



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

**T710(E)(M22)T
APRIL 2012**

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N2

(11022032)

**22 March (X-Paper)
09:00 – 12:00**

Candidates will require drawing instruments, pens and a ruler.

Calculators may be used.

This question paper consists of 6 pages, 2 diagram sheets and a 1-page formula sheet.

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

NOTE: If you answer more than the required number of questions, only the required number of questions will be marked. All work you do not want to be marked must be clearly crossed out.

INSTRUCTIONS AND INFORMATION

1. Answer QUESTIONS 1 to 9 in SECTION A.
 2. Answer either QUESTION 1.1 or 1.2 of QUESTION 1 in SECTION A.
 3. Answer only TWO of the three questions in SECTION B.
 4. Read ALL the questions carefully.
 5. Number the answers correctly according to the numbering system used in this question paper.
 6. Write neatly and legibly.
-

SECTION A

QUESTION 1: OCCUPATIONAL SAFETY

NOTE: Answer either QUESTION 1.1 or QUESTION 1.2

- 1.1 Explain in your own words, FIVE basic safety measures, which apply to the use of mechanical handling equipment. [5]

OR

- 1.2 Name FIVE items from the category 'contraband', which are not allowed in a mine. [5]

QUESTION 2: COUPLINGS

- 2.1 What is the function of a universal joint? (1)
- 2.2 Give FOUR examples of a flexible coupling. (4)
- 2.3 In which class (group) does the fluid coupling fall? (1)
- [6]

QUESTION 3: LIMITS AND FITS

The shaft and bush have to be machined according to the given dimensions in FIGURE 1 below.

Determine the following:

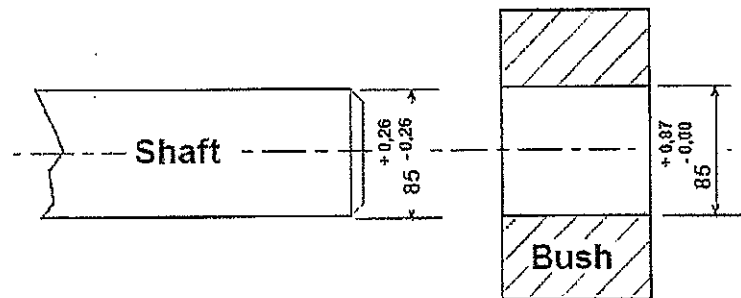


FIGURE 1

Determine the following:

- 3.1 The high limit of the shaft (1)
- 3.2 The high limit of the bush (1)
- 3.3 The low limit of the shaft (1)
- 3.4 The low limit of the bush (1)
- 3.5 The tolerance of the shaft (1)

PTO

- 3.6 The maximum allowance of the fitted parts (1)
- 3.7 The minimum allowance of the fitted parts (1)
[7]

QUESTION 4: BEARINGS

- 4.1 State FOUR disadvantages of plain bearings. (4)
- 4.2 Name the THREE types of load which determine the design of a bearing. (3)
[7]

QUESTION 5: LUBRICATION AND VALVES

- 5.1 Name TWO lubricating devices associated with the 'gravity-feed' principle. (2)
- 5.2 Define the term *cold point*. (1)
- 5.3 With reference to FIGURE 2 on the attached DIAGRAM SHEET 1, label the FOUR different types of lubricators, numbered 5.3.1 to 5.3.4. (4)
[7]

QUESTION 6: PACKING, STUFFING BOXES, JOINTS AND WATER PIPE SYSTEMS

- 6.1 Describe what is the *wall thickness* of a specific pipe. (2)
- 6.2 Name any FOUR expansion bends and loops when working with pipeline-installations. (4)
- 6.3 Give THREE reasons for the lagging of steam-pipelines. (3)
[9]

QUESTION 7: PUMPS

- 7.1 Name the TWO displacement principles into which pumps are classified. (2)
- 7.2 Explain in your own words, the operation of a single-acting reciprocating pump, by referring to the following FOUR important terms:
stroke; inlet valve; outlet valve; plunger moving upwards; plunger moving downwards (4)
[6]

QUESTION 8: COMPRESSORS

Name FIVE components associated with reciprocating compressors. Write only the answer next to the question number (8.1 – 8.5) in the ANSWER BOOK. [5]

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QUESTION 9: V-BELT, GEAR AND CHAIN DRIVES

- 9.1 Explain in your own words, the following gear-drive terms:
- 9.1.1 Gear ratio (1)
 - 9.1.2 Pinion (1)
- 9.2 State TWO advantages of gear drives over belt-drives. (2)
- 9.3 Name the lubrication method which is most applicable when dealing with gear drives. (1)
- 9.4 Name THREE types of gear drives. (3)
- [8]**

TOTAL SECTION A: 60

SECTION B

Answer only TWO of the three questions in this section.

