



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1730(E)(A6)T

NATIONAL CERTIFICATE

TOOLMAKERS' THEORY N2

(11020202)

6 April 2018 (X-Paper)

09:00–12:00

Calculators may be used.

This question paper consists of 6 pages and 2 addenda.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
TOOLMAKERS' THEORY N2
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
 2. Read ALL the questions carefully.
 3. Number the answers according to the numbering system used in this question paper.
 4. Keep subsections of questions together.
 5. Rule off after completion of each question.
 6. Use a BLACK or BLUE pen.
 7. Leave at least THREE lines after each question.
 8. Start each section on a NEW page.
 9. Drawing instruments must be used for ALL drawings/diagrams.
 10. ALL drawings/diagrams must be fully labelled.
 11. Write neatly and legibly.
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QUESTION 1: OCCUPATIONAL SAFETY

- 1.1 Describe in your own words the unsafe conditions in the picture below.



(5)

- 1.2 Name THREE types of unsafe clothing that a person must not wear if he/she is working close to moving machinery in a tool room.

(3)

- 1.3 Describe the responsibilities of a person who is in charge of machinery in a tool room.

(3)

[11]**QUESTION 2: STEEL AND TOOL STEEL**

- 2.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (2.1.1–2.1.5) in the ANSWER BOOK.

2.1.1 Mild steel is used on a large scale for the production of some plug, ring and gap-gauges.

2.1.2 The hardness of mild steel after case hardening is ± 61 Rockwell.

2.1.3 The inner part of mild steel remains soft and therefore provides less shock-resistance.

2.1.4 Corrosion resistant steel is commonly referred to as stainless steel.

2.1.5 Tungsten as an alloy is an extremely soft material.

(5 × 1)

(5)

- 2.2 Name the THREE main ingredients of tensile steel. (3)
- 2.3 Name the THREE applications of tensile steel. (3)
- 2.4 Name ONE use of spring steel. (1)
- [12]**

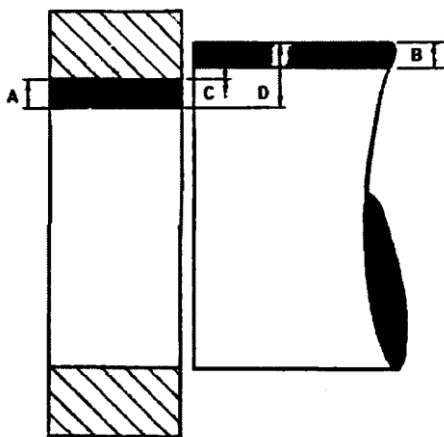
QUESTION 3: HEAT TREATMENT AND HARDNESS TESTING

- 3.1 Define the term *normalisation* in your own words. (1)
- 3.2 Based on what you know, how would you explain the purpose of normalisation? (3)
- 3.3 How would you describe the term *hardness*? (2)
- 3.4 Can you assess the value or importance of hardness? (3)
- 3.5 Can you identify the different testing machines? (3)
- [12]**

QUESTION 4: LIMITS AND FITS

- 4.1 The sketch in the following figure shows an interference fit.

Identify the components (A–D) indicated in the sketch. Write only the answer next to the question number in the ANSWER BOOK.



- 4.2 Define the term *deviation*. (4)
- 4.3 Define the term *zero line*. (2)
- 4.4 How would you classify the following fits:
- 4.4.1 10 H11 c11
- 4.4.2 10 H7 k6

4.4.3 10 H7 p6

4.4.4 12 H7 s6

4.4.5 15 H9 d10

(5 × 1) (5)
[13]

QUESTION 5: PRECISION MEASURING

5.1 Name SIX rules to keep in mind when using gauge blocks. (6)

5.2 Use ADDENDUM B to determine the minimum gauge blocks needed for a size of 69,3475 mm by using the M50 set. (5)
[11]

QUESTION 6: GAUGES

6.1 What type of materials would you select to manufacture gauges?
Name THREE materials. (3)

6.2 What is the function of a plug limit depth gauge? (1)

6.3 Make a neat sketch of a progressive limit calliper gauge. (3)

6.4 Would it be better if gauges are made out of aluminium alloy steel? Prove your answer. (2)

6.5 Can you assess the value or importance of the go and no-go sides on limit plug gauges? (2)
[11]

QUESTION 7: JIGS AND FIXTURES

7.1 Why would it be better to use jigs in production lines? (5)

7.2 How and where would you use slip renewable bushes in production lines? (3)
[8]

QUESTION 8: CUTTING TOOLS

8.1 How would you describe the three main factors to consider for the grinding of carbide tip tools? (3)

8.2 Based on what you know, how would you describe the two groups of carbide tip tools? (2)

- 8.3 Why do you grind clearance angles on cutting tools? (1)
- 8.4 Can you name TWO clearance angles on cutting tools? (2)
- [8]**

QUESTION 9: DRILLS AND REAMERS

- 9.1 For what reason will you use step drills in the machine shop? (1)
- 9.2 On which materials would you use step drills? (1)
- 9.3 What TWO methods would you recommend for sharpening spiral drills? (2)
- 9.4 Name THREE advantages of drills that are sharpened by a machine? (3)
- 9.5 How would you describe the flutes direction on spiral reamers? (1)
- 9.6 Motivate your answer in QUESTION 9.5. (1)
- [9]**

QUESTION 10: SINKING AND FORGING

- 10.1 Make a neat sketch to demonstrate progressive dies. (3)
- 10.2 Define the term *forging*. (2)
- [5]**

TOTAL: 100

ADDENDUM A

6. Table of primary fits (hole basis system) / Tabel van primêre passings (gatbasisstelsel)

Nominal sizes Nominale groottes		CLEARANCE FITS VRYPASSINGS												TRANSITION FITS OORGANGSPASSINGS				INTERFERENCE FITS STUITPASSINGS			
		Tolerance Toleransie			Tolerance Toleransie			Tolerance Toleransie			Tolerance Toleransie			Tolerance Toleransie		Tolerance Toleransie		Tolerance Toleransie		Tolerance Toleransie	
		H11	c11	H9	d10	H9	e9	H8	f7	H7	g6	H7	h6	H7	k6	H7	n6	H7	p6	H7	s6
Over Oor mm	To Tot mm	UNIT / EENHEID 0,001 mm																			
10	18	+110	-95	+43	-50	+43	-32	+27	-16	+18	-6	+18	-11	+18	+12	+18	+23	+18	+29	+18	+39
		0	-205	0	-120	0	-75	0	-34	0	-17	0	0	0	+1	0	+12	0	+18	0	+28
18	30	+130	-110	+52	-65	+52	-40	+33	-20	+21	-7	+21	-13	+21	+15	+21	+28	+21	+35	+21	+48
		0	-204	0	-149	0	-92	0	-41	0	-20	0	0	0	+2	0	+15	0	+22	0	+35
30	40	+160	-120																		
		0	-280	+62	-80	+62	-50	+39	-25	+25	-9	+25	-16	+25	+18	+25	+33	+25	+42	+25	+59
40	50	+160	-130	0	-180	0	-112	0	-50	0	-25	0	0	0	+2	0	+17	0	+26	0	+43
		0	-290																		

ADDENDUM B**M50 SET**

RANGE/SIZE (mm)	INCREMENTS (mm)	NUMBER OF PIECES
1,0025 – 1,0075	0,0025	3
1,01 – 1,09	0,01	9
1,1 – 1,9	0,1	9
1 - 25	1	25
50 - 100	25	3
0,50	-	1
		50