



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

NOVEMBER EXAMINATION

FITTING AND MACHINING THEORY N1

22 NOVEMBER 2016

This marking guideline consists of 8 pages.

SECTION A: GENERAL FITTING

QUESTION 1: OCCUPATIONAL SAFETY

- 1.1
- Use each tool to do the task it is meant for.
 - Point the sharp edges of tools away from you towards the back of your workbench.
 - Keep your tools clean, dry and free of oil.
 - Take care of your tools. For example, have a storage place for each tool and service your tools regularly.
 - Never carry tools which have sharp edges in your pocket.
 - Don't have all your tools on the workbench at once; a cluttered work area often causes accidents.
 - Don't use tools incorrectly or carelessly.

(Any 5 × 1) [5]

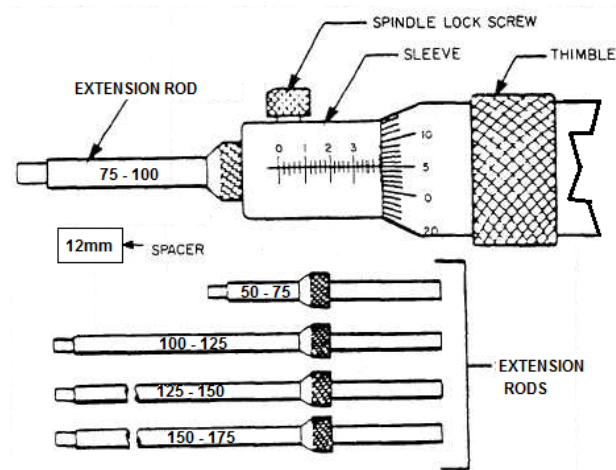
OR

- 1.2
- | | |
|-------|-------|
| 1.2.1 | True |
| 1.2.2 | True |
| 1.2.3 | False |
| 1.2.4 | False |
| 1.2.5 | False |

(5 × 1) [5]

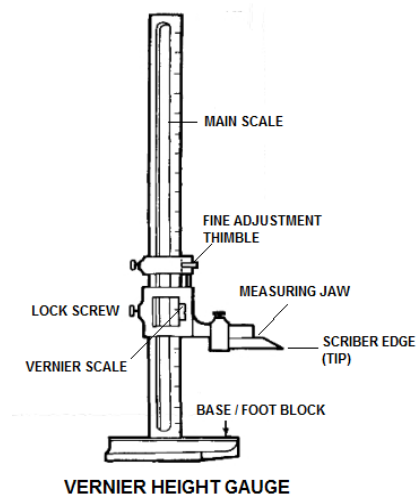
QUESTION 2: MEASURING INSTRUMENTS

2.1 2.1.1



FITTING AND MACHINING THEORY N1

2.1.2



(2 × 4) (8)

- 2.2
- Fast readings can be taken.
 - Precision readings can be taken.
 - Greater accuracy than the normal vernier.
 - Good for quality control and quick inspections.
 - Can take inside, outside and depth measurements in one instrument.
- (Any 2 × 1) (2)

2.3 0.01 mm or 1/100 of a millimetre (1)
[11]

QUESTION 3: SCREW THREADS

- 3.1.1 Lead is 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 times the number of starts.
- 3.1.2 Flank is the straight sloping sides on the left and right of the thread.
- 3.1.3 An included angle is the angle between two screw thread flanks.
- 3.1.4 The included helix angle is the angle the screw thread makes with a line at right angles to the axis of the screw thread.
- (4 × 1) (4)

3.2 SQUARE THREAD –

- Thread form is parallel (seemingly at 90°) used where quick movement of the nut is required or accurate adjustments must be made,
- for example, the cross slide of a lathe,
- the tool head of a shaping machine,
- milling machine slides and
- leadscrews or if strength and force are required, for example, for the fitter's bench vice, for jacks and sluice valves.

Acme thread – thread form – included angle = 29° / used to engage mechanisms; for example, the half nuts on the lathe lead screw / where it is necessary to reduce backlash / Prevent seizing and fouling due to sagging as in long-lathe lead screws.

(2)

3.3 1,75 mm

(1)

[7]

QUESTION 4: HAND TOOLS

- 4.1
- 4.1.1 Ball peen hammer
 - 4.1.2 Straight-peen hammer
 - 4.1.3 Cross-peen hammer
 - 4.1.4 Soft-face hammer
 - 4.1.5 Sledge hammer

(5 × 1)

[5]

QUESTION 5: METALS AND PLASTICS

- 5.1
- Low-carbon steel
 - Medium-carbon steel
 - High-carbon steel

(3)

A Property = very soft, corrosion resistant, good conductor of heat/electricity, ductile and malleable.

Application = switch parts - cables - motor windings - chemical equipment - refrigerator tubes - oil coolers - automotive radiators - steam and water pipelines - base for brass and bronze alloys.

B Property = ductile, malleable, non-corrosive, not strong and a low melting point.

Application = coating for copper wire - die casting - coating metal for thin steel sheets - alloying agent for solder and bearing metals - costume jewellery - tin or zinc alloy for making aluminium.