QUESTION 10: HYDRAULICS AND PNEUMATICS

- 10.1 State ONE advantage of pneumatic systems over hydraulic systems. (1)
- 10.2 State ONE advantage of hydraulic systems over pneumatic systems. (1)
- 10.3 State the THREE ways in which directional control valves can be actuated. (3)
- 10.4 State the function of the following hydraulic components:
- 10.4.1 Power pack or drive unit (1)
 - 10.4.2 Directional control valve (1)
 - 10.4.3 Filter (1)
- 10.5 Name TWO components/parts of a hydraulic power pack or drive unit. (2)
- 10.6 Name the hydraulic components associated with the ISO symbols in FIGURE 3 on the attached DIAGRAM SHEET 1. Write only the answer next to the question number (10.6.1 – 10.6.5) in the ANSWER BOOK. (5)
- 10.7 Name the pneumatic components associated with the ISO symbols in FIGURE 3 on the attached DIAGRAM SHEET 1. Write only the answer next to the question number (10.7.1 – 10.7.5) in the ANSWER BOOK. (5)

[20]

PTO

QUESTION 11: CENTRE LATHES

- 11.1 Give a brief description of how the following lathe mandrels work:
- 11.1.1 Screw or threaded mandrel (2)
 - 11.1.2 Group mandrel (2)
- 11.2 Explain in your own words, TWO advantages (numbering them 11.2.1 and 11.2.2) and TWO disadvantages (numbering them 11.2.3 and 11.2.4) of the use of the tailstock set-over method, when taper turning. (4)
- 11.3 Name the TWO types of lathe-steady, used when working with long work-pieces on a lathe. (2)
- 11.4 State FOUR factors which must be taken into account when programming a CNC lathe. (4)
- 11.5 A taper of 7 in 100 has to be turned on a work piece, 300 mm long. Calculate the amount of tailstock set-over required. (3)
- 11.6 A round shaft with a mean diameter of 90 mm must be provided with a three-start square thread with a 7 mm pitch. Calculate the helix angle of the thread (θ). (3)
- [20]**

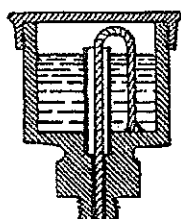
QUESTION 12: MILLING MACHINES AND SURFACE GRINDERS

- 12.1 Identify the milling cutter types in FIGURE 4 on the attached DIAGRAM SHEET 2. Write only the answer next to the question number (12.1.1 – 12.1.3) in the ANSWER BOOK. (3)
- 12.2 Name FOUR fixtures used to perform milling operations. (4)
- 12.3 State THREE possible factors which cause the loading of a grinding wheel. (3)
- 12.4 Calculate the speed of the milling machine spindle in revolutions per minute. The cutter diameter is 90 mm and the cutting speed is 30 metres per minute. (3)
- 12.5 State TWO advantages (12.5.1 and 12.5.2) and TWO disadvantages (12.5.3 and 12.5.4) of down-cut milling. (4)
- 12.6 Give THREE reasons why it is more desirable to use a helical cutter with nicked teeth. (3)
- [20]**

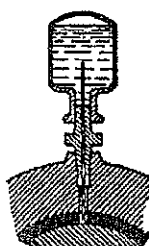
TOTAL SECTION B: 40
GRAND TOTAL: 100

DIAGRAM SHEET 1

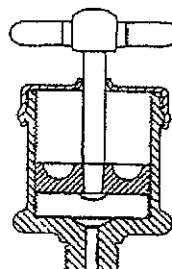
Lubrication/Smering



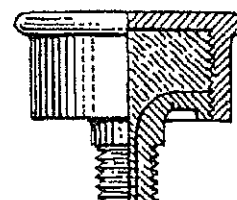
5.3.1



5.3.2



5.3.3

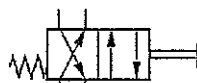


5.3.4

FIGURE 2

Hydraulics/Hidroulika

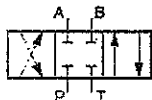
10.6.1



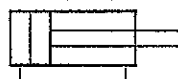
10.6.2



10.6.3



10.6.4



10.6.5



10.7.1



10.7.2



10.7.3



10.7.4



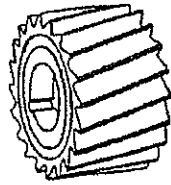
10.7.5



FIGURE 3

DIAGRAM SHEET 2

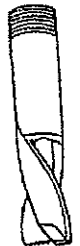
Milling and surface grinding



12.1.1



12.1.2



12.1.3

FIGURE 4

FITTING AND MACHINING THEORY N2

FORMULA SHEET

$$f = f_t \times T \times N$$

$$S = \frac{\pi DN}{60}$$

$$S = \pi DN$$

$$\frac{40}{N}$$

$$\frac{N}{90}$$

$$\frac{D-d}{2} \times \frac{\text{length of workpiece}}{\text{length of taper}}$$

$$\tan \frac{\theta}{2} = \frac{X}{L}$$

$$90^\circ - (\text{Helix angle} + \text{clearance angle})$$

$$90^\circ + (\text{Helix angle} - \text{clearance angle})$$