



**higher education  
& training**

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

# **MARKING GUIDELINE**

**NATIONAL CERTIFICATE  
APRIL EXAMINATION  
FITTING AND MACHINING THEORY N1**

**4 APRIL 2016**

**This marking guideline consists of 8 pages.**

**SECTION A****QUESTION 1: OCCUPATIONAL SAFETY**

1.1	1.1.1	False		
	1.1.2	True		
	1.1.3	False		
	1.1.4	False		
	1.1.5	True		
			(5 x 1)	(5)

**OR**

1.2	1.2.1	False		
	1.2.2	True		
	1.2.3	False		
	1.2.4	False		
	1.2.5	False		
			(5 x 1)	(5)

**QUESTION 2: MEASURING INSTRUMENTS**

2.1	2.1.1	A – Spindle B – Sleeve C – Thimble D – Ratchet	(4 x 1)	(4)
	2.1.2	Depth micrometer		(1)
	2.1.3	FIGURE 1 – READING = 3,54 mm		(2)
2.2	2.2.1	True		
	2.2.2	False		
	2.2.3	False		
	2.2.4	True		
			(4 x 1)	(4)
				<b>[11]</b>

**QUESTION 3: SCREW THREADS**

- 3.1 3.1.1 Pitch – is the distance measured axially from a point on one screw thread to a corresponding point on an adjacent screw thread
- 3.1.2
- The distance that a screw thread will move axially forward in one full revolution.
  - With single-start screw threads the lead is equal to the pitch. With multi-start screw threads the lead is equal to the pitch X number of starts
- 3.1.3 Included angle – angle between two screw-thread flanks
- 3.1.4 External thread – the v-thread over the outside diameter (4 x 1) (4)
- 3.2 Depth =  $0,613 \times 2,5 = 1,533$  (2) [6]

**QUESTION 4: METALS AND PLASTIC**

- 4.1 WHITE CAST IRON
- Crushing equipment
  - Grinding mills and grinding balls
  - Cams, wearing plates and conduit fittings (2 x ½) (1)
- GREY CAST IRON
- Machine tools, machine beds and frames, and engine blocks
  - Marking-off tables, surface plates and bathtubs (2 x ½) (1)
- 4.2 HARDENING
- Steel will only begin to harden when it has a carbon content of at least 0,5%.
  - Hardening **alters (changes)** the molecular structure of the steel sample.
  - Property = very hard to the core.
- CASE HARDENING
- Steel with less than 0,5% carbon – must be case-hardened.
  - Hardens the surface of mild steel to a depth of approximately 2 mm.
  - Only hard on the outside and still soft on the inside. (4)
- 4.3 4.3.1 BRASS – copper and zinc  
 PROPERTIES - Low melting point, strong and ductile, cast well, corrosion resistant.  
 USES – Cartridge cases, wire, rods, tubes, water fittings, bolts and nuts.

- 4.3.2 BRONZE – copper and tin  
 PROPERTIES – Resists wear, casts well, corrosion resistant  
 USES – gears, valves, machine bearings, pump impellers, glands.  
 (3 x 2) (6)  
**[12]**

### QUESTION 5: MARKING-OFF

- 5.1
- Guide lines are required to indicate the outline of a work piece.
  - The exact position of holes, slots and keyways must be clearly marked-off.
  - Marking-off serves as a guide for setting the work piece up in a machine.
  - It serves as a guide for roughing out purposes. (Any 2 x 1) (2)
- 5.2
- 5.2.1 **Engineer's** square – to check surfaces at right angles (90°) to each other and to lay out lines at right angles to a reference face and flatness of a surface
- 5.2.2 Angle plate – to support work pieces in a vertical position for marking-off
- 5.2.3 Measuring tape – for measuring and laying out of long distances OR measurements.  
 (3 x 1) (3)  
**[5]**

### QUESTION 6: KEYS AND KEYWAYS

- 6.1
- Shaping machine with rigid boring bar
  - Milling machine with slotting attachment with vertical movement
  - Slotting machine, also vertical movement
  - Key-seat machine
  - In the chuck of a lathe with axial movement of a rigid boring bar
  - Wire cutting **process**. (Any 4 x 1) (4)
- 6.2
- A pulley to the shaft of a motor
  - The change wheels of a lathe to their shafts
  - The driving flange to the spindle of a grinding machine
  - A lever to a shaft
  - A coupling to a shaft (2)  
**[6]**

**QUESTION 7: HAND TOOLS**

- 7.1
- Philips ('Star')
  - Flat
  - Torx
  - Square point
- (Any 2 x ½) (1)
- 7.2 After the hole is drilled, ✓ use a square file ✓ to rough it out, closely to the lines and then finished it off with a HAND file ✓ to get the corners 90° ✓ (4)
- 7.3
- Reaching into tight corners during mechanical assembly
  - Formation of wire loops; and
  - Removal of split pins
- (Any 1 x 1) (1)  
**[6]**

**QUESTION 8: FASTENERS**

- 8.1 Function of locking fluid – locking of internal/external threads by application of a fluid-based adhesive. (1)
- 8.2
- Symmonds and
  - Nyloc
  - Ex-nut (exhaust nut)
  - Oval nuts
- (Any 2 x 1) (2)
- 8.3 False (1)  
**[4]**