(2 × 2)

(4)

5.3 Carbon, manganese, nickel, chromium, vanadium, tungsten, cobalt, molybdenum. (3)

5.4 Resistance to shock and wear, heat and corrosion, increased magnetic properties. (2)
[12]

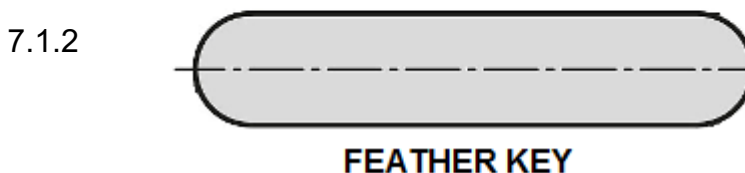
QUESTION 6: MARKING OFF

6.1 6.1.1 OR datum line is a line from which marking-off is done.
 6.1.2 OR datum point is a specific point from which a construction or marking-off is done. (2 × 1) (2)

6.2 • By using the CENTRE HEAD of the combination set and scribe two lines 90° across on the end of the shaft.
 • Put the shaft on a V-block on the marking table. Get the height of the shaft with a vernier height gauge. Subtract half the diameter of the shaft from that reading and scribe a horizontal line across at the end of the shaft. Turn the shaft 90° and scribe another line. (2)

6.3 V-block or angle plate. (1)
[5]

QUESTION 7: KEYS AND KEYWAYS



(2 × 2) (4)

7.2 • Shaper machine – grooving tool
 • Slotting machine – slotting
 • Milling – slotting cutter
 • Milling – side-and-face cutter
 • Milling with Woodruff cutter
 • Spark erosion (Any 2 × 1) (2)
[6]

QUESTION 8: FASTENERS

8.1 External circlip

8.2 Internal circlip

8.3 Lock nut

8.4 Castle nut

8.5 Nylock / Simmonds nut

(5 × 1) [5]

QUESTION 9: HAND TAPS, STOCKS AND DIES AND REAMERS

9.1 When you ream, you drill a hole of 11.7 mm. The reamer removes only a little (0.03 mm) of the material and, therefore, the hole is much more accurate. If the drill of 12 mm is not grinded 100% to specifications, it can drill oversize.

[4]

TOTAL SECTION A: 60**SECTION B: MACHINES****QUESTION 10: DRILLING MACHINES**

- 10.1
- Sensitive drilling machine
 - Column drilling machine
 - Radial drilling machine

Cutting speed = 15 metres per minute (m/min)

Diameter of drill bit = 16 mm.

(3)

$$10.2 \quad S = \pi D N \quad ; \quad N = \frac{S}{\pi D} = \frac{15}{\pi \times 0.016} = 298,4 \text{ RPM} = 300 \text{ RPM}$$

(3)

- 10.3
- 10.3.1 True
 - 10.3.2 False
 - 10.3.3 False
 - 10.3.4 False

(4 × 1) (4)

[10]

QUESTION 11: GRINDERS AND MACHINE CUTTING TOOLS

- 11.1
- Pedestal mount
 - Spindle
 - Coolant tank
 - Guards
 - Protective shield
 - Grinding wheel
 - Tool rest
 - Isolator switch

(Any 4 × 1) (4)

11.2



Left-hand concave radius tool

(2)

- 11.3
- 11.3.1 Back-rake angle
- 11.3.2 Front-clearance angle
- 11.3.3 Side-cutting edge angle
- 11.3.4 End cutting angle

(4 × 1) (4)
[10]**QUESTION 12: CENTRE LATHES**

- 12.1.1 Headstock
- 12.1.2 Spindle
- 12.1.3 Compound slide
- 12.1.4 Lathed
- 12.1.5 Tailstock
- 12.1.6 Apron

(6 × 1) (6)

- 12.2
- A The compound slide has the function to get LENGTHS on a workpiece in tolerance, OR to set for cutting tapers.
- B The tailstock hold the drill chuck OR taper-shank drills OR a running centre.

(2)

- 12.3
- The set-up time to manufacture only one part is a loss.
 - High purchase price.
 - Maintenance – high repair costs.
 - It needs to be programmed before use.

(Any 2 × 1) (2)
[10]

QUESTION 13: MILLING MACHINES

- 13.1
- Clean the milling machine.
 - Never use an air hose to remove the chips.
 - Be familiar with the machine before.
 - Wear proper clothing and approved safety goggles.
 - Stop the machine before you make adjustments to take measurements.
 - Stop the machine before you remove chips.
 - Never reach over or near the rotating cutter.
 - Make sure that the work-holding device is mounted.
 - Place sawdust or oil-absorbing compound on slippery floors.
 - Be aware of the location of the emergency stop lever.
 - Treat any cut and skin puncture immediately.
 - Switch off before performing maintenance / repairs.
 - Wear gloves for when you handle sharp milling cutters.
 - Be aware – do not be distracted.
 - Do not allow others to operate your machine.
 - Keep the floor around the machine clear of chips.

(Any 4 × 1) (4)

13.2 13.2.1 Knee

13.2.2 Column

13.2.3 Table

(3 × 1) (3)

13.3 13.3.1 The knee fits to the column and you can move it vertically up or down by hand or set it automatically.

13.3.2 The column is a precision-machined section which supports and guides the knee vertically.

13.3.3 The table also supports the work piece, machine vice, tailstock and dividing head.

(3 × 1) (3)
[10]

TOTAL SECTION B: 40
GRAND TOTAL: 100