higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N1

28 November 2023

This marking guideline consists of 6 pages.

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SECTION A: GENERAL PRACTICE

QUESTION 1: OCCUPATIONAL SAFETY

- Use each tool for the task it is meant for
- Keep sharp edges of tools pointed away from one's body
- Keep tools clean, dry and free from oil
- Store tools in their correct place and service them regularly
- Never carry tools with sharp edges in one's pocket
- Never have all one's tools on the workbench at once
- Do not use tools incorrectly or carelessly (Any 5 × 1) **[5]**

QUESTION 2: MEASURING INSTRUMENTS

2.1
- Measure the gap in piston rings
- Setting the gap on spark plugs
- Setting a flat work-piece parallel to the movement of the shaper ram
- Testing clearance between machine slides
- Testing clearance on taper roller bearings (Any 4 × 1) (4)

2.2
- The scribing of lines that must be accurate to each other
- The accurate determination of heights as with the sine bar
- Accurate setting up of work pieces (3)

2.3 They are used for obtaining the size of holes, slots and recesses in conjunction with an outside micrometer. (2)

2.4
- Standard dial indicator
- Balanced type dial indicator (2)

[11]

QUESTION 3: SCREW THREADS

3.1
- To engage mechanisms, for example, half nuts on the lathe lead screw.
- Where it is necessary to prevent backlash.
- To prevent seizing and fouling due to sagging as in long lathe lead screws.

(Any 2 × 1) (2)

3.2
- A single-start screw thread is a thread that has a single starting point.
- A multiple-start screw thread has separate threads.

(2 × 1) (2)

3.2 D = 0,866 × p
= 0,866 × 2,5✓
= 2,165 mm✓ (2)

[6]

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QUESTION 4: HAND TOOLS

4.1
- Lead
- Wood
- Copper
- Rubber

(Any 2 × 1) (2)

4.2 4.2.1
- File flat and concave surfaces
- File internal, round corners

4.2.2
- File internal corners at angles greater than 60°
- Used to sharpen teeth of wood saws

(2 × 2) (4)
[6]

QUESTION 5: METALS AND PLASTICS

5.1
5.1.1 Pipeline steel
5.1.2 Stainless steel
5.1.3 High-carbon steel
5.1.4 Structure steel

(4 × 1) (4)

5.2
- Gears
- Bearings
- Sliding plates
- Bolts and nuts
- Fan blades
- Trolley wheels

(Any 4 × 1) (4)

5.3
5.3.1 Elasticity
5.3.2 Malleability
5.3.3 Brittleness
5.3.4 Toughness

(4 × 1) (4)
[12]

QUESTION 6: MARKING OFF

6.1
- Check and mark off external right angles
- Use a depth gauge
- Check and mark off 45° angles
- Indicate vertical and horizontal positions when used as a spirit level

(Any 3 × 1) (3)

6.2 Used for the measuring✓ and laying out of long distances.✓ (2)
[5]

QUESTION 7: KEYS AND KEYWAYS

7.1 To allow partial rotation of the key✓ until perfect contact is obtained with the flat edge.✓ (2)

7.2 h = D/6
= 90/6✓
= 15 mm✓

w = D/4
= 90/4✓
= 22,5 mm✓ (4)
[6]

QUESTION 8: FASTENERS

8.1
- Thread cutting screw
- Self-tapping screw
- Drive screw (3)

8.2
- Castle nut
- Lock nut (1)
[4]

QUESTION 9: HAND TAPS, STOCKS, DIES AND REAMERS

9.1
- Chuck-type wrench (T-handle)
- Bar-type wrench (2)

9.2 Reaming is the removal of a small amount of material from an undersized drilled hole. (1)

9.3 The purpose of reaming a hole is to produce an accurate sized hole that is true round✓ with a good finish.✓ (2)
[5]

TOTAL SECTION A: 60

SECTION B

QUESTION 10: DRILLING MACHINES

10.1 S = 44 m/min = 44 × 1000 = 44 000 mm/min ✓

$$D = \frac{S}{\pi \times N}$$

$$N = \frac{44\,000 \checkmark}{3{,}142 \times 280 \checkmark}$$

= 50 mm ✓ (4)

10.2 10.2.1 Fit between taper shank and socket is poor due to dirt or drill chip, bump marks✓ or worn socket.✓

10.2.2
- Feed too great
- Lip relief angle too great

10.2.3
- Cutting edge angles not equal
- Worn spindle bearing

(3 × 2) (6)
[10]

QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS

11.1
- The material that one needs to grind and its hardness
- The amount of material to be removed
- Whether it is wet or dry grinding
- The wheel speed
- The area of grinding contact
- The severity of the grinding contact (Any 5 × 1) (5)

11.2
- They cushion flanges against high points or uneven surfaces and distribute the pressure evenly.
- They prevent damage to the surfaces of flanges from the abrasive surfaces of the wheel.
- They provide better control of friction between the flange and the wheel, thereby providing power to the wheel. (3)

11.3 11.3.1 Truing a wheel corrects out-of-round conditions.

11.3.2 Dressing a wheel removes the outer layer of dulled or glazed grains and exposes new and sharp grains on the work surface.

(2 × 1) (2)
[10]

QUESTION 12: CENTRE LATHE

12.1
- A CNC lathe has ball screws. The centre lathe has a lead screw.
- A CNC has electronic position encoders and linear scales. The centre lathe has manual Vernier scales and a digital readout.
- CNCs have very little backlash. The centre lathe has much more backlash, even when new.
- Unskilled operators can operate the CNC lathe once it is programmed. Highly skilled tradesmen need to operate a centre lathe.
- A CNC lathe can cut radii, tapers and multiple start screw threads with ease. This task is either very difficult or sometimes impossible on a conventional centre lathe.
- CNCs have a hydraulic clamping chuck and tailstock. The centre lathe works manually. (Any 5 × 1) (5)

12.2
12.2.1 Balance piece
12.2.2 Face plate
12.2.3 Work-piece/Plummer – block bearing
12.2.4 Angle plate
12.2.5 Boring tool

(5 × 1) (5)
[10]

QUESTION 13: MILLING MACHINE

13.1
13.1.1 Fits and clamps to the overarm to align and support the arbor
13.1.2 Supports and guides the knee vertically

(2 × 1) (2)

13.2
13.2.1 Overarm
13.2.2 Arbor
13.2.3 Arbor support
13.2.4 Column
13.2.5 Table
13.2.6 Saddle
13.2.7 Knee
13.2.8 Base

(8 × 1) (8)
[10]

TOTAL SECTION B: 40
GRAND TOTAL: 100

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