

higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

FITTING AND MACHINING THEORY N1

28 March 2013

This marking guideline consists of 8 pages.

QUESTION 1

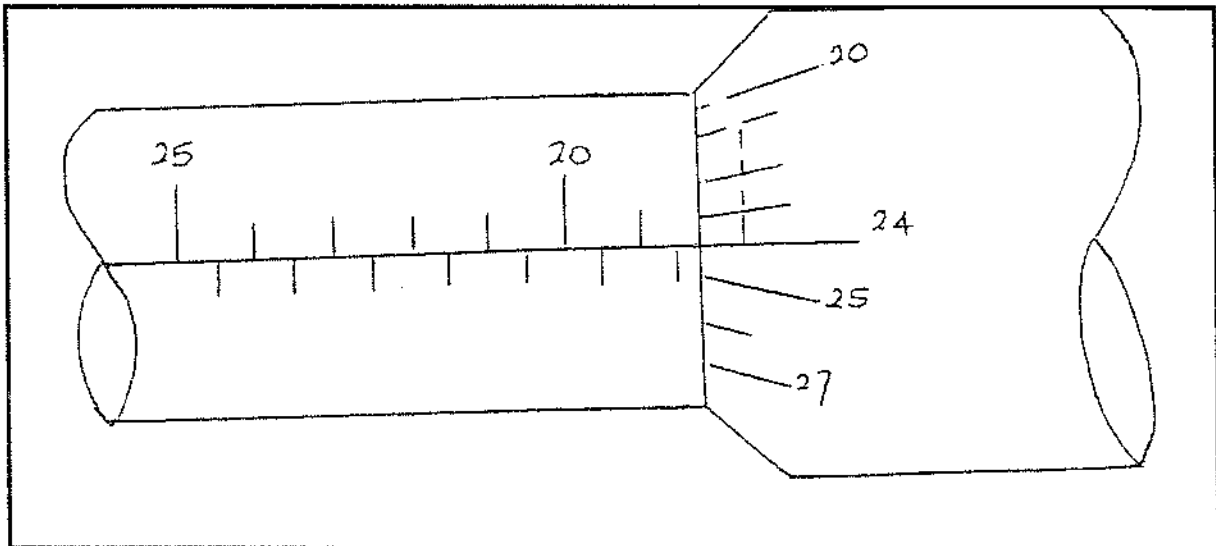
- 1.1
- Advertise and propagate correct techniques by means of notice boards.
 - Stress the necessity of proper lighting.
 - Maintenance of cables and electrical hand tools.
 - Protection of machinery.
 - Workshop conditions and the prevention of accidents by keeping the floors and walkways clear.
 - Proper ventilation so that workers get enough oxygen.
 - Adequate working space so that workers do not get in the way of each other.
- Any (5 × 1) (5)
- 1.2
- 1.2.1 Reference line – is a line from which marking-off is done. (1)
- 1.2.2 Reference point – is a specific point from which a construction or marking-off is done. (1)
- 1.3 Copper sulphate (1)
Marking blue (1)
- 1.4 V-blocks (2)
- 1.5 A ~ pipe or gas pliers (1)
B ~ adjustable spanner (1)
C ~ flat spanner (1)
D ~ stillson wrench (1)
E ~ allen key (1)
- [16]**

QUESTION 2

- 2.1
- 2.1.1 99,89 mm (1)
- 2.1.2 0,01 mm (1)
- 2.1.3 13 mm (1)
- 2.1.4 A long handle is supplied for taking measuring to the back of the deep small diameter holes. (1)

