



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

MACHINE MANUFACTURING NQF LEVEL 3

(6030203)

16 November 2017 (X-Paper)

09:00–12:00

This question paper consists of 9 pages.

**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. ALL the drawings must be neat and well balanced.
 5. Write neatly and legibly.
-

QUESTION 1

1.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.1.1–1.1.5) in the ANSWER BOOK.

1.1.1 Hardening, tempering and annealing are all heat treatment processes.

1.1.2 Wheel dressing and wheel truing are grinding processes performed on a milling machine.

1.1.3 The accuracy of both the inside and the outside micrometers is 0,002.

1.1.4 One of the most important uses of a dial test indicator (DTI) is to test the parallelism of a workpiece.

1.1.5 A telescopic gauge is an instrument used to convert imperial units to the metric system.

(5 × 1) (5)

1.2 Materials used for engineering are selected for specific characteristics.

Complete the following sentences by writing down the missing word or words next to the question number (1.2.1–1.2.4) in the ANSWER BOOK.

1.2.1 Brittleness is the tendency to ... off or crumble to pieces with the application of a sudden load.

1.2.2 Elasticity is the ability of metal to ... to its original shape after the load has been removed.

1.2.3 Plasticity is the ability of material to ... to a new shape under pressure, and to retain its new form.

1.2.4 Toughness is the ability to resist ... or blows. It is the opposite of brittleness.

(4 × 1) (4)

- 1.3 Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–G) next to the question number (1.3.1–1.3.6) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.3.1	It includes the things that make a workplace safe	A	fixed guards
1.3.2	They move into position as soon as the machine is turned on	B	interlocking guards
1.3.3	It switches off power to the motor if it is removed	C	automatic guards
1.3.4	This prevents an electric motor from being turned on	D	safety equipment
1.3.5	A book that contains guidelines and information about a company's health and safety rules	E	lock out
1.3.6	It prevents a machine's moving parts from coming into contact with any parts of the body	F	safety procedure manual
		G	unsafe condition

(6 × 1)

(6)
[15]

QUESTION 2: CAD APPLICATION

- 2.1 Explain the function of the following CAD commands in the manufacturing industry:

2.1.1 Object snap

2.1.2 Polygon

2.1.3 Construction line

2.1.4 Arch

2.1.5 Hatch

(5 × 1)

(5)

- 2.2 What is the purpose of CAD?

(1)

- 2.3 State TWO advantages and TWO disadvantages of CAD application. (2 × 2)

(4)

2.4 Tapping holes in a workplace could be a tricky process.

Identify THREE thread-cutting faults that can occur while tapping. (3)

2.5 By means of a free-hand sketch, show both the top rake and front clearance angles that are ground on HSS. (2)

[15]

