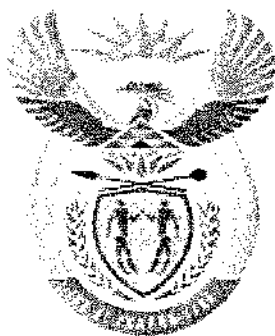


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**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

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

24 MARCH 2014

This marking guideline consists of 9 pages.

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

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

OR

1.2	1.2.1	<ul style="list-style-type: none"> • It must not cause the dissemination of a harmful amount of dust. • It must not cause injury to any person. • It must not be used to clean the body of a person or clothes worn by him or her. 		(3)
	1.2.2	<ul style="list-style-type: none"> • Lifelines • Hard hats • Safety harnesses 		(2)
				[5]

QUESTION 2: MEASURING INSTRUMENTS

2.1		<ul style="list-style-type: none"> • Inside micrometer • Outside micrometer • Depth micrometer 		(3)
2.2		The advantage of the vernier callipers is that inside, outside and depth measurements can be taken with the same instrument.		
		The disadvantage is that if the measuring faces or fixed and moveable jaws are worn, the instrument will give inaccurate readings.		(2)
2.3	2.3.1	0,02 mm		
	2.3.2	5 minutes of a degree		
			(2 x 1)	(2)
2.3	2.4.1	True		
	2.4.2	False		
	2.4.3	True		
	2.4.4	False		
			(4 × 1)	(4)
				[11]

QUESTION 3: SCREW THREADS

- 3.1 False
- 3.2 False
- 3.3 False
- 3.4 True
- 3.5 True
- 3.6 False

(6 × 1) [6]

QUESTION 4: HAND TOOLS

- 4.1
 - To rivet the ends of solid rivets and pins
 - To shape hollow objects
 - To drive in pins

(Any 1 × 1) (1)

- 4.2
 - Centre punch
 - Dotting punch
 - Pin punch
 - Hollow punch

(Any 3 × 1) (3)

- 4.3
 - When you have finished using the hacksaw, wipe it clean.
 - Before you put it away, loosen the tension wing nut on the blade.
 - Do not store the hacksaw in a toolbox with other tools on top of it.

(Any 2 applicable answers)(2 x 1) (2)
[6]

QUESTION 5: METALS AND PLASTICS

- 5.1
 - The colour of the spark
 - The shape of the spark
 - The distance from the emery wheel at which the spark ignite

(3)

5.2 5.2.1 ALUMINIUM PROPERTIES

- Brittle
- Good conductor
- Resists tarnishing in air

(Any 1 × 1) (1)

ALUMINIUM USES

- Bullets
- Battery plates
- Alloy in babbitt bearings
- Toys

(Any 1 × 1) (1)

5.2.2 ZINC PROPERTIES

- Soft
- Brittle
- Corrosion-resistant
- Low tensile strength

(Any 1 × 1) (1)

ZINC USES

- Galvanised roof coverings
- Galvanised water tanks
- Galvanised water pipes

(Any 1 × 1) (1)

5.3

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

(3)

5.4

- It has a very high friction resistance
- It is very light in weight
- It is very easy to handle
- It provides a smooth surface
- It is non-magnetic

(Any 2 × 1) (2)

[12]**QUESTION 6: MARKING OFF**

6.1

6.1.1 Reference line is a line from which marking off is done.

6.1.2 Reference point is a specific point from which a construction or marking off is done.

(2 × 1) (2)

6.2

- Copper sulphate
- Marking blue

(2)

6.3

- V-blocks
- U-shaped clamp

(2)

[6]**QUESTION 7: KEYS AND KEYWAYS**

7.1

- Rectangular key
- Gib-head taper key and ordinary tapered key
- Feather key
- Woodruff key and a normal tapered key

(4)

7.2 RTC height(H) and width (W)

$$D = 30 \text{ mm}$$

$$H = \frac{D}{6} = \frac{30}{6} = \underline{5 \text{ mm}}$$

$$W = \frac{D}{4} = \frac{30}{4} = \underline{7,5 \text{ mm}}$$

(2)

[6]

QUESTION 8: FASTENERS

- 8.1
- Positive locking nuts are physically prevented from getting loose due to vibration
 - Frictional locking nuts are held in place by friction only

(2)

- 8.2
- Thread-cutting screw
 - Self-tapping screw
 - Drive screw

(Any 2 × 1)

(2)

[4]

QUESTION 9: HAND TAPS, STOCK AND DIES AND REAMERS

- 9.1
- Parallel hand reamer
 - Tapered reamer
 - Expanding reamer
 - Adjustable reamer
 - Machine reamer

(Any 3 × 1)

(3)

- 9.2 Used to cut external threads on a shaft or rod

(1)

[4]

TOTAL SECTION A: 60

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

10.1 10.1.1 Spindle – It gives driving motion to the cutting tools or to hold the cutting tool in position

10.1.2 Table – To clamp or hold a workpiece in position to be drilled

10.1.3 Chuck – To hold the cutting tool in position

(3 × 1) (3)

