



**higher education  
& training**

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

# **MARKING GUIDELINE**

**NATIONAL CERTIFICATE (VOCATIONAL)**

**MACHINE MANUFACTURING  
NQF LEVEL 3**

**16 NOVEMBER 2017**

**This marking guideline consists of 6 pages.**

**QUESTION 1**

- |     |  |   |         |                    |
|-----|--|---|---------|--------------------|
| 1.1 | 1.1.1<br>1.1.2<br>1.1.3<br>1.1.4<br>1.1.5          | True<br>False<br>False<br>True<br>False | (5 × 1) | (5)                |
| 1.2 | 1.2.1<br>1.2.2<br>1.2.3<br>1.2.4                   | snap<br>return<br>flow<br>shock         | (4 × 1) | (4)                |
| 1.3 | 1.3.1<br>1.3.2<br>1.3.3<br>1.3.4<br>1.3.5<br>1.3.6 | D<br>C<br>B<br>E<br>F<br>A              | (6 × 1) | (6)<br><b>[15]</b> |

**QUESTION 2: CAD APPLICATION**

- |     |   |   |         |     |
|-----|---|---|---------|-----|
| 2.1 | 2.1.1<br>2.1.2<br>2.1.3<br>2.1.4<br>2.1.5 | This allows an object, such as a circle, to be added to a drawing.<br>This will draw a figure of between 3 sides and up to 1 024 sides.<br>This will produce a line that passes through two points and has infinite length.<br>This command will draw an arch of a circle.<br>Hatching is a way of filling in areas of a drawing with a pre-formatted pattern to represent certain materials. | (5 × 1) | (5) |
|-----|---|---|---------|-----|

2.2 CAD is a computer package used for two- and three-dimensional drawing, design and manufacturing. (1)

2.3	<b>ADVANTAGES</b>	<b>DISADVANTAGES</b>	
	<ul style="list-style-type: none"> <li>• Is fast and accurate.</li> <li>• Is suitable for repetitive work.</li> <li>• Colour is included easily.</li> <li>• Drawings can be downloaded directly to a CNC machine.</li> </ul> <p style="text-align: right;">(Any 2)</p>	<ul style="list-style-type: none"> <li>• Programs are expensive.</li> <li>• Heavy power is required.</li> <li>• Cost of hardware is high.</li> <li>• Some CAD packages are complicated and take time to learn.</li> </ul> <p style="text-align: right;">(Any 2)</p>	(2 × 2) (4)

- 2.4
- The drilled hole is too small or too big.
  - Tap is not square in the hole.
  - Cutting fluid is not used.
  - Tap wrench is used incorrectly.
  - Excess material is not cleaned away often enough.
- (Any 3 × 1) (3)

2.5



(2)  
[15]

**QUESTION 3: FITS AND LIMITS**

- 3.1
- |  |       |           |  |  |
|--|-------|-----------|--|--|
|  | 3.1.1 | 30,00 mm  |  |  |
|  | 3.1.2 | 30,026 mm |  |  |
|  | 3.1.3 | 29,97 mm  |  |  |
|  | 3.1.4 | 0,034 mm  |  |  |
|  | 3.1.5 | 0,016 mm  |  |  |
- (5 × 1) (5)

- 3.2
- |  |       |                                      |  |  |
|--|-------|--------------------------------------|--|--|
|  | 3.2.1 | Tolerance on the hole                |  |  |
|  | 3.2.2 | Degree of tolerance on the hole      |  |  |
|  | 3.2.3 | Tolerance on the shaft               |  |  |
|  | 3.2.4 | Degree of tolerance on the shaft     |  |  |
|  | 3.2.5 | Nominal diameter of the fitted parts |  |  |
- (5 × 1) (5)

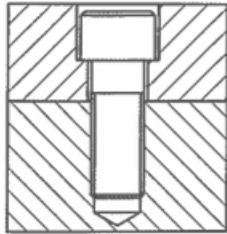
- 3.3
- Safety equipment – fitted to machines to prevent an accident that can happen when people come into close contact with dangerous moving parts, viz. machine guards.
- Safety device – a device that ensures that a machine or equipment is stopped and isolated from a circuit, viz. circuit breaker, isolator switch or sensor.
- (2 × 2) (4)

- 3.4
- 0,02 mm (1)  
[15]

**QUESTION 4: CENTRE LATHE AND MILLING MACHINE**

4.1 4.1.1 10 mm (1)

4.1.2



(2)

- 4.1.3
- Tap not square to the work-piece when doing the tapping.
  - Tapping size drill bit too small.
  - Not using all three taps when cutting internal threads.
  - Cutting threads without using cutting fluid.
  - Excess material not cleared away. (Any 2 × 1) (2)