QUESTION 3: FITS AND LIMITS

3.1 FIGURE 1 below shows two components machined according to the given dimensions.

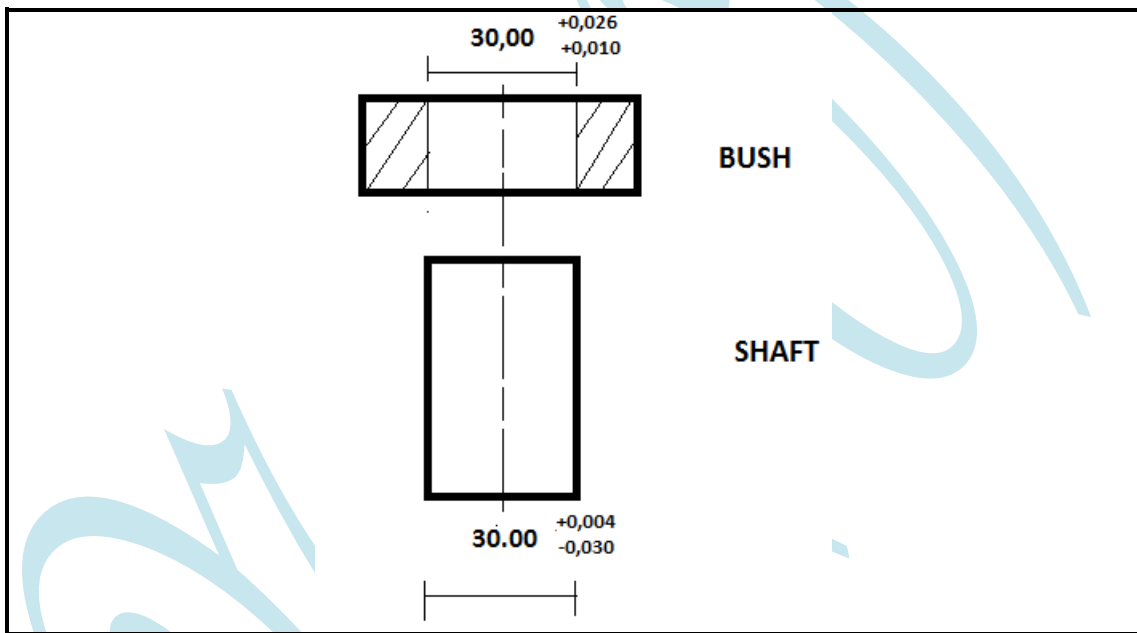


FIGURE 1

Determine the following:

3.1.1 The basic size of the bush

3.1.2 The upper limit of the bush

3.1.3 The lower limit of the shaft

3.1.4 The tolerance of the shaft

3.1.5 The tolerance of the bush

(5 × 1) (5)

3.2 A precision fit between a shaft and a bearing is given as 150 H7–g6.

What is meant by the following symbols?

3.2.1 Capital letter – H

3.2.2 Number – 7

3.2.3 Small letter – g

3.2.4 Number – 6

3.2.5 The value – 150

(5 × 1) (5)

3.3 Distinguish between *safety equipment* and *safety device* and give ONE example of each.

(2 × 2) (4)

3.4 What is the accuracy of a Vernier height gauge?

(1)
[15]

QUESTION 4: CENTRE LATHE AND MILLING MACHINE

4.1 As an apprentice toolmaker you are required to machine an engine block and carry out the following machining processes:

Task 1 Drill and tap 4 × M12 × 2,0 mm holes.

Task 2 Drill 4 × 12 mm counter-bore cap screw holes.

4.1.1 What is the tapping size drill for the four cap screws? (1)

4.1.2 Make a neat, sectional drawing showing how the cap-head screw fits into the counter-bored cap screw hole. (2)

NOTE: During the tapping process the plug tap breaks.

4.1.3 Give TWO possible reasons as to why the tap broke. (2)

4.1.4 Name TWO methods of removing a broken tap from a hole. (2)

4.1.5 State any TWO pre-operational checks to be done on the milling machine before starting with machining. (2)

4.2 FIGURE 2 below shows a method of cutting a single-start screw thread between centres. Identify the numbered components and write only the answer next to the question number (4.2.1–4.2.5) in the ANSWER BOOK.

