



**higher education  
& training**

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

# **MARKING GUIDELINE**

**NATIONAL CERTIFICATE (VOCATIONAL)**

**FITTING AND TURNING  
NQF LEVEL 3**

**16 November 2022**

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

**QUESTION 1: BEARINGS**

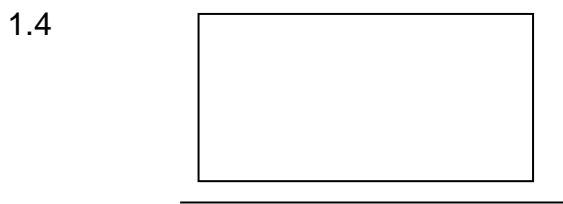
- 1.1
- Workers or other people won't slip and injure themselves.
  - Core of good housekeeping practice.
  - Allows you to work safely and efficiently.
- (Any 2 × 1) (2)

- 1.2 Advantages
- Easy to replace.
  - Used where starting torques are high.
  - Become noisy when they are failing.
  - Can be pre-packed with grease with seals to provide for a relative maintenance-free installation.
  - Can support a combination of radial and thrust loads.
  - Longer-lasting/Durable.
  - Generate low friction.
- (Any 3 × 1)

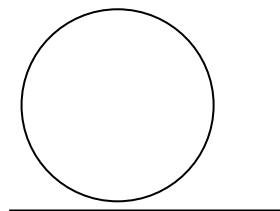
Disadvantages

- Noisier at high speeds than plain bearings.
  - Initial costs are high.
  - Bearings cannot be repaired, only replaced.
  - High accuracy is required.
  - Consists of many moving parts.
  - They require a larger space to work in.
- (Any 2 × 1) (5)

- 1.3
- Induction heater method.
  - Oil bath method.
  - Heating lamp method.
- (3)



Line contact  
(roller bearing)



Point contact  
(ball bearing) (2 × 2) (4)

- 1.5
- To keep the bearing lubricant from leaking out.
  - To prevent dirt and other contaminants from entering the bearing.
- (Any ONE) (1)

**[15]**



**QUESTION 4: BELT DRIVES, CHAIN DRIVES AND GEAR DRIVES**

- 4.1 4.1.1 True
- 4.1 4.1.2 False
- 4.1 4.1.3 True
- 4.1 4.1.4 True
- 4.1 4.1.5 False

(5 × 1) (5)

4.2

ADVANTAGES	DISADVANTAGES
<ul style="list-style-type: none"> <li>• Positive drive (no slip).</li> <li>• Compact systems.</li> <li>• Used for high speeds/torque</li> <li>• Power transmission is direct.</li> <li>• Maintenance costs are low.</li> <li>• Less quiet in operation</li> </ul> <p style="text-align: right;">(Any 3 × 1)</p>	<ul style="list-style-type: none"> <li>• Expensive to manufacture.</li> <li>• Expensive to repair.</li> <li>• Require constant lubrication.</li> <li>• Driver and driven must be close to each other. (Any 2 × 1)</li> </ul>

(3 + 2) (5)

- 4.3 • Accidents are reduced.
- 4.3 • Injuries are reduced.
- 4.3 • Tools and equipment can be found easily.
- 4.3 • Workers are more productive.
- 4.3 • Space is saved.
- 4.3 • Saves time.
- 4.3 • Increases worker morale.

(Any 5 × 1) (5)

[15]

**QUESTION 5: PIPES, PIPE FITTINGS AND VALVES**

5.1

ADVANTAGES OF PLASTIC PIPING	DISADVANTAGES OF PLASTIC PIPING
<ul style="list-style-type: none"> <li>• Easy to cut and join.</li> <li>• Lightweight.</li> <li>• Flexible.</li> <li>• Can be made in long lengths.</li> <li>• Less expensive.</li> <li>• Resistant to corrosion.</li> <li>• Simple to install.</li> <li>• Good electrical insulator.</li> </ul> <p style="text-align: right;">(Any 3 × 1)</p>	<ul style="list-style-type: none"> <li>• Cannot be used for high-pressure installations.</li> <li>• Cannot be used for high-temperature situations.</li> <li>• Brittle and easily damaged.</li> <li>• Not rigid like metal pipes.</li> <li>• Cannot be used with all types of acids</li> <li>• Not very stable (Any 2 × 1)</li> </ul>

(3 + 2) (5)

- 5.2
- Gate valve
  - Diaphragm valve
  - Ball valve
  - Foot valve
  - Non-return valve
  - Pressure relief valve
  - Safety valve
  - Butterfly valve
  - Pop safety valve
  - Weight controlled valve
- (Any 5 × 1) (5)  
**[10]**

**QUESTION 6: CENTRE LATHE**

- 6.1
- a – Headstock
  - b – Carriage
  - c – Tailstock
  - d – Tool post
  - e – Compound slide
  - f – Cross slide
  - g – Apron
  - h – Feed shaft
  - l – Lead screw
- (9)
- 6.2
- $D = 10 \text{ mm} = 10/1000 = 0.01\text{m}$   
 $N = 2000 \text{ rpm}$
- $S = \pi \times D \times N$   
 $= \pi \times 0,01 \times 2\,000 \checkmark \checkmark$   
 $= \underline{62,832 \text{ m/min}} \checkmark$
- (3)
- 6.3
- Advantages
- Holds a wide range of cylindrical and hexagonal workpieces.
  - Easy to mount a workpiece.
  - Setting-up time is quick.
  - Jaws can be used internally and externally.
- (Any 2 × 1)
- Disadvantages
- Worn jaws result in inaccuracy.
  - Chuck can only hold cylindrical and hexagonal workpieces.
  - Impossible to correct shaft run-out.
  - Gripping power of the chuck can damage the workpiece.
- (Any 2 × 1)  
(2 × 2) (4)

6.4

PROBLEMS	POSSIBLE CAUSES
<ul style="list-style-type: none"> <li>• Tool breaks</li> <li>• Excessive tool wear</li> <li>• Tool chatter (Any 2 x 1)</li> </ul>	<ul style="list-style-type: none"> <li>• Wrong tool material, high feed pressure</li> <li>• No cutting fluid used, wrong tool angle, high feed pressure</li> <li>• Workpiece or tool not clamped securely, or the tool is blunt (Any 2 x 1)</li> </ul>

(2 x 2)

(4)  
[20]

**QUESTION 7: MILLING MACHINE**

- 7.1
- Reduces friction and wear.
  - Washes away chips and filings.
  - Keeps the cutting tool and workpiece cool (prevents overheating).
  - Provides a good surface finish.
  - Protects against corrosion.
  - Longer life of the cutting tool.
- (Any 5 x 1) (5)

- 7.2
- Roughing cutter
  - End mill cutter
  - Slot drill cutter
  - Ball nose cutter
  - T-slot cutter
  - Dovetail cutter
  - Radius cutter
- (Any 6 x 1) (6)

- 7.3
- Feed rate per tooth
  - Number of teeth on the cutter
  - Revolutions per minute
- (3)

- 7.4
- D = 25 mm = 25/1000 = 0.025m  
 S = 45 m/min  
 ft = 0.18 mm/tooth  
 T = 4 teeth

$$S = \pi \times D \times N$$

$$N = S / \pi \times D$$

$$= 45 / \pi \times 0.025 \checkmark \checkmark$$

$$= \underline{572,958 \text{ r/min}} \checkmark$$

$$f = ft \times T \times N$$

$$= 0.18 \times 4 \times 572,958 \checkmark \checkmark$$

$$= \underline{412,53 \text{ mm/min}} \checkmark$$

(6)  
[20]

**TOTAL: 100**