



higher education
& training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

**FITTING AND TURNING
NQF LEVEL 4**

(6011044)

**22 November 2019 (X-Paper)
09:00–12:00**

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. Start each section on a NEW page.
 5. Use only BLUE or BLACK ink.
 6. Write neatly and legibly.
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QUESTION 1: PUMPS AND COMPRESSORS

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 (1.1.1–1.1.6) in the ANSWER BOOK.

1.1.1 The ... transfers the power from the motor directly to the impeller through its rotation.

- A bearing housing
- B impeller
- C drive shaft
- D volute casing



1.1.2 ... control leakage on centrifugal pumps.

- A Volute casings
- B Mechanical seals
- C Inlet and outlet flanges
- D Seal chambers and stuffing boxes



1.1.3 The ... is connected to the manifold and it is designed to open and release compressed air if the pressure inside the tank exceeds a safe limit.

- A pressure gauge
- B air receiver
- C check valve
- D relief valve



1.1.4 The ... converts some of the liquid velocity into flow pressure.

- A impeller
- B diffuser
- C volute casing
- D seal camber and stuffing box



1.1.5 The ... controls how much compressed air can leave the tank?

- A control switch
- B regulator
- C pressure gauge
- D supply line



1.1.6 The purpose of the ... is to suck air in and force pressurised air into the storage tank.

- A air receiver
- B outlet pipe
- C compressor pump
- D supply line




- 1.2 Name FOUR safety precautions to be followed before you start using the pump for the first time after you have completed maintenance on the pump. (4)
- 1.3 Name TWO types of rotary pumps that are used in the industry.  (2)
- 1.4 Explain why electrical equipment need to be isolated from other energy sources. (1)
- 1.5 Explain the functions of the intercooler as used in piston compressors. (2)
- 1.6 Air compressors have a number of functions in application.  (5)
- Name FIVE practical examples where compressed air can be used. (5)
- [20]**




QUESTION 2: HYDRAULICS AND PNEUMATICS

- 2.1 List FIVE general safety practices that should be followed when working with hydraulic systems and related equipment. (5)
- 2.2 Explain the function of the different valves used in hydraulic systems.
- 2.2.1 Directional control valves
- 2.2.2 Safety valves  (3 × 2) (6)
- 2.2.3 Variable flow valve
- 2.3 List FIVE operational factors that influence the choice between hydraulic and pneumatic systems. (5)
- 2.4 Differentiate between a *normally-closed* and *normally-open valve*.  (2)
- 2.5 Pneumatic pipe layouts have to be inspected for kinks and neatness.
- Give TWO reasons why pneumatic pipe systems must not have kinks in the pipes. (2)
- [20]**


QUESTION 3: SURFACE GRINDER

- 3.1 List FOUR types of grinding wheels that can be used when working with a surface grinder. (4)
- 3.2 Explain the purpose of doing the following operations on a grinding wheel:
- 3.2.1 Dressing the wheel  (2)
- 3.2.2 Balancing the wheel (2 × 1) (2)
- 3.3 List FOUR steps that have to be followed when dressing the grinding wheel on a surface grinding machine with a diamond dresser. (4)
- [10]**

QUESTION 4: CENTRE LATHE MACHINE

- 4.1 State THREE reasons why machine guards on lathe machines are designed in a specific way. (3)
- 4.2 It is important to select the correct tools and equipment for quality checks when machining. 
- Name any measuring tool that can be used to accurately check the outside diameter of the shaft. (1)
- 4.3 Long work pieces often need support in the middle because cutting tools can push/ bend a work piece as a result of huge pressure that cutting the metal produces. 
- List the names of TWO types of steadies that are used when working on the centre lathe machine cutting a long work piece. (2)
- 4.4 A work piece with a diameter of 200 mm is to be turned on a centre lathe.
- Calculate the spindle speed in revolutions per minute if the prescribed cutting speed for the material is given as 250 mm per second.
- Formula: $S = \pi \times D \times N$  (3)
- 4.5 List THREE pieces of information that need to be recorded after you have completed machining a work piece on a lathe. (3)
- [12]**

QUESTION 5: MILLING MACHINE

- 5.1 As part of a practical exercise you are required to cut two slots on a rectangular work piece. 

State FIVE factors that you have to take into consideration to calculate the depth of each cut. (5)

- 5.2 Calculate the required indexing for a gear which should have 58 teeth machined on a gear blank by using a Brown & Sharpe dividing indexing plate.

BROWN & SHARPE INDEXING PLATES

PLATE 1	15	16	17	18	19	20
PLATE 2	21	23	27	29	31	33
PLATE 3	37	39	41	43	47	49


INDEXING FORMULA = $\frac{40}{N}$ 

(3)

- 5.3 Name FOUR types of cutters that can be used on the milling machine. (4)

[12]**QUESTION 6: CNC MILLING AND CENTRE LATHE**

- 6.1 Cleaning the work area after your shift is standard, but maintaining it throughout the day is not only better but safer too.

List FOUR things to be considered when cleaning the workshop as indicated in the statement above. 

(4)

- 6.2 Cutting speed need to be identified as per the material specification.

What will be the effect of the following when cutting a particular material.

6.2.1 Cutting speed too high

6.2.2 Cutting speed too low

(2 × 1)

(2)

- 6.3 A part programme is produced using geometrical data and technological data.

List THREE stages that needs to be followed when programming at an offline workstation. 

(3)

- 6.4 List FIVE steps that need to be followed when you manually edit a CNC programme on the CNC controller. (5)

- 6.5 Calculate the depth of cut per tooth required for a 30 mm diameter HSS milling cutter, with four flutes when cutting mild steel at 720 rpm. Cutting speed for mild steel is 68 m/min



$$\text{Formula} = \text{MMP} = \frac{M/\text{Min}}{\text{RPM} \times \#FL}$$

(3)

- 6.6 The following is a written programme for a milling machine to produce a rectangular block using a 20 mm thick mild steel plate. Study the programme and answer the questions.

Programme No 00002

```
G80 G40 G91 G28 Z0G28 X0 Y0
M6 T1
G90 G54 G0 XO YO S1200 M3
G43 Z5.0 H1
G01 X110.0 F100
Y-50.0
X0
Y0
G91 G28
Z0
M30
Program reset
```



- 6.6.1 What are the dimensions of the rectangular block?
- 6.6.2 Explain the meaning of S1200 in the programme.
- 6.6.3 What is the meaning the of N-code and T-code used in CNC programming

(3 × 2) (6)

- 6.7 Components are measured to check if they conform to the specific tolerance.

Name THREE sections or phases that quality control can be divided into.



(3)

[26]**TOTAL: 100**