

higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

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

16 APRIL 2015

This marking guideline consists of 9 pages.

QUESTION 1: OCCUPATIONAL SAFETY

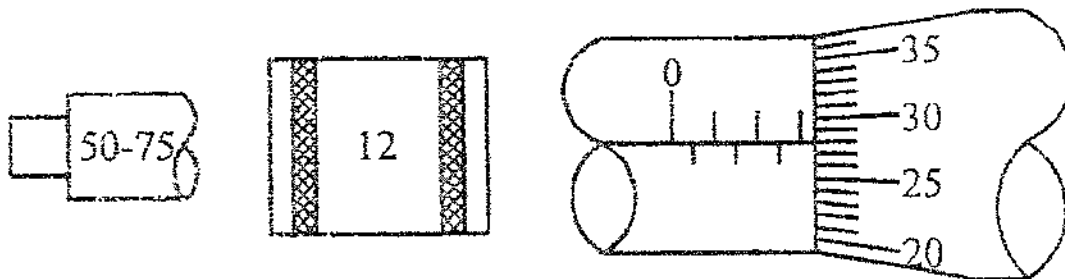
- | | | | |
|-----|-------|--|--------------------|
| 1.1 | 1.1.1 | Golden brown – oils | (1) |
| | 1.1.2 | Bright green – water
Silver or Aluminium – steam
Artic Blue – air
Jacaranda – acids | (4 x 1) (4)
[5] |

OR

- | | | | |
|-----|-------|---|------------|
| 1.2 | 1.2.1 | <ul style="list-style-type: none"> • Dissemination of a harmful amount of dust. • Injury to any person. • To clean the body of a person or clothes worn by him | (3) |
| | 1.2.2 | <ul style="list-style-type: none"> • Life-line • Hard hat | (2)
[5] |

QUESTION 2: MEASURING INSTRUMENTS

2.1



Reading = 50 + 12 + 3 + 0,28 = 65,28 mm (5)

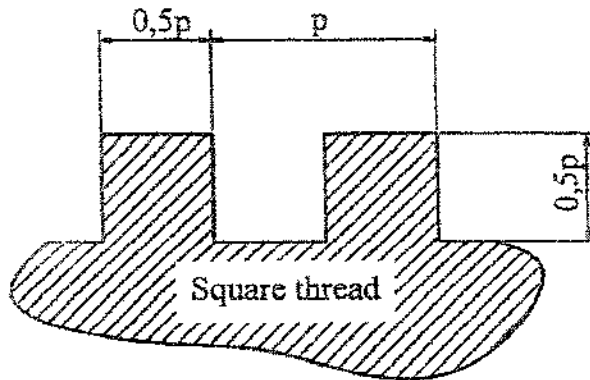
- | | | |
|-----|--|-------------|
| 2.2 | A - Anvil
B - Spindle
C - Sleeve
D - Thimble
E - Ratchet | (5 x 1) (5) |
|-----|--|-------------|

- | | | |
|-----|--|-------------|
| 2.3 | Feeler gauge is used to measure a small gap between components
Spark-plug gap | (1)
[11] |
|-----|--|-------------|

QUESTION 3: SCREW THREADS

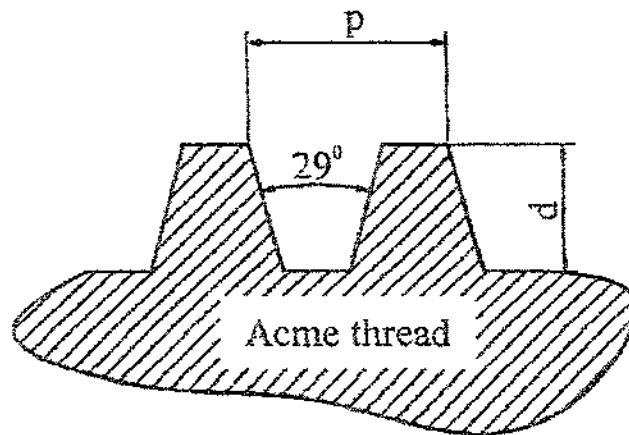
3.1 Internal thread is a thread on the inside of a part.
 Example: Nut
 External thread is a thread on the outside of a part.
 Example: Machine bolt (2)