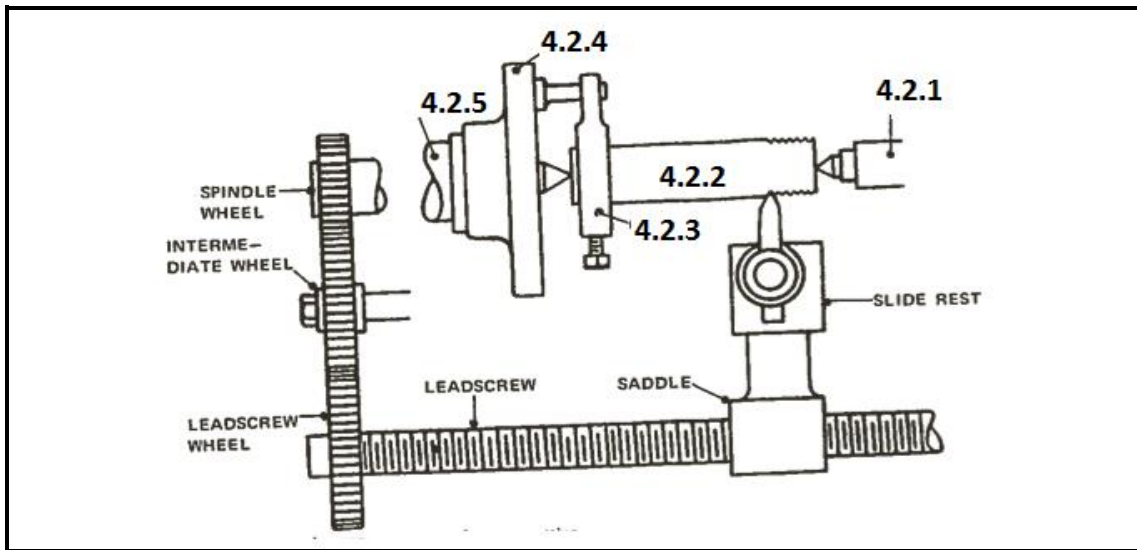


FIGURE 2

(5)

4.3 Compare a *milling machine* with a *centre lathe* in terms of the clamping of a work-piece.

(2)

4.4 Analyse the sketch in FIGURE 2 above, and give TWO advantages and TWO disadvantage of a work-piece being held between centres.

(4)
[20]

QUESTION 5: CENTRE LATHE AND MILLING MACHINE

5.1 Identify the machining processes as indicated in FIGURE 3 below. Write only the answer next to the question number (5.1.1–5.1.4) in the ANSWER BOOK.

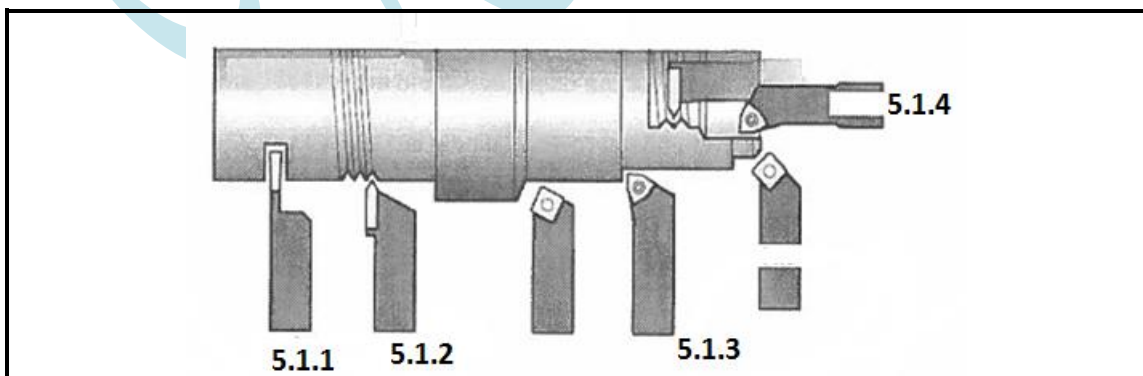


FIGURE 3

(4)

5.2 Using coolant on a work-piece during machining is important for good quality workmanship.

Compare soluble oil with cutting fluid by answering the following questions:

5.2.1 Give TWO advantages of using soluble oil.

5.2.2 State TWO functions of cutting fluid.

(2 × 2) (4)

5.3 FIGURE 4 below shows an angle plate that is being set so that it runs parallel or perpendicular to the machine's axis. Identify the components 5.3.1–5.3.5 from the sketch below. Write only the answer next to the question number (5.3.1–5.3.5) in the ANSWER BOOK.

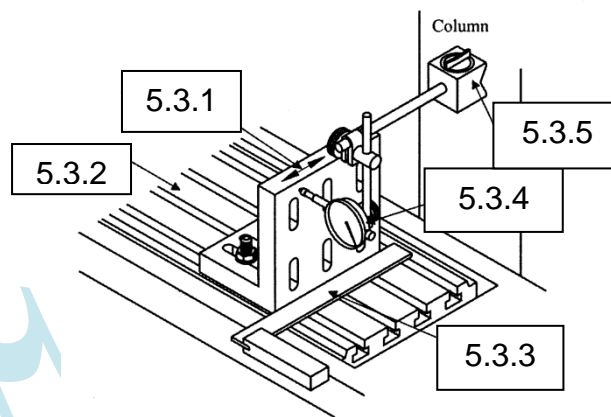


FIGURE 4

(5 × 1) (5)

5.4 State FOUR factors that must be considered when working out the cutting speeds on the milling machine.

(4)

5.5 FIGURE 5 below shows a work-piece mounted on a milling machine using a dividing head. Identify the components numbered 5.5.1–5.5.6. Write only the answer next to the question number (5.5.1–5.5.6) in the ANSWER BOOK.

