higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T630**(E)**(M25)T
APRIL EXAMINATION

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N2

(11022032)

25 March 2014 (Y-Paper)
13:00–16:00

Candidates require drawing instruments.
Calculators may be used.

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

SECTION A

QUESTION 1: OCCUPATIONAL SAFETY

NOTE: Answer ONLY QUESTION 1.1 or QUESTION 1.2

1.1 State FIVE basic rules for preventing manual handling accidents. (5)

OR

1.2 State:

1.2.1 TWO safety regulations which apply to the use of self-propelled vehicles in a mine. (2)

1.2.2 THREE safety regulations which apply to lighting and the use of safety lamps in a mine. (3)
[5]

QUESTION 2: COUPLINGS

2.1 FIGURE 1 shows a sketch of a type of coupling with different types of misalignment.

Name the types of coupling misalignment shown in FIGURE 1. Write only the answer next to the question numbers (2.1.1 and 2.1.2) in the ANSWER BOOK. (2 × 1) (2)

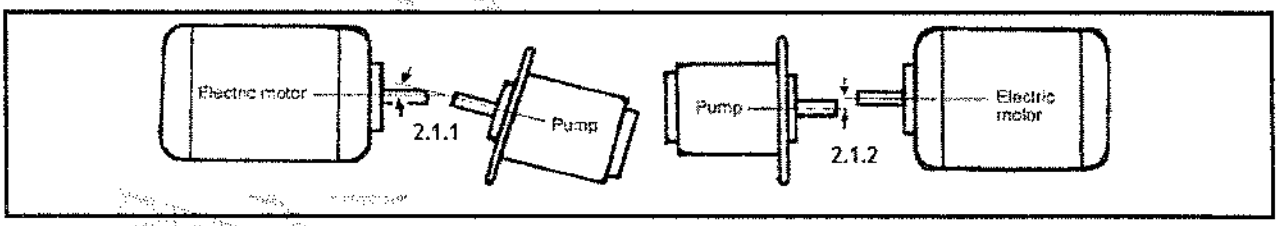


FIGURE 1

2.2 Name the classification of the coupling in FIGURE 2. (1)

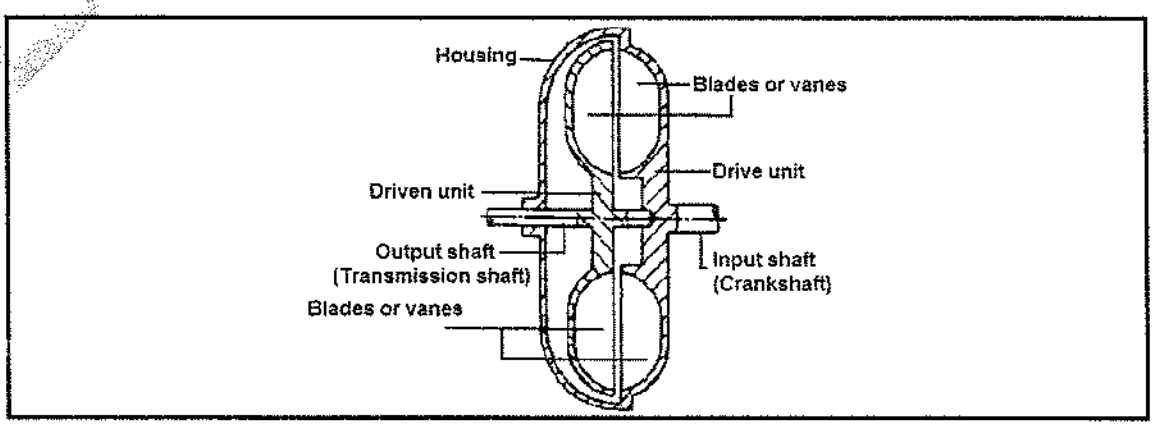


FIGURE 2

2.3 Name the type of coupling shown in FIGURE 2. (1)

2.4 Name TWO other types of couplings associated with the classification of the coupling shown in FIGURE 2. (2)
[6]

QUESTION 3: LIMITS AND FITS

3.1 Give ONE example of each of the following classifications of fits:

3.1.1 Clearance fit

3.1.1 Transition fit

(2 × 1) (2)

3.2 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (3.2.1–3.2.5) in the ANSWER BOOK.

