



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

FITTING AND TURNING NQF LEVEL 4

(6011044)

**21 November 2017 (Y-Paper)
13:00–16:00**

This question paper consists of 8 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. Write neatly and legibly.
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QUESTION 1: PUMPS

- 1.1 Centrifugal pumps are classified according to its design.
Name TWO of these design classifications. (2)
 - 1.2 When working with driven machinery there are regulations that must be followed according to the Occupational Health and Safety Act.
State FOUR of these regulations. (4)
 - 1.3 Name TWO types of rotary pumps. (2)
 - 1.4 Name TWO tools that are required in the disassembling of pumps. (2)
- [10]**

QUESTION 2: COMPRESSORS

- 2.1 The Occupational Health and Safety Act promotes the safety of all workers and protects the rights of employees to a safe and healthy working environment.
 - 2.1.1 State THREE responsibilities of employees to make sure that they adhere to the above mentioned act.
 - 2.1.2 Give THREE advantages of keeping a work area as clean and tidy as possible. (3 × 2) (6)
 - 2.2 Explain the function of each of the following compressor components:
 - 2.2.1 Manifold
 - 2.2.2 Relief valve (2 × 1) (2)
 - 2.3 Explain in your own words what a two-stage reciprocating compressor is and give a brief description of how it operates. (2)
- [10]**

QUESTION 3: HYDRAULICS AND PNEUMATICS

3.1 State the steps that need to be followed when a hydraulic system is drained and cleaned. (3)

3.2 Complete the following paragraph by writing down the missing word or words next to the question number (3.2.1–3.2.4) in the ANSWER BOOK.

A hydraulic system uses an (3.2.1) ... to drive a (3.2.2) ... The pump, through its action, applies pressure on a system that is filled with hydraulic fluid. The piston uses the hydraulic pressure to do work. This implies that (3.2.3) ... energy was converted to (3.2.4) ... energy. (4 × 1) (4)

3.3 State THREE safety precautions that should be adhered to when doing maintenance work on a hydraulic system. (3)

3.4 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–F) next to the question number (3.4.1–3.4.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
3.4.1	Throttle valve	A	allows flow to be switched off
3.4.2	Shut-off valve	B	protects the hydraulic system from being overloaded
3.4.3	Safety valve	C	maintains a constant flow rate and adjusts to variable pressure
3.4.4	Variable flow valve	D	fluid flows in the correct direction
3.4.5	Directional control valve	E	regulates system pressure and opens when this pressure exceeds the system limits
		F	allows a certain amount of fluid to flow, and then stops or limits flow

(5 × 1) (5)

3.5 List THREE components a pneumatic system uses to construct a circuit. (3)

3.6 Explain in your own words the difference between a *linear actuator* and a *rotary actuator* found in pneumatic systems. (2)

[20]

QUESTION 4: SURFACE GRINDING

4.1 Before operating a surface grinder, one must make sure the machine is in good working condition.

State FIVE aspects that need to be checked.

(5)

4.2 Name THREE types of surface-grinding machines.

(3)

4.3 State TWO possible factors which may cause the magnetic chuck not to function properly.

(2)

[10]**QUESTION 5: CENTRE LATHES**

5.1 State THREE factors that need to be considered to determine the depth of a cut on a lathe for either roughing or finishing cuts.

(3)

5.2 The cutting speed for bronze is given as 25 m/min.

Calculate the rotational speed in revolutions per minute when turning a bar with a diameter of 60 mm. The spindle speeds available are 40, 65, 95, 125 and 160 revolutions per minute. Indicate the final speed that the machine will be set at.

HINT: $S = \pi \times D \times N$

(3)

5.3 Name the tools that are used to do each of the following quality checks on a work piece after it was cut on a lathe:

5.3.1 To determine the pitch of a thread on the work piece

5.3.2 To measure the diameter of holes accurately

5.3.3 To measure the depth of bore of the work piece

(3 × 1)

(3)

5.4 Give the information that needs to be captured in a report when a work piece had been completed on a lathe.

(3)

[12]

QUESTION 6: MILLING MACHINES

- 6.1 Calculate the feed rate in mm/min that would be required to machine a brass work piece using a 70 mm diameter cutter having 12 teeth and operating at 25 m/min with a feed of 0,08 mm per tooth.

HINT: $S = \pi \times D \times N$ and $\text{Feed/min} = \text{Feed/tooth} \times \text{No. of teeth} \times r/\text{min}$ (4)

- 6.2 Give the function of each of the following cutters:

6.2.1 Radius cutter

6.2.2 Ball-nose cutter

6.2.3 Face cutter

(3 × 1) (3)

- 6.3 Use a Cincinnati dividing head, as shown below, to calculate the indexing required for the following:

An angular-shaped groove of $11^\circ 15'$

Side 1: 24, 25, 28, 30, 34, 37, 38, 39, 41, 42, 43

Side 2: 46, 47, 49, 51, 53, 54, 57, 58, 59, 62, 66

HINT: $\text{Indexing} = \frac{N}{9^\circ}$ (3)

- 6.4 State TWO malfunctions that may occur when doing machining operation on a milling machine.

