



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

**FITTING AND TURNING
NQF LEVEL 4**

(6011044)

**4 March 2024 (X-paper)
09:00–12:00**

This question paper consists of 6 pages and 1 formula sheet.

489Q1S2404

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE (VOCATIONAL)
FITTING AND TURNING
NQF LEVEL 4
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. Start each section on a new page.
 5. Use only a blue or black pen.
 6. Write neatly and legibly.
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QUESTION 1: PUMPS AND COMPRESSOR

- 1.1 Name THREE types of impellers that are used in pumps. (3)
- 1.2 Explain the need for using the correct tools, equipment, cleaning materials and appropriate safety clothing when working with compressors. (3)
- 1.3 Explain the safety precautions required before and after replacing compressor components. (3)
- 1.4 Explain how you will isolate equipment electrically from other energy sources before maintenance starts. Also state a reason for this action. (2)
- 1.5 Explain how you will measure, test replacement parts, and evaluate their performance when working on the pump. (3)
- 1.6 Look at the diagram shown in FIGURE 1 and answer the questions that follow next to the Question numbers (1.6.1–1.6.2) in the ANSWER BOOK.

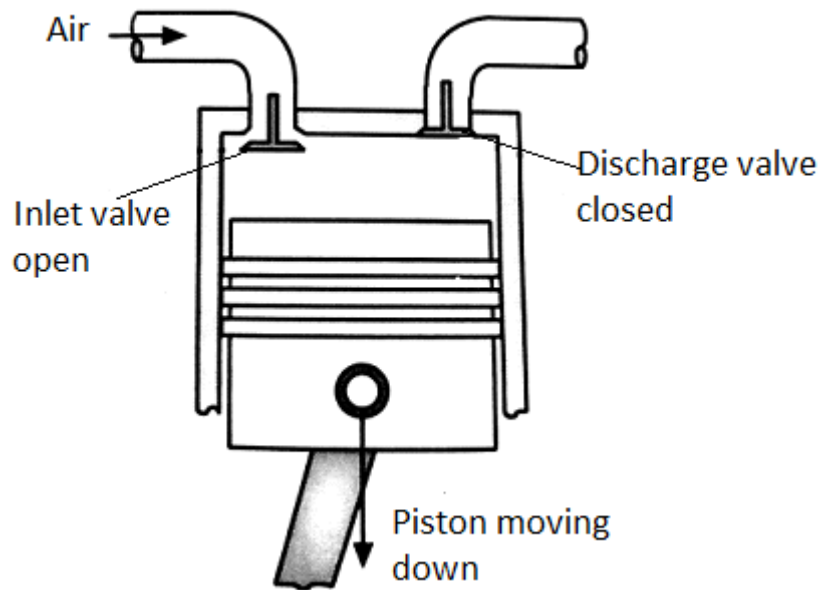



FIGURE 1

- 1.6.1 Identify the type of compressor shown in FIGURE 1. (2)
- 1.6.2 Explain how the above-mentioned compressor works. (4)


[20]

QUESTION 2: HYDRAULIC AND PNEUMATIC

2.1 Indicate whether the following statements are TRUE or FALSE. Write only 'True' or 'False' next to the question number (2.1.1–2.1.5) in the ANSWER BOOK. 

2.1.1 An exhaust in a pneumatic system is designed for the quick release of hydraulic oil from a pneumatic system.

2.1.2 The most commonly used consumable while working with a pneumatic system will be grease as it also serves as a sealant but also lubricates components to prevent corrosion from taking place.


2.1.3 The main reason for cleaning components before you start working on the hydraulic system is that it enables you to see more clearly where the problem might have occurred on the system. 

2.1.4 Pneumatic control valves are valves that are used to control the speed of oil into or out of a pneumatic circuit.

2.1.5 The main function of the actuator in the compressor is to convert the compressed air into working energy.

(5 × 1) (5)

2.2 While operating the hydraulic circuit to test the functionality of the design, you realise that it is not working, even though it has been constructed according to the circuit diagram.

List FOUR things that might cause the system not to function even when the power is on. 