3.2.1 Basic size is NOT the same as nominal size.

3.2.2 An interference fit is a fit in which a shaft could be larger or smaller than the hole.

3.2.3 The hole-basis system is used when a hole is machined according to a fixed shaft size.

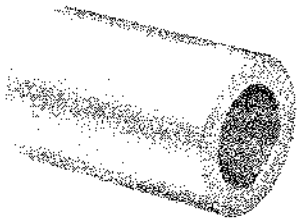
3.2.4 Tolerance is the fit which is on one side of the basic size only

3.2.5 Allowance is the difference in size between a hole and a shaft.

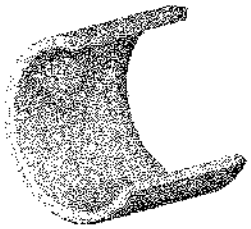
(5 × 1) (5)
[7]

QUESTION 4: BEARINGS

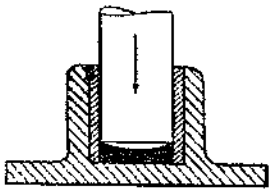
4.1 Name the plain bearings shown in FIGURE 3 below. Write only the name of the bearing next to the question number (4.1.1–4.1.4) in the ANSWER BOOK.



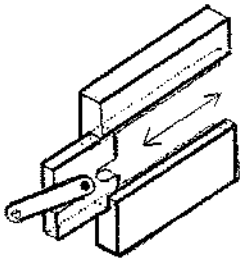
4.1.1



4.1.2



4.1.3



4.1.4

FIGURE 3

(4 × 1) (4)

4.2 List THREE points to consider when placing oil holes and grooves in plain bearings. (3)
[7]

QUESTION 5: LUBRICATION AND VALVES

5.1 Explain the lubricating action of a bottle-oiler (or needle) lubricating device. (4)

5.2 Give TWO examples of a solid-type lubricant. (2)

5.3 Explain the working principle of the gate valve with rising stem. (1)

5.4 Explain the working principle of the gate valve with the non-rising stem. (1)
[8]

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

6.1 Name FOUR important guidelines to ensure the proper fitting of o-rings and seals in hydraulic systems. (4 × 1) (4)

6.2 Give FOUR advantages of using thermo-plastic and thermo-setting plastic pipe in water systems. (4 × 1) (4)
[8]

QUESTION 7: PUMPS

7.1 Give ONE function of a stuffing box assembly in centrifugal and reciprocating pumps. (1)

7.2 FIGURE 4 shows a sketch of a vane pump.

Name the parts of the pump numbered (7.2.1–7.2.4). Write only the answer next to the question number in the ANSWER BOOK.