- 4.1.4
- Tap extractor
  - Dull cape chisel
  - Penetrating oil
  - Nitric acid (Any 2 × 1) (2)

- 4.1.5
- Check oil level.
  - Check coolant level.
  - Oil the slides of the machine.
  - Be familiar with manufacturer's manual.
  - Check instruments, dial gauge, machine spirit level. (Any 2 × 1) (2)

- 4.2 4.2.1 Tailstock  
 4.2.2 Work-piece  
 4.2.3 Carrier or dog  
 4.2.4 Drive plate  
 4.2.5 Headstock  
 (5 × 1) (5)

4.3

<b>MILLING MACHINE</b>	<b>CENTRE LATHE</b>
<ul style="list-style-type: none"> <li>• Clamped by machine vice</li> <li>• Clamped by dividing head</li> <li>• By use of clamps on machine table (Any 1)</li> </ul>	<ul style="list-style-type: none"> <li>• Clamped by 3- or 4-jaw chuck</li> <li>• By face plate and use of clamps</li> <li>• By clamping between centres (Any 1)</li> </ul>

(2 × 1) (2)

## 4.4 ADVANTAGES

- You can reverse the work-piece without loss of concentricity.
- You can machine long work-pieces for the full length of the bed.
- You can also transfer work-pieces between machines without loss of concentricity. (Any relevant 2 × 1) (2)

## DISADVANTAGES:

- You have to drill centre holes before you set up the work-piece.
- There is lack of rigidity on long work-pieces.
- Boring operations are not possible.
- You can do only limited work on the face of the bar. (Any relevant 2 × 1) (2)

**[20]****QUESTION 5: CENTRE LATHE AND MILLING MACHINE**

- |     |       |  |             |     |
|-----|-------|--|-------------|-----|
| 5.1 | 5.1.1 | Parting off  |             |     |
|     | 5.1.2 | Thread cutting or threading  |             |     |
|     | 5.1.3 | Chamfering   |             |     |
|     | 5.1.4 | Boring   | (4 × 1)     | (4) |
| 5.2 | 5.2.1 | <ul style="list-style-type: none"> <li>• Greater cooling capacity</li> <li>• Lower cost</li> <li>• Reduced smoke</li> <li>• Elimination of fire hazards</li> </ul>   | (Any 2 × 1) | (2) |
|     | 5.2.2 | <ul style="list-style-type: none"> <li>• Keeps the cutting tool and work-piece cool.</li> <li>• Allows higher cutting speed.</li> <li>• Washes away chips and cuttings.</li> <li>• Imparts a smooth finish.</li> </ul> | (Any 2 × 1) | (2) |
| 5.3 | 5.3.1 | Angle plate  |             |     |
|     | 5.3.2 | Machine table  |             |     |
|     | 5.3.3 | Square   |             |     |
|     | 5.3.4 | Dial test indicator or DTI   |             |     |
|     | 5.3.5 | Magnetic stand   | (5 × 1)     | (5) |
| 5.4 |       | <ul style="list-style-type: none"> <li>• Type of material to be cut</li> <li>• Diameter of the cutter</li> <li>• Width and depth of the cut</li> <li>• Use of cutting fluid</li> <li>• Speed of the feed</li> </ul>    | (Any 4 × 1) | (4) |

5.5	5.5.1	Overarm		
	5.5.2	Arbor support		
	5.5.3	Arbor		
	5.5.4	Straddle mills		
	5.5.5	Three-jaw chuck		
	5.5.6	Index plate		
			(6 × 1)	(6)
5.6		Simple indexing		(2)
5.7		N/9°		
		$= \frac{30^{\circ}30'}{9^{\circ}}$		
		$= 3 \frac{3 \frac{1}{2}}{9} \checkmark$		
		$= \frac{7}{2}$		
		$= \frac{7}{2} \times \frac{1}{9} \checkmark$		
		$= \frac{17}{18}$		
		$= \frac{17}{18} \times \frac{3}{3}$		
		$= \frac{21}{54} \checkmark$		
		Answer = 3 complete turns ✓ and 21 holes on 54-hole circle. ✓		(5)
5.8		<ul style="list-style-type: none"> <li>• Simple indexing</li> <li>• Rapid indexing</li> <li>• Angular indexing</li> <li>• Differential indexing</li> </ul>	(Any 2 × 1)	(2)
5.9		<ul style="list-style-type: none"> <li>• Index plate</li> <li>• Three-jaw chuck</li> <li>• Crank</li> <li>• Sector arms</li> <li>• Worm and worm wheel</li> <li>• Plunger</li> </ul>	(Any 3 × 1)	(3)
				<b>[35]</b>
			<b>TOTAL:</b>	<b>100</b>