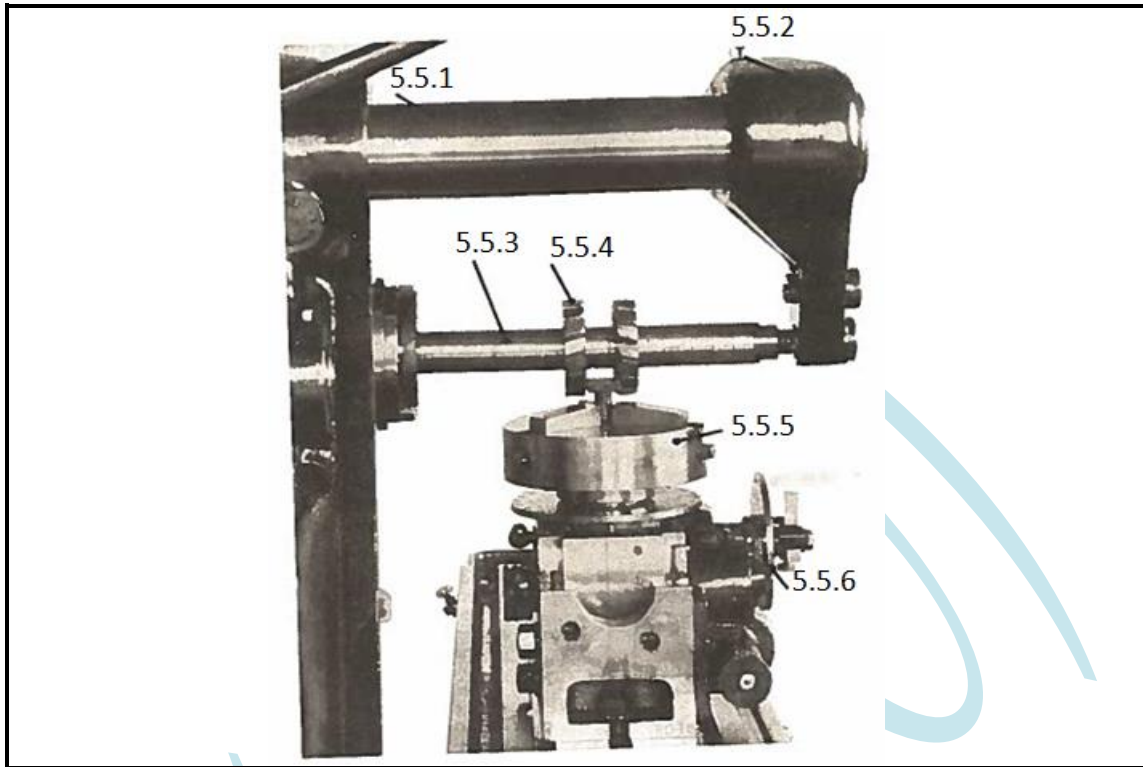


FIGURE 5

(6 × 1)

(6)

5.6 Name the machining operation that is being performed in FIGURE 5.

(2)

5.7 Calculate the required indexing for an angle of 30° 30' using a Cincinnati dividing head. The values of the dividing head are given below.

Side1	24	25	28	30	34	37	38	39	41	42	43
Side 2	46	47	49	51	53	54	57	58	59	62	66

(5)

5.8 Name any TWO indexing methods that can be performed on a milling machine.

(2)

5.9 Name THREE components that make up a dividing head.

(3)

[35]

TOTAL: 100