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higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N1

7 April 2020

This marking guideline consists of 6 pages.

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SECTION A: GENERAL PRACTICE

QUESTION 1: OCCUPATIONAL SAFETY

1.1 Where natural light at any machinery is inadequate, or where machinery is used at night, the user shall use artificial lighting,✓ so designed that the external moving parts can be clearly seen✓ and that no serious stroboscopic effects are produced.✓ (3)

1.2 Artificial light shall be so placed or shaded as to prevent direct rays from impinging on the eyes of the person operating a machine,✓ in a manner that is efficient, safe and convenient.✓ (2)
[5]

QUESTION 2: MEASURING INSTRUMENTS

2.1
2.1.1 Spindle
2.1.2 Anvil
2.1.3 Ratchet
2.1.4 Thimble
2.1.5 Barrel
2.1.6 Spindle lock
2.1.7 Frame
(7 × 1) (7)

2.2
- Ensure that the micrometer faces are clean.
- Turn the ratchet until the anvil and spindle engage properly.
- Insert the spanner into the hole at the back of the barrel.
- Turn the spanner until the datum line lines up with the zero on the thimble scale. (4)

[11]

QUESTION 3: SCREW THREADS

3.1
- Quick engagement and disengagement of nuts and half nuts
- Prevents seizing as a result of sagging
- Reduces backlash (3)

3.2
- Valve spindle
- Bench-vice screw
- Lifting-jack screw (3)

[6]

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QUESTION 4: HAND TOOLS

4.1
- Incorrect and careless use
- Blade too soft
- Blade too hard
- Wrong type of blade (4)

4.2 Broken blade✓ or fatigued worker✓ (2)
[6]

QUESTION 5: METALS AND PLASTICS

5.1
- Sound test
- Spark test
- Fracture test
- Machining test
- Painting the metal (5)

5.2 5.2.1 Hardening occurs when steel is rapidly cooled from above 800 °C✓ by quenching in cold oil or water thereby causing a structure change that hardens the steel right through to the core.✓

5.2.2 Tempering occurs when steel is reheated to between 230 °C and 300 °C,✓ depending on the component function, and quenched in water or oil. The purpose is to reduce the brittleness of the hardened steel.✓

(2 × 2) (4)

5.3 5.3.1 Resist scratching and wear
5.3.2 Crumble to pieces
5.3.3 Return to its original size after load has been removed

(3 × 1) (3)
[12]

QUESTION 6: MARKING OFF

6.1
- Defining the shape of a workpiece
- Indicating the exact position of holes
- Keeping wastage of material to a minimum
- Allowing a machinist to set up the work correctly on a machine (Any 2 × 1) (2)

6.2
- Scribing of circles and arcs
- Repeating the same dimensions
- Transferring dimensions from ruler to workpiece (Any 2 × 1) (2)

6.3 Marking off centres of holes for drilling (1)
[5]

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QUESTION 7: KEYS AND KEYWAYS

7.1 Preventing gears, pulleys, hubs, discs, etc. from turning on their shafts (1)

7.2 The head assists with removal of the key. (1)

7.3 t = D/6
= 40/6✓
= 6,67 mm✓

w = D/4
= 40/4✓
= 10 mm✓ (4)
[6]

QUESTION 8: FASTENERS

8.1 The spring action in the washer absorbs the shocks✓ and the pressure is then exerted by the washer in trying to retain its original shape.✓ When the nut starts to unscrew, the sharp points to the washer bite into the machine part and the nut to prevent loosening of the nut.✓ (3)

8.2
- Round head
- Flat head
- Oval head
- Pan head
- Truss head (Any ONE) (1)

[4]

QUESTION 9: HAND TAPS, STOCKS, DIES AND REAMERS

9.1
- Taper tap
- Intermediate tap
- Plug tap (3)

9.2 A tap wrench is a tool that fits on the shank of a tap✓ to turn the tap to cut a thread inside a hole.✓ (2)
[5]

TOTAL SECTION A: 60

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SECTION B

QUESTION 10: DRILLING MACHINES

10.1
- Manual feed for small drilling jobs
- Conventional power feed on the spindle
- Power driven arm
- Head which can be positioned manually or powered
- Rapid transverse control to quickly reposition the head
- Removable table for heavier work to be clamped to the base (Any 4 × 1) (4)

10.2
- Cutting edge angles unequal
- Worn spindle bearing
- Cutting edges not the same height (Any 2 × 1) (2)

10.3 D = ? mm
S = 25 m/min = 25 × 1 000 = 25 000 mm/min✓
$S = \pi \times D \times N$

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

$$= \frac{25\,000}{3{,}142 \times 300} \checkmark$$

= 26,52 mm✓

OR

$$N = \frac{1\,000\,S}{\pi D}$$

$$D = \frac{1\,000\,S}{\pi N}$$

$$= \frac{1\,000 \times 25}{\pi \times 300}$$

= 26,52 mm (4)
[10]

QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS

11.1 11.1.1 Grinding wheel
11.1.2 Wheel dresser
11.1.3 Tool rest
(3 × 1) (3)

11.2 Huntington or ordinary wheel dresser (1)

11.3 The grinding wheel gets smaller and smaller because of all the grinding. (1)

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11.4
- Abrasive types
- Grain size
- Bonding material
- Grade
- Structure (5)

[10]

QUESTION 12: CENTRE LATHES

12.1
12.1.1 Computer controller
12.1.2 Chuck
12.1.3 Turret
12.1.4 Tailstock
12.1.5 Sliding guard

(5 × 1) (5)

12.2
- High manufacturing speed
- High accuracy of machining
- Easily machine complex shapes
- Better surface finish
- Unskilled labour can be used
- Long life of cutting tools because of constant surface speed
- Low running costs (Any 4 × 1) (4)

12.3
- The CNC-lathe is computer operated and the conventional centre lathe is manually operated.
- Unskilled labour can be used on the CNC-lathe, while highly skilled operators are needed on the conventional lathe.
- The CNC-lathe has very little backlash while the conventional centre lathe has backlash, even when new.
- The CNC-lathe has electronic position encoders and linear scales while the conventional centre lathe has manual vernier scales with a digital readout for assistance.
- The CNC-lathe can cut radii and multiple start threads with ease while these functions are difficult on the conventional centre lathe. (Any ONE) (1)

[10]

QUESTION 13: MILLING MACHINES

13.1 Machining flat surfaces and grooves on any metal and get a smooth finish on that surface (3)

13.2
13.2.1 Overarm
13.2.2 Arbor support
13.2.3 Arbor
13.2.4 Saddle
13.2.5 Knee
13.2.6 Elevating screw
13.2.7 Base

(7 × 1) (7)

[10]

TOTAL SECTION B: 40
GRAND TOTAL: 100

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