**QUESTION 9: HAND TAPS, STOCK, DIES AND REAMERS**

- 9.1
- Tapertap (1<sup>st</sup> tap or nr one tap)
  - Intermediate tap (2<sup>nd</sup> tap)
  - Plugtap (bottoming tap)
- (3)
- 9.2 TWO types of dies – Split (1) and Solid dies (1) (2)  
**[5]**

**TOTAL SECTION A: 60**

**SECTION B: MACHINE CUTTING TOOLS AND MACHINES****QUESTION 10: DRILLING MACHINES**

- 10.1
- Good temperature cooling capacity
  - Good lubricating qualities
  - Good rust-resistance
  - Have a long life (in use/storage)
  - Be non-toxic
  - Low viscosity to assist chips and dirt to settle quickly (Any 3 x 1) (3)
- 10.2  $N = \frac{S}{\pi \times D} = \frac{30}{\pi \times 0,012} = 795 \text{ RPM} = 13 \text{ R/second}$  (3)
- 10.3
- |        |       |             |
|--------|-------|-------------|
| 10.3.1 | False |             |
| 10.3.2 | True  |             |
| 10.3.3 | True  |             |
| 10.3.4 | True  | (4 x 1) (4) |
- [10]**

**QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS**

- 11.1
- | ADVANTAGES HUNTINGTON<br>WHEEL DRESSER  | DIAMOND-TIPPED WHEEL<br>DRESSER  |     |
|---|--|-----|
| 1. It is cheaper than the diamond-tipped wheel dresser  | 1. It is more expensive than the Huntington wheel dresser                                  |     |
| 2. It is difficult to control the amount of material removed from the wheel face  | 2. Every pass removes a controlled amount from the wheel face                              |     |
| 3. The star wheels wear down quickly and need replacement   | 3. Diamonds last a long time   |     |
| 4. It is difficult to keep the face of the wheel parallel to the edge of the work rest because star wheels wear rapidly | 4. Diamonds wear slowly, therefore the wheel face is parallel to the edge of the work rest |     |
| 5. The dresser dulls very quickly   | 5. The turning movement of the handle and the diamond always presents a sharp cutting edge | (2) |
- 11.2
- Cushion flanges against high points or uneven surfaces and distribute the pressure evenly.
  - Prevent damage to the surfaces of the flanges from the abrasive surface of the wheel.
  - Better control of friction between the flange and the wheel, thereby providing power to the wheel. (Any 2 x 1) (2)

- 11.3 Flanges must not be less than one-third of the diameter of the wheel (1)
- 11.4 Positive rake – the top rake (wedge angle) is less than 90°  
Negative rake – the top rake (wedge angle) is greater than 90° (2)
- 11.5 Chip breaking – the action of directing the swarf or shaving off the wedge angle of the cutting tool. This may either 'break' the chip or allow a smooth streaming shaving (2)
- 11.6 Machining of internal diameters (1)
- [10]**

**QUESTION 12: CENTRE LATHE**

- 12.1
- V-Flat
  - V-type
- (2)
- 12.2
- The chuck can hold a wide range of hexagonal and cylindrical work pieces.
  - There are jaws available for external and internal work.
  - You can do work on the end face of the work piece.
  - You can easily mount the work piece.
  - The work piece is clamped concentrically and need not to be clocked.
- (Any 3 x 1) (3)
- 12.3
- Taper turning attachment
  - Compound slide
  - Setting over of tailstock
- (3)
- 12.4
- Higher manufacturing speed
  - Accuracy
  - Better surface finish
  - Easy to machine complex shapes
  - **Do** not require skilled operators
  - Lower running costs
  - Cutting-tool life is improved
- (Any 2 x 1) (2)
- [10]**

13.1	<p>Universal milling machine</p> <ul style="list-style-type: none"> <li>• The table can swing in both directions for helical milling</li> <li>• The spindle can turn in both directions</li> <li>• Special attachments enable a horizontal machine to change into a vertical machine and a slotting machine</li> </ul> <p>Plain milling machine</p> <ul style="list-style-type: none"> <li>• Plain milling machine is sturdily built.</li> <li>• Used to produce work where it is important to make heavy cuts.</li> </ul>	(3)
13.2	<p>13.2.1 Table trips – set the table travel length – determines the cutter's travel over the work piece.</p> <p>13.2.2 Table trips – set the table travel length – determines the cutter's travel over the work piece.</p> <p>13.2.3 Arbor support – supports the arbor and machine spindle</p> <p>13.2.4 Adjustable footstock – supports work pieces held in the chuck off the dividing head</p> <p>13.2.5 Arbor – connects to the spindle and holds the cutter(s)</p> <p>13.2.6 Dividing head – used on the table of the milling machine to hold the work piece and divide the circumference in equal holes or teeth</p> <p>13.2.7 Boring head – it is an attachment whereby you cut internal diameters on a milling machine to any size of diameter</p>	(7 x 1) (7) <b>[10]</b>
<b>TOTAL SECTION B:</b>		<b>40</b>
<b>TOTAL:</b>		<b>100</b>