3.2 3.2.1



SQUARE THREAD (2)

3.2.2



ACME THREAD (2)
 [6]

QUESTION 4 HAND TOOLS

- 4.1 Ball-pein hammer: Face is used for general hammering
Pein is used for riveting, shaping and formwork (1)
- 4.2 Types of punches – Dotting punch
Centre punch
Pin punch
Hollow punch
Aligning punch
Bell punch (Any 3 x 1) (3)
- 4.3 The teeth are staggered from left to right which provided a wider groove.
That wider groove ensures that the blade will not stick in the groove.

There's clearance for the blade. (2)
[6]

QUESTION 5: METALS AND PLASTICS

- 5.1 5.1.1 Hardening – Preheat steel and then quenched rapidly in oil.
Results in hardened steel that resists wear or it can be used to cut other metals.
- 5.1.2 Annealing – Steel is heated slowly to a certain temperature and allowed to cool slowly. This releases internal stresses, refine the grain structure and reduces brittleness.
- 5.1.3 Normalising – Steel is heated slowly and then allowed to cool in air. Process refines the structure. Removes strains and stresses.
- 5.1.4 Tempering: Steel is heated in its hardened state and then quenched rapidly in oil or water. Process removes stresses and strains induced by hardening, reduces brittleness and increases toughness.
- 5.1.5 Case-hardening – During the proses carbon penetrates the outer skin of the low carbon steel. This surface presents a good wearing surface. (5 x 1) (5)

5.2	5.2.1	Brass: Composition: Copper and zinc – Used for bolts and nuts – Electric wire – Pipes	(2 x 1)	(2)
	5.2.2	Bronze : Composition : Copper and Tin – Used for bearings – Valves – Impellers	(2 x 1)	(2)
5.3	Tufnol Nylon			(2)
5.4	To identify the various types of metals			(1) [12]

QUESTION 6: MARKING-OFF

6.1	<ul style="list-style-type: none"> • Ruler • Square • Protractor • Centre head 	(4 x 1)	(4)
6.2	V-blocks are used to support round workpieces on the marking-off table		(1) [5]

QUESTION 7: KEYS AND KEYWAYS

7.1	Rectangular key Gib-head taper key Feather key Woodruff key	(4 x 1)	(4)
7.2	R.T.C. H and W D = 30 mm		
	$H = \frac{D}{6} = \frac{30}{6} = 5 \text{ mm}$		(1)
	$W = \frac{D}{4} = \frac{30}{4} = 7,5 \text{ mm}$		(1) [6]

QUESTION 8: FASTENERS

8.1	False		
8.2	False		
8.3	False		
8.4	True	(4 x 1)	(4) [4]

QUESTION 9: HAND TAPS, STOCKS, DIES AND REAMERS

9.1	9.1.1	Tap extractor – this tool fits into the flutes of a tap, pushes against the thread of the surrounding material and forces the tap out.	
	9.1.2	Dull cap chisels – place the chisel in a flute of the tap against the side of the cutting edge and strike the chisel lightly with a hammer.	
	9.1.3	Penetrating oil – this oil flows between the surrounding materials and the tap creates a small clearance between components.	
	9.1.4	Nitric acid – the acid will eat the steel and loosen up the tap. (Any 2 x 1)	(2)
9.2		The function of the reamer is to smooth the inside surface of drilled holes or to shape and enlarge holes.	(1)
9.3		Dies are used to cut external threads on a shaft.	(1)
9.4		State one type of die:– Circular-split die – Two-piece rectangular die – Solid die	(1) [5]

