higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

MACHINE MANUFACTURING
NQF LEVEL 3

6 March 2020

This marking guideline consists of 7 pages.

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QUESTION 1

1.1 CNC-lathe (1)

1.2
- Parallel turning
- Taper turning
- Boring
- Drilling
- Screw cutting
- Reaming (Any 4 × 1) (4)

1.3
- Hydraulic power chuck
- Turret tools
- AutoCAD graphic screen/controller
- Hydraulic tailstock
- Sliding guard (Any 4 × 1) (4)

1.4

ADVANTAGES	DISADVANTAGES
• Excellent precision • Lower running cost • Better finish • Easily machine complex shapes	• Highly expensive (CAD packages) • Costly set-up time to manufacture one part • Heavy computing power • High initial expense of hardware

(Any 2 + any 2) (4)

1.5
- Tie/Scarf
- Jewellery
- Loose clothing (Any 2 × 1) (2)

[15]

QUESTION 2

2.1
2.1.1 Headstock
2.1.2 Bed
2.1.3 Compound slide
2.1.4 Dead centre
2.1.5 Tailstock

(5 × 1) (5)

2.2
- Compound-slide taper-turning method
- Graduated-sleeve taper-turning method
- Dial-test indicator method
- Tailstock set-over
- Taper-turning attachment (Any 3 × 1) (3)

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2.3

	FIGURE 1	FIGURE 2
2.3.1	Chuck operated by hydraulics	Chuck operated manually
2.3.2	Cutting tools on home position and hydraulic operated	Cutting tools mounted on tool post and changed manually

(2 × 1) (2)

2.4 To support long, slender workpieces against bending and vibration during machining on the centre lathe (1)

2.5
- Fixed steady✓ mounted on the machine bed✓
- Travelling steady✓ mounted on the carriage✓ (4)

[15]

QUESTION 3

3.1
3.1.1 B
3.1.2 D
3.1.3 E
3.1.4 C
3.1.5 A

(5 × 1) (5)

3.2
3.2.1 False
3.2.2 False
3.2.3 True
3.2.4 True
3.2.5 False

(5 × 1) (5)

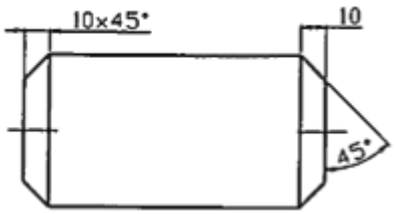
3.3
3.3.1 B
3.3.2 C
3.3.3 D
3.3.4 A
3.3.5 D

(5 × 1) (5)

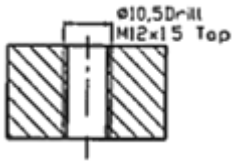
[15]

QUESTION 4

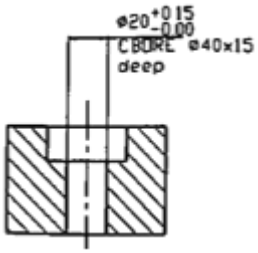
4.1 4.1.1



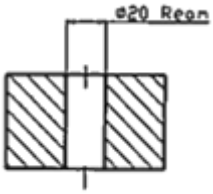
4.1.2



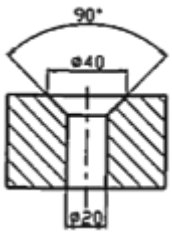
4.1.3



4.1.4

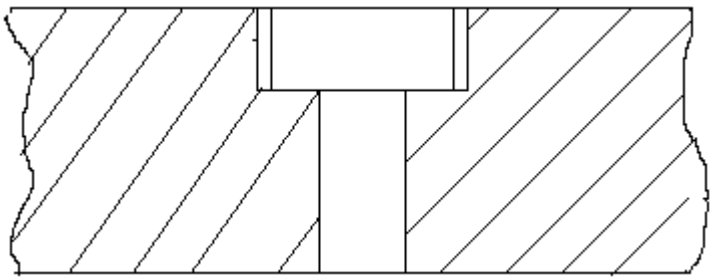


4.1.5



(5 × 1) (5)

4.2 4.2.1



(2)

4.2.2
- Counterbore tool
- 12 mm taps (set of three) (2)

4.2.3 **Reasons**
- Incorrect ground or blunt drill point
- Feed too rapid or incorrect
- Insufficient coolant
- Abuse and mishandling (Any TWO)