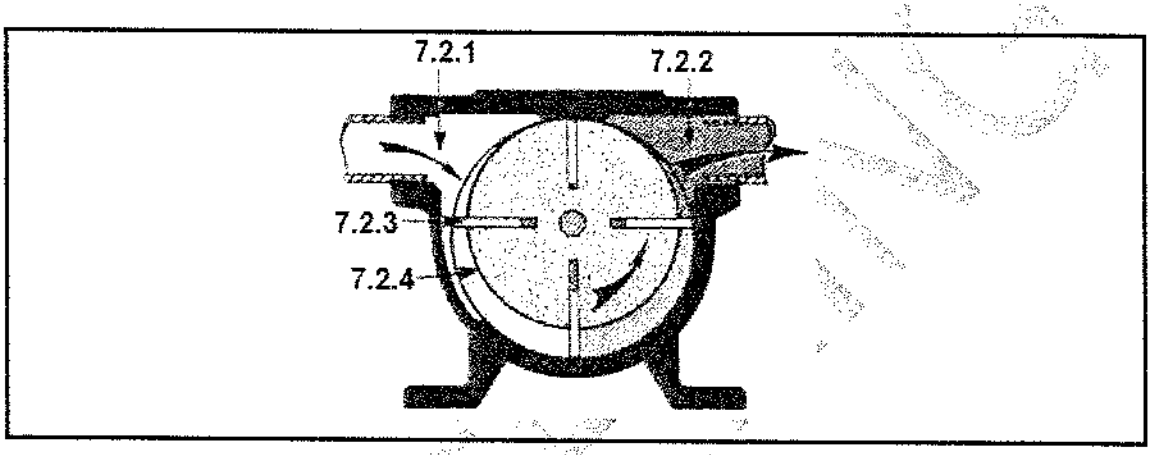


FIGURE 4 (4)
[5]

QUESTION 8: COMPRESSORS

8.1 Explain the function and operating principle of each of the following compressor components:

8.1.1 After-cooler

8.1.2 Water separator

8.1.3 Start-and-stop control switch

(3 × 1) (3)

8.2 Explain the purpose of a compressor used in the manufacturing and engineering industry. (2)
[5]

QUESTION 9: V-BELT, GEAR AND CHAIN DRIVES

9.1 Give THREE examples of the use of belt drives in the manufacturing and engineering industry. (3)

9.2 Give THREE advantages that belt drives have over chain drives. (3)

9.3 State THREE safety measures when maintaining belt drives. (3)
[9]

TOTAL SECTION A: 60

SECTION B

Answer only TWO questions in SECTION B.

QUESTION 10: HYDRAULICS AND PNEUMATICS

10.1 Give TWO examples of the use of a hydraulic motor in the manufacturing and engineering industry. (2)

10.2 Name the parts numbered (10.2.1–10.2.4) as shown in FIGURE 4. Write only the answer next to the question number (10.2.1–10.2.4) in the ANSWER BOOK.

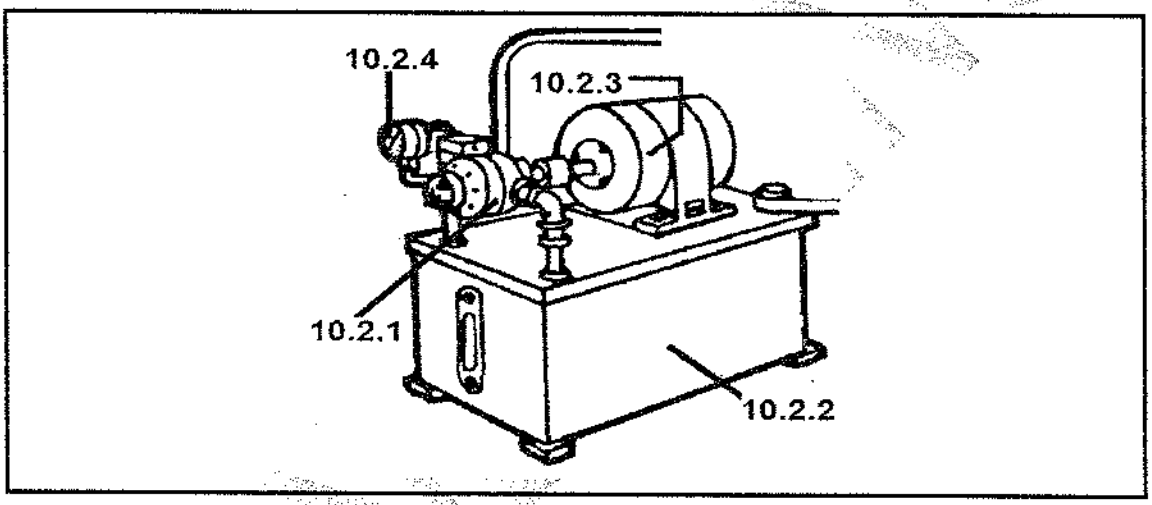


FIGURE 4 (4)

10.3 Give the THREE main functions of valves in a hydraulic flow system. (3)

10.4 Name TWO basic components of a hydraulic system. (2)

10.5 FIGURE 5 shows the sketch of a hydraulic reservoir.

Name the parts numbered (10.5.1–10.5.4). Write only the answer next to the question number (10.5.1–10.5.4) in the ANSWER BOOK.

