



# higher education & training

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL CERTIFICATE (VOCATIONAL)**

### **FITTING AND TURNING NQF LEVEL 4**

(6011044)

**10 March 2022 (X-paper)  
09:00–12:00**

**This question paper consists of 8 pages.**

**TIME: 3 HOURS**  
**MARKS: 100**


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**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 question on a new page.
  5. Use only a black or blue pen.
  6. Write neatly and legibly.
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**QUESTION 1**

1.1 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 (1.1.1–1.1.5) in the ANSWER BOOK.


1.1.1 It is very important to maintain the correct clearance between the impeller and the pump to ... 

- A avoid blockage.
- B minimise friction.
- C minimise leakage.
- D reduce overloads

1.1.2 The service unit in a compressor does not consist consists of a ...


- A filter with a water trap.
- B pressure regulator with a pressure gauge.
- C lubricator.
- D High pressure cylinder

1.1.3 Tools driven by a compressor are connected via the ...

- A supply line. 
- B control unit.
- C manifold.
- D regulator.

1.1.4 Which ONE of the following pump components plays an important role in supporting the weight and maintaining the correct position of the impeller?

- A Impeller wear rings
- B Bearings
- C Casing wear rings
- D Replaceable shaft sleeve

1.1.5 Which ONE of the following pumps works by using reciprocal motion to build pressure in a pumping chamber? 

- A Piston pump
- B Plunger pump
- C Air-driven reciprocating pump
- D Steam-driven reciprocating pump

(5 × 1) (5)