(4)


2.3 Make a neat, labelled drawing of a simple hydraulic circuit showing the following components:

- Hydraulic cylinder
- Control valve
- Gear pump (Hydraulic)
- Filter
- Reservoir/Tank

(5)

2.4 List FOUR practices that should be considered and implemented when using hydraulic systems to minimise health and safety risks to personnel.

(4)


2.5 Defective tools and equipment need to be replaced as soon as you identify them. 

Identify the information that needs to be highlighted on the defective report.



(2)

[20]

QUESTION 3: SURFACE GRINDING


- 3.1 Explain why most Surface Grinding Machine operators choose a double-cup grinding wheel over a straight-cup grinding wheel.  (2)
- 3.2 Explain step-by-step how an operator can dress a grinding wheel. (4)
- 3.3 An operator must recognise and report problems that might arise while the grinding operation is taking place.
- Identify TWO problems that might lead to the Grinding wheel table not moving smoothly during the grinding operation. (2 × 2) (4)


[10]**QUESTION 4: CENTRE LATHE AND MILLING MACHINE**

- 4.1 You have been selected as a turner machinist for a World Skill Competition that will be held in a National City next year.
- List FIVE tools and equipment that you will select to machine components on the lathe machine.  (5)
- 4.2 Briefly explain what it means by specifying an appropriate tolerance as per drawing ($\pm 0,05$ mm) when machining components on the Centre lathe or Milling machine. (2)
- 4.3 What is the main function of a slip gauge? (2)
- 4.4 Identify THREE problems that will lead to an adjustment of the feed rate to be made when working on the Centre lathe or Milling machine. (3)
- 4.5 When machining, the size of the metal chip depends on several variables, Name THREE of the variables. (3)
- 4.6 List TWO ways that can be used when mounting the appropriate HM cutting tool when working on the Milling machine. (4)
- 4.7 Which measuring tool will you use to check if the Milling machine table is perpendicular to the spindle axis?  (1)
- 4.8 Explain step-by-step how to clean the Milling machine once you have completed the job. (4)

[24]

QUESTION 5: CNC CENTRE LATHE AND CNC MILLING MACHINE

- 5.1 Explain why you will choose the following forms of the Dry Run cycle when simulating and dry running a part programme. 
 - 5.1.1 Dry run with machine lock.
 - 5.1.2 Dry run with air cutting.
 - 5.1.3 Normal cycle with air cutting. (3 × 2) (6)

 - 5.2 Explain the purpose of applying the following codes when working on the CNC machine:
 - 5.2.1 G71 - Stock removal in turning
 - 5.2.2 G70 - Finish cycle  (2 × 2) (4)


 - 5.3 Explain why you will have to programme the reference zero point for two axes when working on a machine which is four meters long. (2)

 - 5.4 In your own words, explain the importance of doing quality control when manufacturing components in bulk. (2)

 - 5.5 What is the advantage of checking the assigned programme zero to fixture offset if you were to machine and drill holes on a rectangular block? (2)

 - 5.6 Describe the function of the operation sheet before you start machining components. (2)

 - 5.7 List FIVE safety signs that should be placed on the notice board next to the CNC lathe or Milling machine to remind workers of the safety regulations. (5)

 - 5.8 Calculate the required feed for a high-speed steel milling cutter of 35 mm diameter(Ø35 mm) with two flutes when cutting bronze at 540 revolutions per minute(rpm) with the recommended cut per tooth of 0,025 mm. (3)
-  **TOTAL: 100**

FORMULA SHEET

1. $S = \pi \times D \times N$

2. $F = F \times T \times N$

3. $RPM = \frac{m/min \times 318,057}{\text{tool diameter}}$

4. $MMPT = \frac{m/min}{rpm \times \#FL}$

5. $MMPR(FR) = mm/min \div rpm$

6. $mm/min = rpm \times MMPT \times \#FL$

7. Indexing formula = $\frac{40}{N}$

8. Indexing formula = $\frac{N}{9^v}$

9. Gear ratio = $N - n \times \frac{40}{N}$