



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

FITTING AND TURNING NQF LEVEL 4

(6011044)

**12 March 2019 (Y-Paper)
13:00–16:00**

This question paper consists of 7 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 In all workshops health and safety work practices are compulsory to prevent unnecessary injuries or loss of life.
Name FOUR general health and safety precautions that should be implemented and practiced in a workshop. (4)
- 1.2 Name THREE safety precautions to be taken into account before and after replacing pump components. (3)
- 1.3 Name the THREE different impeller types found in centrifugal pumps. (3)

[10]**QUESTION 2: COMPRESSORS**

- 2.1 The vane compressor uses the positive displacement working principle by design.
Draw a neat fully labelled diagram of the vane compressor. (4)
- 2.2 Explain any TWO purposes of applying safety practices before using the compressor or before maintenance is done on a compressor. (2)
- 2.3 Name TWO components where an air leakage in the compressed air system may occur. (2)
- 2.4 Once all work is completed you need to do quality checks on the assembly making sure everything is back in its correct place and that the system is ready for use.
Name TWO specific quality checks you must carry out. (2)

[10]**QUESTION 3: HYDRAULICS AND PNEUMATICS**

- 3.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (3.1.1–3.1.2) in the ANSWER BOOK.

3.1.1 Why is de-pressurising the accumulator necessary before maintenance on a hydraulic system can proceed?

- A Accumulator may be damaged when the system is shut down.
- B The oil is stored under high pressure and it can become dangerous to workers.
- C The gas in the accumulator will contaminate the oil.
- D Oil can leak out of the accumulator when it is opened.

- 3.1.2 Bleeding of the hydraulic brake system of a car means:
- A Cleaning the system of dirt and foreign materials
 - B The correct brake fluid is used
 - C Getting rid of all the air in the system
 - D Flushing out all the used oil from the system
- (2 × 1) (2)
- 3.2 Describe FOUR major functions of hydraulic fluids. (4)
- 3.3 Name SIX reasons why the oil in the hydraulic system may cause the system to fail. (6)
- 3.4 Name FOUR safety regulations to follow when you intend using pneumatic tools. (4)
- 3.5 You are responsible for designing a pneumatic system service checklist.
- Name FOUR points that would form part of your checklist during the quality inspection. (4)
- [20]**

QUESTION 4: SURFACE GRINDING

- 4.1 Name TWO reasons why it is regarded as standard practice to check the grinding wheel for any defects such as cracks; before it is fitted to the grinding machine. (2)
- 4.2 While doing the pre-checks on the condition of the grinding machine, you find that the grinding wheel spindle vibrates when it is rotating.
- Name any reason that could be the cause of the problem and explain your answer by stating what would happen if this problem is not rectified. (1 + 1) (2)
- 4.3 You receive instructions that require you to machine the top and bottom face of a case hardened block. The instructions provided recommend that the faces must be ground parallel and to a fine finish. You must use a straight grinding wheel.
- 4.3.1 What type of machine would you use? (1)
- 4.3.2 Which holding down or clamping device would you use. (1)
- 4.3.3 While monitoring the grinding process, you observe that the grinding wheel has become glazed. You also find that the block is heating up.
- Give TWO reasons for the problem and what should be done to rectify this? (2 + 1) (3)

- 4.4 You have completed the grinding of the top face of a metal block and you are preparing to grind the other side.

Why is it very important to clean the block and the machine before you proceed with the grinding?

(1)
[10]

QUESTION 5: CENTRE LATHE

- 5.1 A 50 mm diameter cast iron shaft is to be turned on a lathe.

What would the required lathe spindle speed be in revolutions per minute when the cutting speed for turning cast iron is given as 22 m/min?

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

(3)

- 5.2 An artisan has been given a job card to cut a screw thread on a centre lathe.

Name FOUR maintenance checks that should be done before he/she can operate the machine.

(4)

- 5.3 You are required to inspect the hand wheels and feed dials on the lathe:

5.3.1 Identify the main area of concern when you are inspecting these components.

5.3.2 Explain what the result will be if these components are not functioning properly.

(2 × 1)

(2)

- 5.4 You are required to machine the outside diameter of a brass bush. The machining must be done between centres while the bush is fitted on to a mandrel.

Show with the aid of a neat labelled drawing how the bush is fitted on the mandrel and is set-up between centres.

(3)
[12]

QUESTION 6: MILLING MACHINE

6.1 Indicate the function of the following cutters used on the milling machine:

6.1.1 Dovetail cutter

6.1.2 Rounding-mill cutter

(2 × 1) (2)

6.2 Name THREE types of indexing that can be performed to divide a workpiece into a number of equal parts and also explain where you would apply them.

(3 × 2) (6)

6.3 Calculate the indexing required to machine two grooves into a shaft when the angle measured between the grooves is 120°.

DIVIDING HEAD											
CINCINNATI INDEX PLATES											
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: Indexing = $\frac{\Theta}{9^\circ}$

(4)
[12]

QUESTION 7: CNC TURNING AND CNC MILLING

7.1 Name ONE precaution an operator should take when operating the pneumatic chuck on the numerical controlled lathe.

(1)

7.2 Name ONE advantage of using computer numerical controlled machining processes.

(1)

7.3 Name TWO reasons why it is important and recommended to first have a trial run when setting up the CNC machine to machine a new component.

(2)

7.4 A CNC machine has various safety devices that protect the operator from injury during the machining process.

Name FOUR such devices and explain their function.

(4)

7.5 A tool holder is used to hold or clamp a cutting tool.

Name the THREE factors that one must consider when choosing the right tool holder.

(3)

7.6 When preparing for the workpiece to be machined on the machine, tools and equipment must be checked.

Name FOUR critical factors that need to be checked. (4)

7.7 When operating a CNC machine an artisan must identify and report problems, changes and malfunctioning of the machine.

Briefly explain why it is necessary to:

7.7.1 Recognise any problems

7.7.2 Report any problems

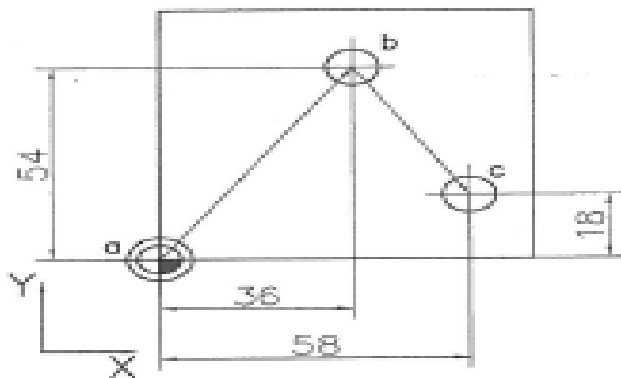
7.7.3 Recognise any changes

7.7.4 Report any changes

(4 x 1) (4)

7.8 Briefly explain what *quality control* means. (2)

7.9 The figure below shows the direction and pathways a drill has to follow to machine the holes at b and c.



7.9.1 Calculate the X-axis and Y-axis dimensions by using the absolute dimension method. Do not write the program, but only write down the X and Y dimensions needed for the program. (2)

7.9.2 Write a simple program line by using the standard program writing format and appropriate codes to instruct the machine to rapidly move the drill from b to c. (3)

[26]

TOTAL: 100