1.2 Differentiate between a *piston pump* and a *plunger pump*. (2 + 2) (4)

1.3 Explain the purpose of an intercooler as used in a piston compressor. (2)

1.4 List TWO items used to clean components of a pump while doing maintenance. (2)

1.5

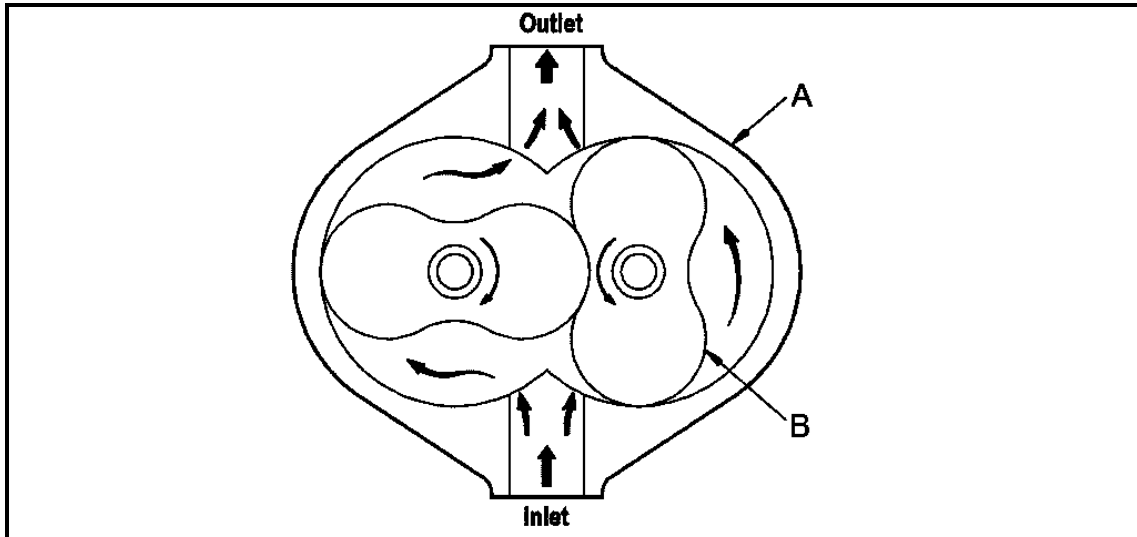


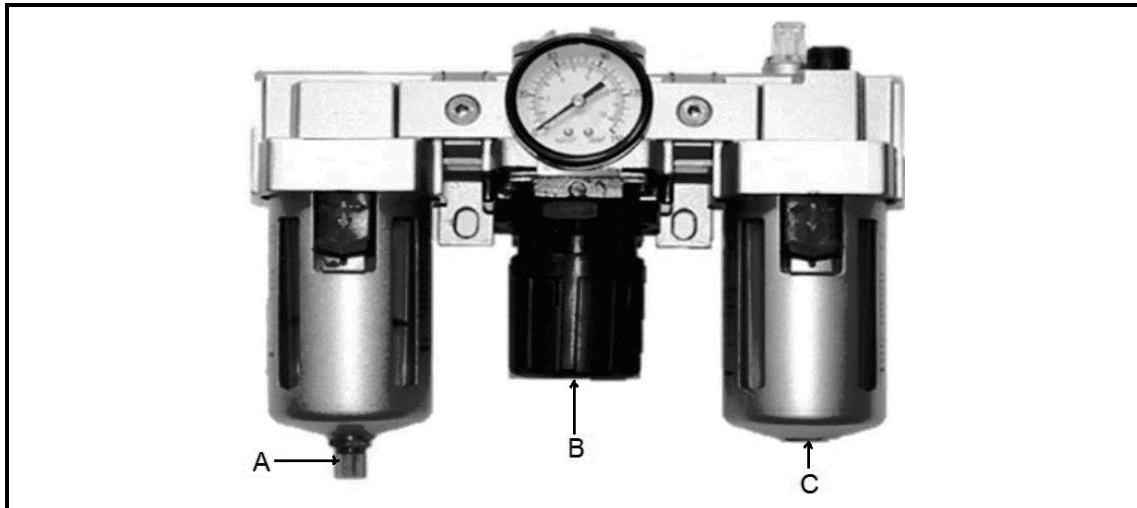
FIGURE 1

- 1.5.1 Identify the compressor shown in FIGURE 1. \* (1)
- 1.5.2 Label FIGURE 1 by writing only the answer next to the letter (A–B) in the ANSWER BOOK. (2 x 1) (2)
- 1.6 Name FOUR major components of a compressed-air system. \* (4) [20]

**QUESTION 2**

- 2.1 List THREE general guidelines to follow when installing a pump or motor in a workshop. (3)
- 2.2 Name the type of valve that should be used in each of the following cases:
  - 2.2.1 \* Allowing a certain amount of fluid to flow and then stop in the correct direction
  - 2.2.2 Protecting a hydraulic system from being overloaded while working on it
  - 2.2.3 Regulating system pressure and opening when this pressure exceeds the system limit (3 x 1) (3)
- 2.3 Explain why a hydraulic system report should be accurate and clear. \* (2)

2.4



**FIGURE 2**

2.4.1 Identify the component shown in FIGURE 2. \* (1)

2.4.2 Label the components shown in FIGURE 2 by writing only the answer next to the letter (A–C) in the ANSWER BOOK. (3 × 1) (3)

2.5 Briefly explain the purpose of the Occupational Health and Safety Act. (3)

2.6 Explain why an operator is required to keep on checking the air pressure when working with a pneumatic system and state what will happen if there is insufficient air. \* (2)