(2)
[12]

QUESTION 7: MILLING AND TURNING CNCs

- 7.1 Safety shoes must be worn when entering a workshop as stipulated by safety regulations.

Give TWO reasons why it is important to wear safety shoes in a workshop. (2)

- 7.2 The Occupational Health and Safety Act states that all workers must wear eye protection to prevent the risk of stray objects or metal chips entering their eyes.

State TWO potential hazards that may cause injury to the eyes and face. (2)

- 7.3 Define the term *cutting speed of material* and give the SI unit. (2)

- 7.4 The CNC machine operator needs to make sure the machine and the tools are in good working condition. He/She also needs to ensure that the set-up is done according to the job specifications.

Briefly describe what he/she should check with regard to the selection and mounting/fitting of the cutting tools. (2)

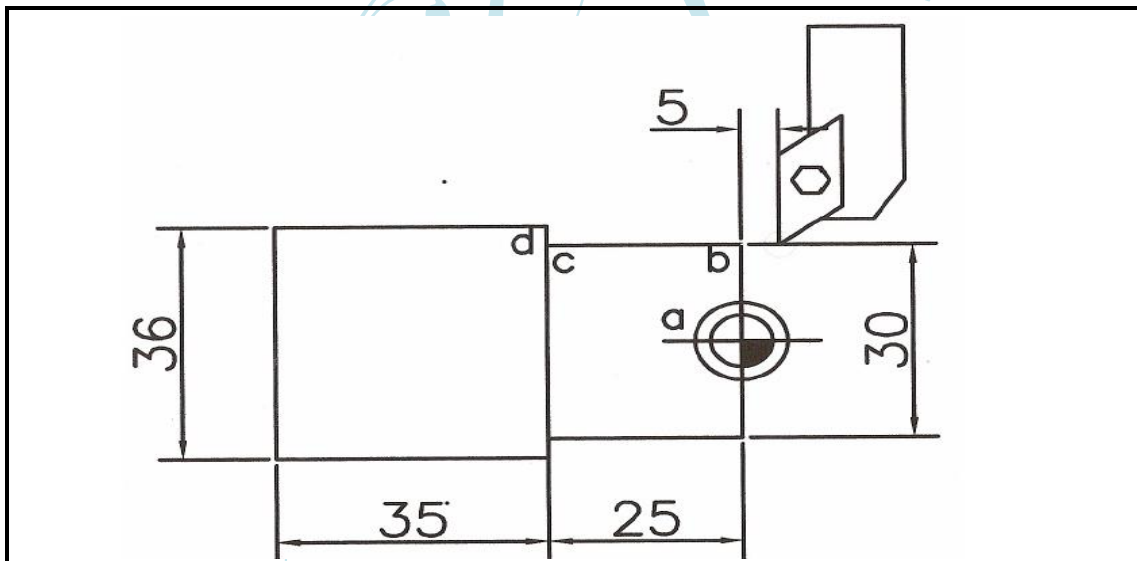
- 7.5 A programmer can check whether a machining programme is correct by using the computer simulation method.

Briefly explain why this is done. (2)

- 7.6 The functions for CNC machines vary from one machine type to another, but they have common benefits.

Give FOUR of these benefits. (4)

- 7.7 The FIGURE below shows the top view of a work piece that will be machined in a CNC lathe. The machine spindle is turning in a clockwise direction. The work piece zero symbol is placed at the centre.



FIGURE

- 7.7.1 When setting up the machine the CNC programmer must determine the positive direction of the X-axis and the Z-axis.

Copy the work piece zero symbol and clearly show, by means of direction arrows, the positive X-axis and the positive Z-axis. (2)

7.7.2 The table below provides part of a simple CNC programme that was used to machine the work piece shown in the FIGURE on the previous page. The absolute dimensioning method is used.

Study the drawing and programme carefully and complete the programme to machine the part from position b to c. Do NOT copy the table. Write only the missing codes and descriptions for G, X and Z in line number N30 next to the question number (7.7.2) in the ANSWER BOOK.

LINE	CODES	DESCRIPTION
00	G90	Absolute programming
N10	G00 X0,0 Z5,0 S1500	Move to start position G00 rapid traverse S1500 spindle speed
N20	G01 X30.0 Z0.0 F0.2	Tool cuts from a to b G01 rapid feed X30.0 Z0.0 F0.2 feed rate
N30		Tool cuts from b to c G X Z

(3)

7.8 Explain why it is useful to place comments next to the lines of codes for CNCs.

(3)

7.9 When dealing with waste disposal materials, it is best to recycle them.

Give FOUR other methods of disposing waste materials.

(4)

[26]**TOTAL: 100**