higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

TOOLMAKERS' THEORY N2

11 AUGUST 2021

This marking guideline consists of 6 pages.

Copyright reserved

QUESTION 1: OCCUPATIONAL SAFETY

1.1
- Make sure the handles are secure.
- Make sure the handles are dry and free of oil or wetness.
- Make sure the handles are not broken.
- Make sure a hammer handle is tight before use.
- Make sure a chisel or punch head does not have a mushroom head.
- Make sure a spanner does not have an open end that is stretched.
- Make sure the correct spanner is used for the bolt to be tightened or loosened.
- Try to avoid using a shifting spanner due to the uncertain opening of the movable jaw.
- Make sure files have handles that are secure. (Any 5 × 1) (5)

1.2
- The person does not wear safety glasses.
- The person is leaning on the machine.
- The person does not wear PPE.
- The person is wearing a watch while working on a machine. (Any 3 × 1) (3)

1.3
- Responsible for the safe installation and proper maintenance, repair and operation of the machinery
- Ensures that all safety appliances, devices and guards are maintained in a good condition
- Stops the working of any apparatus or machine when it is dangerous to a person (3)

[11]

QUESTION 2: STEELS AND TOOL STEELS

2.1 2.1.1
- Steel can be hardened or tempered through heating and blasting
- Increased strength of steel (Any 1 × 1)

2.1.2 Improved shock resistance by removing the brittleness in the steel (2 × 1) (2)

2.2
- Tungsten
- Molybdenum
- Nickel
- Chromium
- Vanadium
- Manganese (6)

2.3 The term *tool steel* refers to a variety of carbon and alloy steels that are particula well suited to be made into tools. (2)

[10]

QUESTION 3: HEAT TREATMENT AND HARDNESS TESTING

3.1
- Gas ovens
- Induction ovens (2)

3.2
- It causes air pollution.
- Automatic temperature control is not possible. (2)

3.3
1 = Colour segment on dial face
2 = Large pointer or indicator
3 = Penetrator
4 = Specimen
5 = Anvil
6 = Wheel
7 = Trip lever (7)
[11]

QUESTION 4: LIMITS AND FITS

4.1
- Clearance or free fit
- Transition or bearing fit
- Interference or press fit (3)

4.2 Maximum tolerance = φ34,03 – bush✓
-φ33,98 – shaft✓
00,05 mm✓

Minimum tolerance = φ34,00 – bush✓
-φ34,00 – shaft✓
0,00 mm✓ (6)

4.3 H9 = hole tolerance
d10 = shaft tolerance (2)
[11]

QUESTION 5: PRECISION MEASURING

5.1 $\sin \Theta = \frac{h}{L}$✓
$h = (\sin \Theta)(L)$✓
$h = (\sin 23°36')(250)$✓
$h = 100,075$ mm✓ (4)

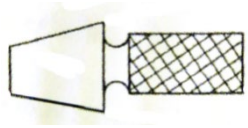
5.2 100,075

- 1,005 ---------- block 1✓
99,07
- 1,07 ---------- block 2✓
98,00
- 8,00 ---------- block 3✓
90,00
- 90,00 ---------- block 4✓
0,00✓ (5)

5.3 To provide protection against wear (1)
[10]

QUESTION 6: GAUGES

6.1
- Working gauges
- Inspection gauges
- Master or reference gauges (3)

6.2  (1)

6.3 So that air can escape while using the gauge in a hole (1)

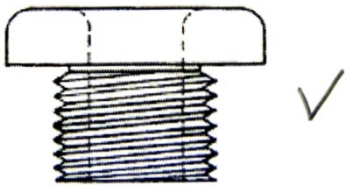
6.4 To check the size of a hole (1)

6.5
- Requires little skill
- Quicker to use than measuring instruments
- Time saved increases production
- Eliminates the use of expensive measuring instruments (4)

[10]

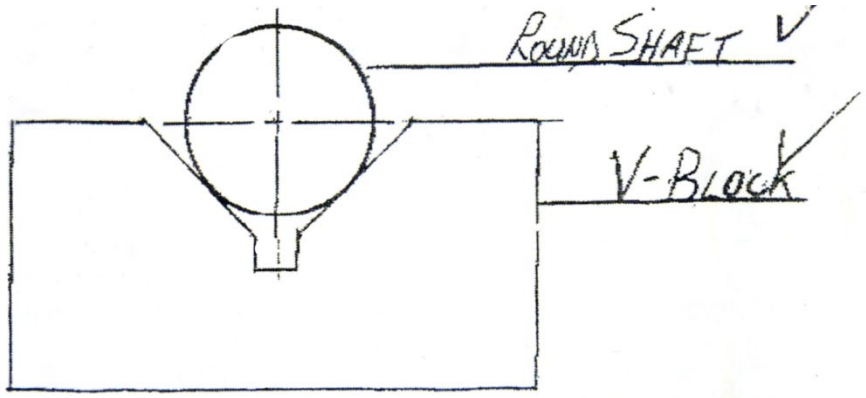
QUESTION 7: JIGS AND FIXTURES

7.1 1 = Workpiece
2 = Hole locator
3 = Recess to allow workpiece to sit on jig
4 = Jig
5 = Recessed shoulder (5)

7.2 

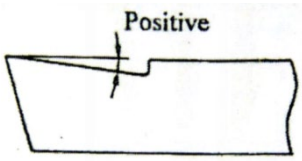
(1)

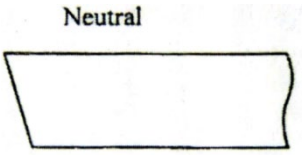
7.3
- A jig is used to locate a workpiece for machining with guides to lead the cutting component.
- A fixture is used to clamp a workpiece for machining, but not with guides. (2)

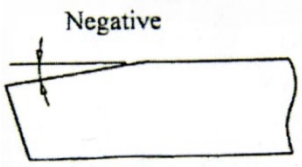
7.4 

(2)
[10]

QUESTION 8: CEMENTED CARBIDE TIP AND CUTTING TOOLS

8.1 8.1.1 

8.1.2 

8.1.3 

(3 × 1) (3)

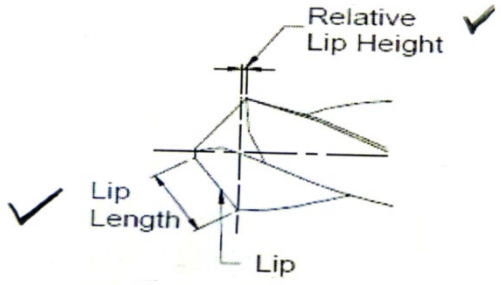
8.2
- Turning
- Drilling
- Profiling
- Shaping
- Slotting (5)

8.3 Left to right (1)

8.4 Right to left (1)
[10]

QUESTION 9: DRILLS AND REAMERS

9.1



(2)

9.2 The grooves in the body of the drill provide space for chip removal and allow coolant to the drill cutting edges. (2)

9.3
- Hand reamer
- Machine reamer
- Chucking or rough-out reamer
- Finishing reamer
- Expanding reamer
- Adjustable reamer (Any 5 × 1) (5)

9.4 A steel tapered drift (1)
[10]

QUESTION 10: DIE SINKING AND FORGING

10.1
- The forging size and the material to be forged
- The direction in which the component is to be forged
- Whether the blank material should be pre-formed or not before the final forging steps
- The quantity of components to be produced (4)

10.2
- Dies and die sinking
- Drop stamp forging
- Hand forging (3)
[7]

TOTAL: 100

Copyright reserved