2.7 Give the use of each of the following in preparation of the layout and construction of a hydraulic circuit:

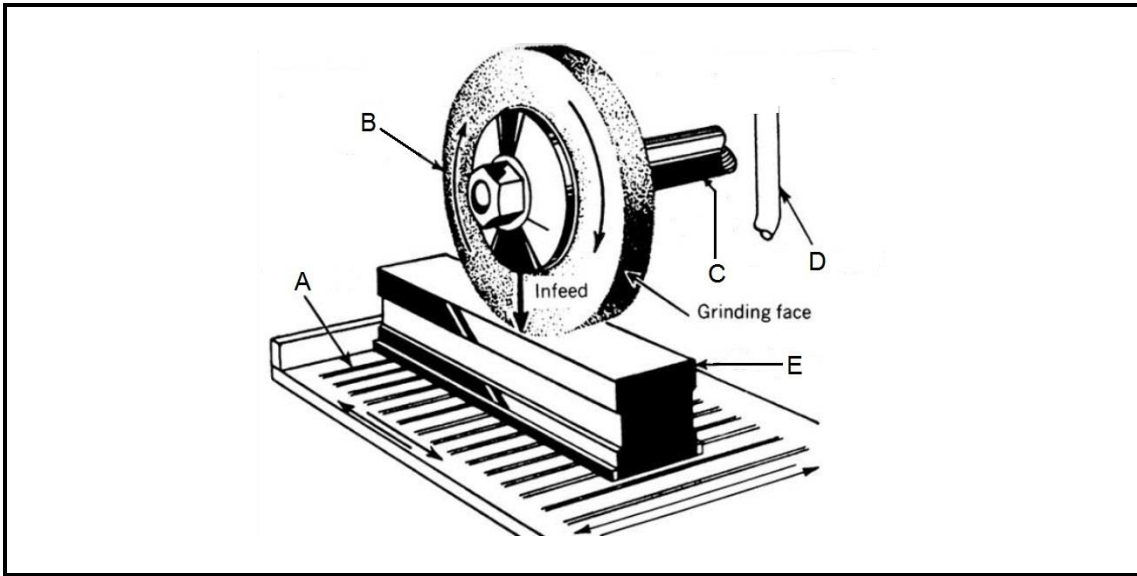
2.7.1 Oil

2.7.2 Cleaning agent \* (2 × 1) (2)

**[19]**

**QUESTION 3**

3.1



**FIGURE 3**



3.1.1 Identify the cutting table shown in FIGURE 3. (1)

3.1.2 Label FIGURE 3 by writing only the answer next to the letter (A–E) in the ANSWER BOOK. (5 × 1) (5)

3.2 Identify the type of grinding operation shown in FIGURE 3. Choose from facing, peripheral or orbital. (1)






3.3 What will determine the way in which an automatic feed operation must be adjusted according to the operation sheet when working on a surface grinder? (2)

3.4 Explain in detail how an operator will adjust an automatic feed operation according to the operation sheet when operating a surface grinder. (2)





**[11]**

**QUESTION 4**

- 4.1 State TWO safety measures to observe when loading and unloading a workpiece onto a centre lathe.  (2)
- 4.2 Explain how to deflect chips and/or swarf from the machining operation so that it does not enter the machine or strike the operator. (2)
- 4.3 What is the proper machining sequence when operating a centre lathe? (2)
- 4.4 Why is it important that a machine operator must identify the type and grade of workpiece materials? (2)
- 4.5 What is meant by the tolerance of a component? (2)
- 4.6 Determine the centre lathe spindle speed in r/min if a mild steel bar has a diameter of 70 mm. The cutting speed for cast iron steel is 25 m/min.  (3)
- FORMULA:**  $S = \pi \times D \times N$  (3)
- 4.7 Why must a centre lathe or milling machine be cleaned, lubricated and checked according to the manufacturer's maintenance schedule? (2 x 2) (4)
- 4.8 Name TWO ways to ensure that a completed component complies with the dimensions as stipulated in the specifications. (2)
- 4.9 Why is it important that the cutting speeds and feeds must be in line with the type of materials to be cut? (2)
- 4.10 List THREE guidelines that an operator should follow when cleaning a milling machine after completing a job.  (3)
- [24]**

**QUESTION 5**

- 5.1 Give TWO reasons why a CNC operator needs to clean the equipment, materials and machines after use. (2)
- 5.2 What will happen if a CNC programmer instructs the boring bar to machine the inside of a product to a depth of 100 mm, but the tool selected is only 75 mm to the length? (2)
- 5.3 Why should all CNC operators complete a checklist after they have used a CNC machine?  (2)

5.4 Study program 01233 in FIGURE 4. 

<b>01233</b>
T0101
M03 S1500
G00 X42 Z1
G90 X38 Z-31 F0,1
X34
X30
X26
X24
G00 X100 Z100
M30

**FIGURE 4**

Explain each of the following codes:

5.4.1 T0101


5.4.2 M03 

5.4.3 S1500

5.4.4 M30

5.4.5 F0,1

(5 × 1) (5)

5.5 Explain the benefit of writing a program on a CNC controller. 

(2 × 2) (4)

5.6 Calculate the depth of cut per tooth required for a 25 mm diameter, high-speed steel milling cutter with four flutes when cutting an alloy steel at 700 r/min. Use the following table to determine the cutting speed:

Material	High-speed steel	Carbide
Alloy steel	20 m/min	75 m/min
Aluminium	300 m/min	250 m/min
Bronze	35 m/min	120 m/min
Cast iron	25 m/min	60 m/min

(3)

**FORMULA:**  $MMPT = \frac{m/min}{rpm \times \#FL}$

5.7 How will testing a part program block by block help?

(2)

5.8 List THREE steps to follow when carrying out a dry run with a machine lock.

(3 × 2) (6)



**[26]**

**TOTAL: 100**