used primarily to mark the centre of holes for drilling.
- The dotting punch is used to mark a line, drawn with a scriber with a series of dots.
- It provides better guidance while sawing, milling and doing general machining. (3)

[5]

QUESTION 7: KEYS AND KEYWAYS

7.1
- It is used to prevent gears, pulleys, hubs, discs, etc. from turning on their shafts.
- In some cases, keys may be required to allow axial sliding movement between components. (2)

7.2 h = D/6
= 80/6✓
= 13,33 mm✓

w = D/4
= 80/4✓
= 20 mm✓ (4)

[6]

QUESTION 8: FASTENERS

8.1
- Soldering
- Welding

8.2
- Prevent longitudinal movement.
- Keep parts in a fixed position.

(2 × 2) **[4]**

QUESTION 9: HAND TAPS, STOCKS, DIES AND REAMERS

9.1
- Removal of a small amount of material from an undersized hole
- To obtain the accurate size of a hole that is true and round (Any 1 × 1) (1)

9.2
- Tap out of alignment with hole
- Incorrect feed pressure producing thin or deformed threads
- Core hole too small
- Incorrect tap for the material
- Tap hitting bottom of a blind hole
- Tap reversed carelessly
- Lubrication lacking or of wrong quality
- Excess material not cleared away often enough (Any 4 × 1) (4)

[5]

TOTAL SECTION A: 60

SECTION B

QUESTION 10: DRILLING MACHINES

10.1 D =? Standard form → V = 24 m/min ← like terms
S = 24 m/min = 24 × 1 000 = 24 000 mm/min✓ N = 293 r/min
S = π x D × N D = ?

$D = \frac{S}{\pi \times N}$ ✓

$= \frac{24\,000}{3{,}142 \times 293}$ ✓

= 26 mm✓

OR

$D = \frac{s}{\pi \times N}$ ✓

$= \frac{24}{\pi \times 293}$ ✓

= 0,026 m✓
= 0,026 × 1 000
= 26 mm (4)

10.2
10.2.1 Electric motor
10.2.2 Spindle speed gearbox
10.2.3 Hand-feed lever
10.2.4 Base
10.2.5 Drift slot
10.2.6 Work table

(6 × 1) (6)

[10]

QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS

11.1
- The spindle has two wheels mounted on the shaft. The spindle has a left-hand thread at one end and a right-hand thread at the other end
- to prevent the spindle nut from becoming loose during grinding. (2)

11.2
- They ensure that the flanges maintain an equal pressure on the wheel.
- They prevent unnecessary tension in the wheel. (2)

11.3
- Huntington-type dresser
- Diamond-tipped dresser (2)

11.4
- Soft wheel for hard materials
- Hard wheel for soft materials
- Correct size wheel
- Correct speed of the wheel
- Check the wheel grade (Any 4 × 1) (4)

[10]

QUESTION 12: CENTRE LATHE

12.1
12.1.1 Spindle lock
12.1.2 Spindle
12.1.3 Barrel
12.1.4 Hand wheel
12.1.5 Adjusting screw

(5 × 1) (5)

12.2
- Set-over of tailstock
- Measuring with a rule
- Set-over with a dial test indicator
- Set-over by means of a graduated sleeve
- Set-over of compound slide
- Taper-turning attachment (Any 3 × 1) (3)

12.3
- It supports long shafts during turning, boring or threading operations.
- It rigidly holds the workpiece and prevents it from springing away from the workpiece. (2)

[10]

QUESTION 13: MILLING MACHINE

13.1
- Ensure that you are fully conversant with the machine and know how to stop it in an emergency.
- Never idly play with the controls.
- Do not distract the user while he is operating the machine.
- Never lean against or rest hands on any moving part.
- Never oil or adjust the machine while it is in motion.
- Ensure that the work is secure before starting the machine.
- Do not wear loose clothing near the machine.
- Wear adequate eye protection.
- Spanners or keys must not be left on rotary parts.
- Make sure all guards are in place. (Any 6 × 1) (6)

13.2
- The index head is used to divide the circumference of the work into any number of equal parts.
- It holds the work in the required position while the machining operation takes place. (2)

13.3
- Simple indexing
- Direct indexing (2)

[10]

TOTAL SECTION B: 40
GRAND TOTAL: 100

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