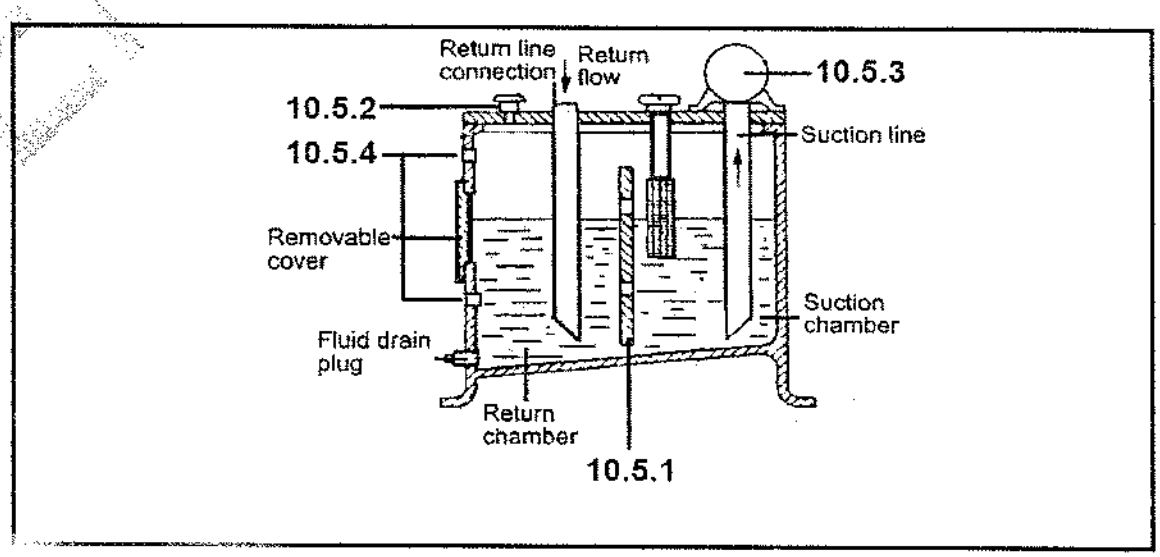


FIGURE 5 (4)

10.6 Make neat freehand sketches of the symbols representing the following hydraulic components:

10.6.1 Hydraulic motor

10.6.2 Shut-off valve

10.6.3 Accumulator

10.6.4 Pressure gauge

10.6.5 Pump

(5 × 1) (5)
[20]

QUESTION 11: CENTRE LATHES

11.1 Upon which part of the lathe would the following attachments be mounted?

11.1.1 Fixed steady

11.1.2 Travelling steady

(2 × 1) (2)