TOTAL SECTION A: 60

SECTION B: MACHINE CUTTING TOOLS AND MACHINES

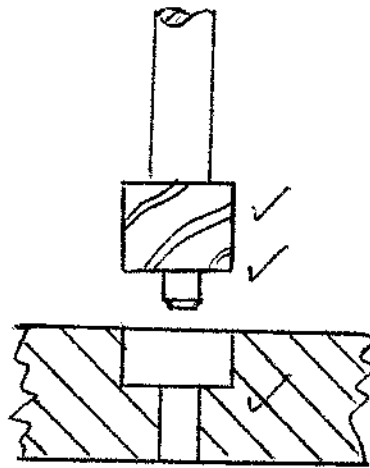
ANSWER ALL FOUR QUESTIONS FROM THIS SECTION

QUESTION 10

- 10.1 Pedestal drilling machine
Pillar drilling machine
Radial drilling machine
Portable electrical hand drill

(Any 3 x 1) (3)

10.2



(3)

- 10.3 Large drill bits will grab the plate and rip it loose from the clamps or vice and rotate the plate with the drill bit.

(1)

- 10.4
$$N = \frac{1000 \times 60}{\pi \cdot 15} = 1\,273,24 \text{ r.p.m.}$$

(3)
[10]

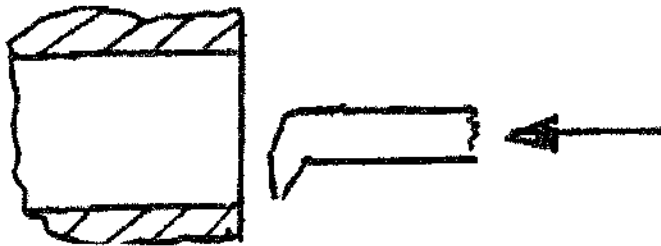
QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS

- 11.1
- Kinds of abrasive mediums
 - Grain size
 - Bonding material
 - Grade
 - Structure
- (5)

- 11.2 Parting-off tool (1)

- 11.3 Positive rake is when the wedge angle is less than 90° .
Negative is when the edge is strong and the wedge angle is bigger than 90° . (2)

- 11.4 Is a lathe tool used to enlarge the size of holes



(1)

- 11.5 Chip breaker acts as an obstruction to smooth the flow of the chip.
It causes the chip to break into short manageable chips. (1)
- [10]**

QUESTION 12: CENTRE LATHE

- 12.1
- Set-over of compound slide
 - Set-over of the tail stock
- (2)

- 12.2 Ease of work setting
- Wide range of cylindrical and hexagonal workpieces can be held
 - Internal and external jaws are available
 - Work can be readily performed on the end face of a job
 - Work can be bored
- (Any 3 x 1) (3)

- 12.3
- Tool bit to be at centre height
 - Tool bit 90° set to workpiece
 - Machine set at correct pitch
 - Compound slide at correct setting
- (Any 3 x 1) (3)

- 12.4
- Highly-skilled labour needed
 - Complex shapes take a long time to manufacture
- (2)
- [10]**

QUESTION 13: MILLING MACHINE

13.1 Plain milling machine

- Table can be moved in three straight lines
- Longitudinal, cross and vertical manually or by power
- It can not cut helical gears

Universal milling machine

- Table has the same movements as the plain milling machine
- In addition, the table can be swivelled at an angle to the column face.
- It can cut helical gears (Any 3 x 1) (3)

13.2 Production of multi-faceted, mainly flat workpieces, eg. cut gears, splines, hexagon shapes, octagonal objects. (2)

13.3 13.3.1 The machine vice is an attachment to the milling machine. It is bolted to the bed of the milling machine to hold a workpiece for cutting flats and grooves

13.3.2 Dividing head is also an attachment to the milling machine. Also bolted to the bed for cutting gears

13.3.3 Is the shaft on which all cutters are supported for horizontal milling. A key is provided with a keyway and it provides the drive.

13.3.4 To support the work at the other end when placed in the dividing head

13.3.5 The ripper is put in a collet in the spindle for roughing out purposes.

(5 x 1) (5)
[10]

TOTAL SECTION B: 40
GRAND TOTAL: 100