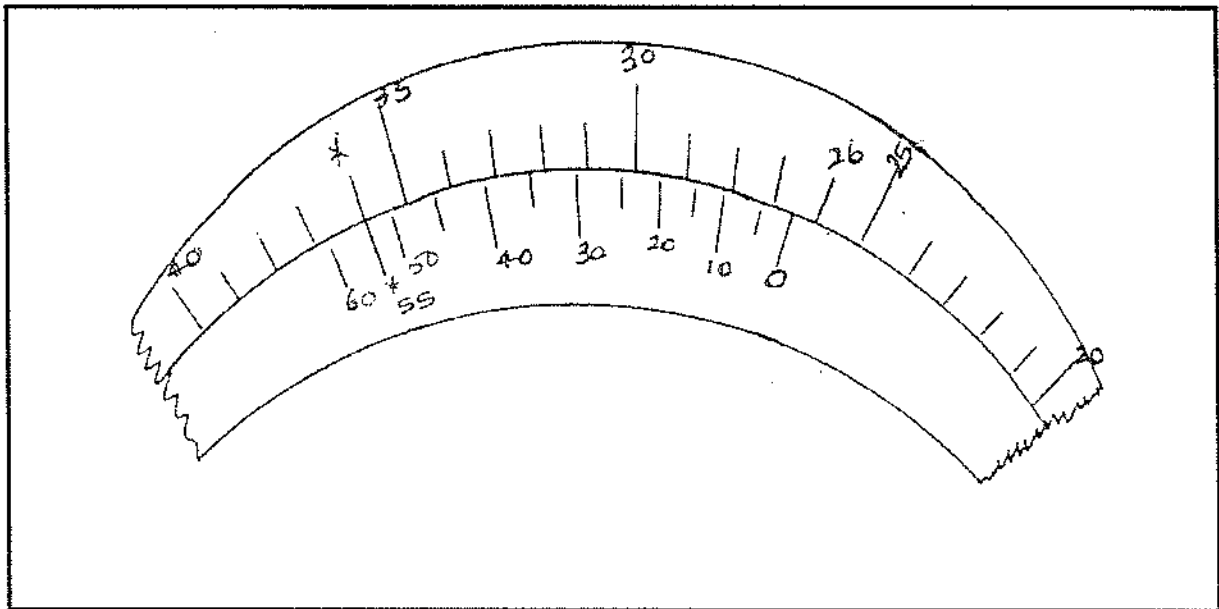
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2.2 2.2.1



(4)

2.2.2



(3)

- 2.3 2.3.1 Grey cast iron
- 2.3.2 Dull sound
- 2.3.3 Softens
- 2.3.4 Cobalt
- 2.3.5 Copper and tin

2.3.6 Solder

2.3.7 Case hardening

2.3.8 Aluminum

2.3.9 Red

2.3.10 Orange

2.3.11 Plastic

2.3.12 Gears

(12 × 1)

(12)
[23]

QUESTION 3

- 3.1 3.1.1
- Where quick movement of the nut is required
 - Where accurate adjustment must be made
 - Where strength and force are required
- Any (2 × 1) (2)
- 3.1.2
- To prevent seizing and fouling due to sagging as in long lathe lead screw.
 - Where it is necessary to reduce backlash.
 - To engage mechanisms, for example the half nut on a lathe lead screw.
- Any (2 × 1) (2)
- 3.2 Left-hand screw thread is cut so that the nut must be turned to the left to screw on and the right-hand screw thread is cut so that the nut must be turned to the right to screw on. (2)
- 3.3 3.3.1 Rectangular key
- A pulley to the shaft of a motor.
 - The change wheels of a lathe to their shaft.
 - The driving flange to the spindle of a grinding machine.
 - A lever to a shaft.
 - A coupling to a shaft.
- Any (1 × 1) (1)
- 3.3.2 Taper gib head key
- For a driving pulley or gear keyed to a shaft.
 - To key a crank disc to its driving shaft.
- Any (1 × 1) (1)

- 3.3.3 Feather key
- The feed shaft of a lathe.
 - The lifting spindle of a jack.
 - A tailstock spindle, where the key prevents the spindle from turning.
- Any (1 x 1) (1)
- 3.3.4 Woodruff key
- To locate a pulley on the end of a shaft where the pulley is secured by means of a nut.
- (1)
- 3.4 $H = \frac{D}{6} = \frac{48}{6} = 8 \text{ mm}$ (1)
- $W = \frac{D}{4} = \frac{48}{4} = 12 \text{ mm}$ (1)
- 3.5 A ~ split pin (1)
 B ~ castle nut (1)
 C ~ self-tapping screw (1)
 D ~ external circlip (1)
- 3.6
- Parallel hand reamer
 - Taper reamer
 - Expanding reamer
 - Adjustable reamer
 - Machine reamer
- Any (3 x 1) (3)
- 3.7 Used to cut external threads in a shaft or rod. (1)
- 3.8 When the final thread has to finish the hole. (1)
- [21]