Corrective measures
- Use enough coolant during drilling.
- Use correct ground or sharp drill bit.
- Avoid clogging with chips.
- Release pressure when drilling. (Any TWO)

(2 + 2) (4)

4.2.4
- How long did the entire operation take?
- Is there any loss of material/rejects during the operation?
- Are there any safety hazards? (3)

4.3 4.3.1 Digital read-out (DRO) milling machine (1)

4.3.2 A: Machine table
B: Digital read-out (DRO)
C: Switch box

(3 × 1) (3)
[20]

QUESTION 5

5.1 5.1.1 Apron
5.1.2 Saddle
5.1.3 Cross slide
5.1.4 Tool post
5.1.5 Compound slide

(5 × 1) (5)

5.2 Given: D = 15 mm and S = 600 mm/s

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

$N = \frac{S}{\Pi \times D}$✓

$= \frac{60 \times 0,6}{\Pi \times 0,015}$✓

$= \frac{36}{0,047}$✓

= 765,957✓
= 766 r/min✓ (5)

5.3 5.3.1 Simple indexing (1)

5.3.2 $\frac{40}{N} = \frac{40}{13}$✓

$= 3\ 1/13$

$= 1/13 \times 3/3$✓

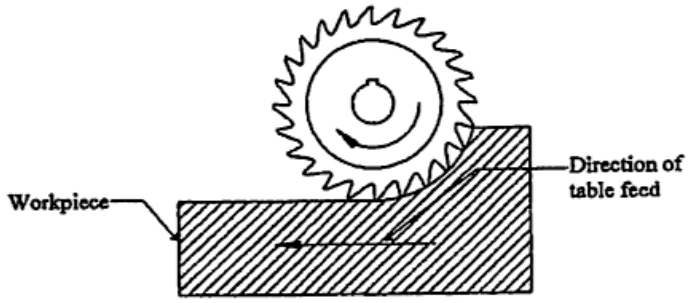
$= \frac{3}{39}$✓

= 3 complete full turns✓ + 3 holes on a 39-hole circle✓ (4)

5.4
- Check oil levels daily.
- Oil slides and grooves.
- Be familiar with the operations manual.
- Check coolant levels and change if needed.
- Check if emergency stop is working properly.
- Check the following instruments:
  - Dial gauges
  - Mandrels
  - Machine spirit levels

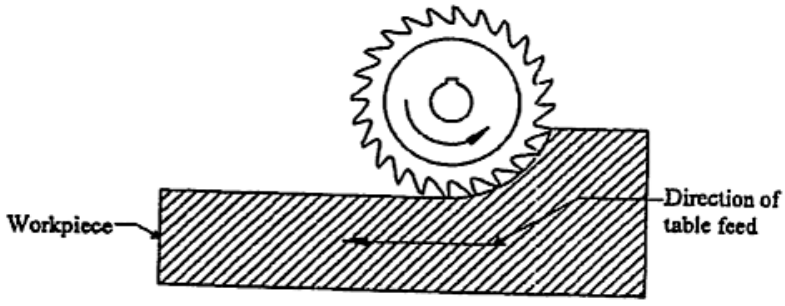
(Any 5 × 1) (5)

5.5



DOWN-CUT MILLING

Advantages
- Deeper cuts
- Finer finish



UP-CUT MILLING

Advantages
- Less vibration
- Courser feed
- Less strain on cutter and arbor

(4 + 4) (8)

5.6 Given: Length of shaft (L) = 300 mm = 0,03 m
Feed (f) = 0,5 mm/r
Cutting speed (S) = 26 m/min = 26/60 = 0,43
Diameter (d) = 45 mm = 0,045 m

$$S = \frac{\pi \times d \times N}{60}\checkmark$$

$$\text{But } N = \frac{S \times 60}{\Pi \times d}\checkmark$$

$$= \frac{0,43 \times 60}{3,142 \times 0,045}\checkmark$$

$$= 184,29 \text{ r/s}\checkmark$$

$$\text{But } T = \frac{L}{f \times N}$$

$$\text{Time} = \frac{300}{0,5 \times 184,29}\checkmark$$

$$= \frac{300}{92,15}$$

$$= 3,26\checkmark$$

= 3 min 15 sec✓ (7)
[35]

TOTAL: 100

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