11.2 A spindle is to be turned to the dimensions given in FIGURE 6.

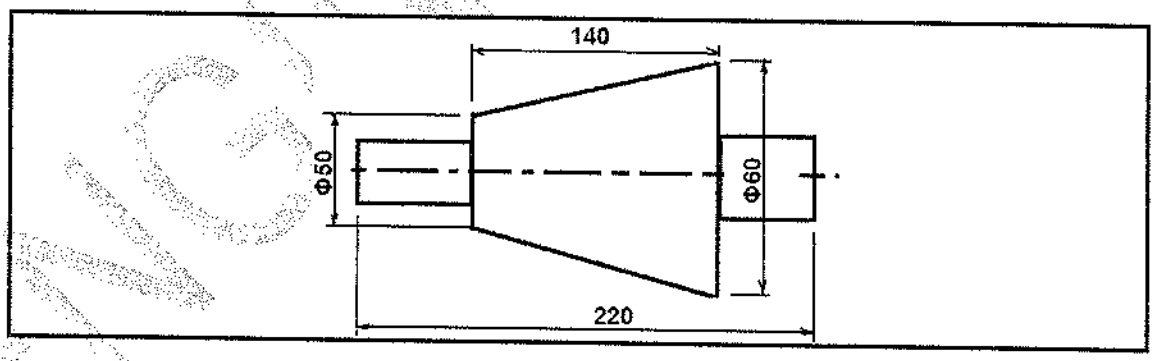


FIGURE 6

11.2.1 Calculate the amount of tailstock set-over. (3)

11.2.2 Calculate the included angle of the tapered portion. Give the answer in degrees and minutes. (2)

11.3 Calculate the time taken in minutes and seconds, to take one cut over a length of 250 mm if the automatic feed of the cutting tool is 0.5 mm/revolution. The spindle speed is 199 r/min. (3)

11.4 Calculate the helix angle of three-start square thread with an outside diameter of 40 mm and a pitch of 6 mm. (3)

11.5 Explain the following terms applicable to CNC machining:

11.5.1 Incremental programming

11.5.2 Absolute programming

11.5.3 G-codes

11.5.4 M-codes

(4 × 1) (4)

11.6 State THREE advantages of the use of mandrels on a centre lathe. (3)
[20]

QUESTION 12: MILLING MACHINES AND SURFACE GRINDERS

12.1 Identify the milling processes in FIGURE 7. Write the answer next to the question number (12.1.1–12.1.3) in the ANSWER BOOK.

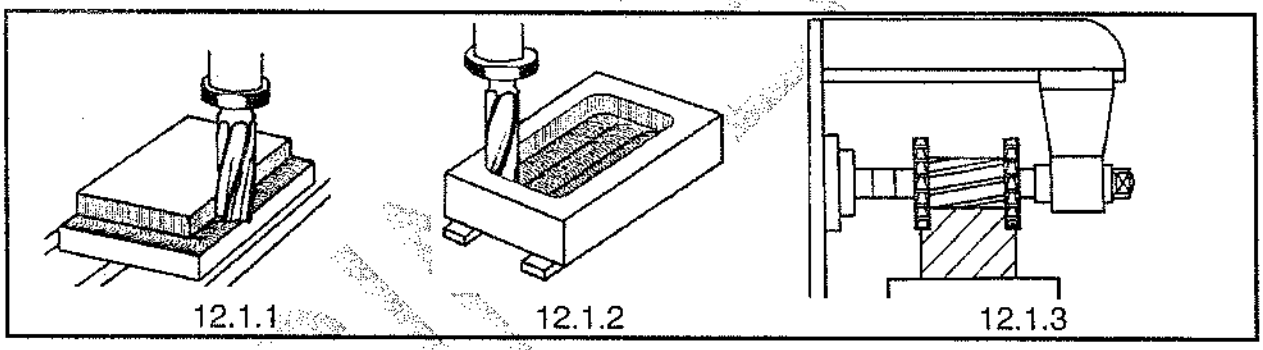


FIGURE 7 (3)

12.2 Name FOUR methods of indexing on a milling machine. (4)

12.3 State THREE possible factors, which cause the scratching of the workpiece when surface grinding. (3)

12.4 Calculate the cutting speed of the cutter in meters per minute, when using a cutter of 35 mm in diameter at a speed of 360 r/min. (3)

12.5 State FOUR advantages of using milling cutters with coarse teeth. (4)

12.6 Give THREE reasons why it is more desirable for using small diameter milling cutter. (3)
[20]

TOTAL SECTION B: 40
GRAND TOTAL: 100

FITTING AND MACHINING THEORY N2

FORMULA SHEET

$L = ft \times T \times N$

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

$S = \pi DN$

$\frac{40}{N}$

$\frac{N}{9°}$

$Set - over = \frac{D - d}{2} \times \frac{length\ of\ workpiece}{length\ of\ taper}$

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

$Leading\ angle = 90° - (Helix\ angle + clearance\ angle)$

$Following\ angle = 90° + (Helix\ angle - clearance\ angle)$

$Lead = No\ of\ starts \times pitch$

$Dm = OD - ½ \times pitch$

$\tan\theta = \frac{lead}{\pi \times D_m}$