QUESTION 4

- 4.1 The sensitive drilling machine derives its name from the fact that it enables the operator to feel the progress of the drill as it cuts through the material. (2)
- 4.2
- They provide the rake angle.
 - They form the cutting edge.
 - They provide a passage for the coolant.
 - They facilitate removal of swarf.
- Any (2 x 1) (2)

- 4.3 $D = 15 \text{ mm}$
 $S = 600 \text{ mm/sec}$
 $R.T.C \ N = r/\text{min}$
- $S = \frac{600 \times 60}{1000} = 36 \text{ m/min}$ (1)
- $S = \pi DN$ (1)
 $N = \frac{S}{\pi D} = \frac{36 \text{ m/min}}{\pi \times 0.015}$ (1)
 $= 764 \text{ r/min}$ (1)
- 4.4
- General turning operation
 - Taper turning
 - Internal turning operation
 - Drilling operation
 - Facing
 - Screw thread cutting
- Any (3 × 1) (3)
- 4.5 Fixed steady (1)
 Travelling steady (1)
- 4.6
- You can use a higher manufacturing speed.
 - The finished part is more accurate.
 - It gives a better surface finish.
 - You can easily machine complex shapes.
 - The CNC lathe does not require skilled operators to operate it.
 - It has lower running costs.
 - The life of a cutting tool is much greater due to its features such as constant surface speed and backlash compensation.
- Any (3 × 1) (3)
- 4.7
- | | | |
|---|--------------------|-----|
| A | Side roughing tool | (1) |
| B | Knife tool | (1) |
| C | Screw cutting tool | (1) |
| D | Grooving tool | (1) |
| E | Parting tool | (1) |
- [20]**

QUESTION 5

- 5.1 A ~ Ram (1)
 B ~ Ram locking lever (1)
 C ~ Compensating link (1)
 D ~ Slotted arm (1)
 E ~ Fulcrum (1)
- 5.2 Number of strokes per minute = $\frac{\text{cutting speed (m/min)} \times \text{ratio}}{\text{Length of strokes (m)}}$
 $= \frac{15 \text{ m/stroke} \times 2}{0,25 \text{ m} \quad 3}$
 $= 60 \times 0,667$
 $= 40 \text{ strokes/min}$ (1)
- Time = $\frac{\text{width of work piece (mm)}}{\text{Feed/stroke} \times \text{strokes per min}}$
 $= \frac{240}{2 \text{ mm/min} \times 40}$ (1)
 $= 3 \text{ min}$ (1)
- 5.3 5.3.1 The overarm provides support and the correct alignment for the arbor and you can adjust and clamp it in any position.
- 5.3.2 Bracing arms are fitted to the overarm and knee of the machine, to provide better support to the arbor and prevent vibration and chatter when you make heavy cuts.
- 5.3.3 The table trips trip the automatic feed at pre-set positions.
- 5.3.4 The adjustable footstock supports the work piece on the opposite side of the dividing head and you can adjust it in the vertical plane for taper work.
- 5.3.5 The spindle is hollow and provides the drive to the arbour and cutters.
- 5.3.6 The arbour is located and held by the taper in the spindle nose; the arbour drives and holds the cutters in their correct position.
- 5.3.7 The arbour support fits and clamps to the overarm in any position along its length to align and support the arbour.
- 5.3.8 The column is a precision-machined section which supports and guides the knee vertically. (8 × 1) (8)

- 5.4
- The material you have to grind and its hardness.
 - The amount of material you must remove and the finish you require.
 - Whether you have to do wet or dry grinding.
 - The wheel speed.
 - The area of grinding contact.
 - The severity of the grinding operation.
- Any (4 x 1) (4)
[20]
- TOTAL: 100**