- 10.2
- Workpiece insufficiently supported or secured to table
 - When the feed is too heavy
 - Lands that are being worn away cause the drill to blind the hole
 - The drill is clogged with chips causing fracture to drill
 - An incorrect ground angle or blunt drill point
 - When the feed is too rapid or incorrect
 - When insufficient coolant is being used

(Any 4 × 1) (4)

10.3 $D = 12 \text{ mm} = 0,012 \text{ m}$

$$S = 30 \text{ metres/minute} = \frac{30}{60} = 0,5 \text{ metres/sec}$$

$$S = \pi DN$$

$$N = \frac{S}{\pi D}$$

$$N = \frac{0,5 \text{ metres/second}}{\pi \times 0,012 \text{ r/sec}}$$

$$\underline{N = 13,263 \text{ r/sec}}$$

OR

$$\begin{aligned} N &= \frac{1000S}{\pi D} \\ &= \frac{1000 \times 30}{\pi \times 12} \\ &= 795,418 \text{ r/min} \div 60 \\ &= 13,257 \text{ r/s} \end{aligned}$$

(3)
[10]

QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS

- 11.1
- They tend to cushion flanges against high point or uneven surfaces and distribute the pressure evenly.
 - The compressible washers prevent damage to the surface of the flange from the abrasive surface of the wheel.
 - They provide better control of friction between the flange and the wheel, thereby providing power to the wheel. (Any 2 × 1) (2)
- 11.2 In both cases the nut will tend to tighten as the spindle turns. (1)
- 11.3 11.3.1 Trueing means getting an out of shape wheel to be perfectly round again.
- 11.3.2 Dressing means to sharpen a blunt wheel, it improves the wheel's cutting action. (2 × 1) (2)
- 11.4 Parting-off tool (1)
- 11.5 A – Centre drill
 B – Spiral steel drill (drilling)
 C – Countersinking hole (90°)
 D – Reaming (4)
[10]

QUESTION 12: SHAPING MACHINE

- 12.1 RAM HEAD
- Tool slide
 - Clapper box
 - Tool post (3)
- 12.2
- Trueing
 - Setting the vice parallel to the movement of the ram
 - Setting the vice at the right angle to the movement of the ram (3)

- 12.3 Length of stroke = 450 mm = 0,45 m
 Width = 200 mm
 Feed = 0,15 mm per stroke
 Cutting speed = 30 metres/minute
 Stroke ratio = 3 : 2
 Cutting stroke ratio = 3/5

Strokes / minute = cutting speed m/min x stroke ratio

$$\frac{\text{length of stroke (m)}}{30 \text{ m /min}} \times \frac{3}{5}$$

$$= \frac{0,45 \text{ m}}{0,45 \text{ m}} \times \frac{3}{5}$$

$$= 40 \text{ strokes/min}$$

$$\text{Time} = \frac{\text{width of work (mm)}}{\text{feed/stroke} \times 40 \text{ strokes/min}}$$

$$= \frac{200 \text{ mm}}{0,15 \text{ mm/stroke} \times 40 \text{ strokes/min}}$$

$$= 33,3 \text{ min or 33 minutes 20 seconds}$$

(4)
[10]

QUESTION 13: CENTRE LATHE

- 13.1
- General diameter turning operations
 - Taper turning
 - Internal turning
 - Drilling operation
 - Facing
 - Screw-thread cutting
- (Any 3 × 1) (3)
- 13.2
- Fixed steady
 - Travelling steady
- (2)
- 13.3
- A higher manufacturing speed can be achieved
 - The finished part is more accurate
 - It gives a better surface finish
 - It can easily machine complex shapes
 - The CNC lathe does not require skilled operators to operate it
 - It has a lower running cost
 - The life of a CNC cutting tool is much greater due to its features such as constant surface speed and backlash compensation
- (Any 3 × 1) (3)

- 13.4 The gap bed is a removable short piece of the bed, directly underneath the chuck which allows the machining of bigger workpieces than would normally swing over the bed. (1)
- 13.5
- You can cut long tapers
 - You can use automatic feed
- (Any 1 × 1) (1)
[10]

QUESTION 14: MILLING MACHINE

- 14.1 A – Over-arm
B – Arbor support
C – Arbor
D – Knee
E – Spindle (5)
- 14.2
- To machine flat surfaces or profile or shaped surfaces.
 - You can drill accurately with it.
 - You can use it for boring gears.
 - You can adapt it for vertical work
 - It can produce slots and grooves on a shaft
- (Any 3 × 1) (3)
- 14.3
- Clean the milling machine, like all machine tools after each work period.
 - Never use air hose to remove chips.
 - Make sure that you are thoroughly familiar with the machine before you attempt to use it.
 - Wear proper clothing and approved safety goggles
 - Never reach over or near the rotating cutter
- (Any 2 × 1) (2)
[10]

TOTAL SECTION B : 40
GRAND TOTAL : 100