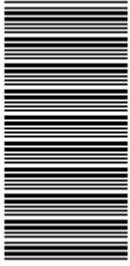


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**higher education  
& training**

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

**NATIONAL CERTIFICATE (VOCATIONAL)**

**FITTING AND TURNING  
NQF LEVEL 4**

**NOVEMBER EXAMINATION**

(6011044)

**30 November 2015 (Y-Paper)  
13:00–16:00**

**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. Write neatly and legibly.
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**QUESTION 1: PUMPS**

- 1.1 Once you have completed doing maintenance on a pump, there are certain precautions you have to follow before using the pump for the first time.  
Name any TWO of these precautions. (2)
- 1.2 Explain in your own words the working principle of a centrifugal (dynamic) pump. (4)
- 1.3 Briefly explain the functions of the following pump components:
- 1.3.1 Diffuser
- 1.3.2 Stuffing box (2 x 1) (2)
- 1.4 Planning for pump installation or maintenance requires that it must be isolated electrically and mechanically from energy sources.  
State TWO reasons for machines to be locked and tagged. (2)
- [10]**

**QUESTION 2: COMPRESSORS**

- 2.1 Name one example of:
- 2.1.1 Positive displacement compressor.
- 2.1.2 Negative displacement compressor. (2 x 1) (2)
- 2.2 Explain in your own words the working principle of the following compressor types:
- 2.2.1 Positive displacement compressor.
- 2.2.2 Negative displacement compressor. (2 x 2) (4)
- 2.3 State TWO items you need to check on a compressor during routine maintenance. (2)
- 2.4 Explain the function of the after-cooler unit in a compressed air system. (2)
- [10]**

**QUESTION 3: HYDRAULICS AND PNEUMATICS**

- 3.1 Choose a phrase from COLUMN B that completes the sentence in COLUMN A. Write only the letter (A–E) next to the question number (3.1.1–3.1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
3.1.1	Safety glasses must be worn ...	A	which can cause damage to your eyes
3.1.2	Leaks on a hydraulic system must never be checked ...	B	when working around hydraulic or pneumatic systems
3.1.3	A non-volatile solvent ...	C	all pressure in the system must be relieved
3.1.4	Compressed air contains oil droplets ...	D	must be used to wash the hydraulic components of a system
3.1.5	Before disconnecting any hydraulic or pneumatic lines ...	E	by running your hand or finger along the line

(5 x 1)

- 3.2 Name any TWO common hazards that can be avoided when applying good health and safety practices applicable to hydraulic equipment. (2)
- 3.3 Explain what is meant by *energy conversion* in a pneumatic system between the electrical, mechanical and pneumatic energy elements. (6)
- 3.4 Name any FOUR components required to construct a pneumatic circuit. (4)
- 3.5 Name any THREE differences between pneumatic and hydraulic systems. (3)

**[20]**

**QUESTION 4: SURFACE GRINDING**

4.1 Choose a phrase from COLUMN B that completes the description in COLUMN A. Write only the letter (A–E) next to the question number (4.1.1–4.1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
4.1.1	Dressing a grinding wheel ...	A	by regularly performing a ring test
4.1.2	Truing a grinding wheel is done ...	B	could be caused by dirty coolant being used during the grinding operation
4.1.3	The wheel must be inspected for cracks	C	to correct the out-of-round condition of a grinding wheel
4.1.4	Fishtail scratches on a workpiece ...	D	is used for sharpening milling cutters
4.1.5	The flaring-cup wheel ...	E	improves the cutting action of the grinding wheel

(5 x 1) (5)

4.2 During a grinding operation on a surface grinding machine the operator sees that the workpiece is getting discolored or burnt.

4.2.1 Name TWO factors that cause the workpiece to burn.

4.2.2 State TWO remedial actions that the operator could take to solve the problem in QUESTION 4.2.1.

(2 x 2) (4)

4.3 Why is it essential for the operator to wear safety goggles when performing a grinding operation?

(1) [10]

**QUESTION 5: CENTRE LATHES**

5.1 John must do a turning operation between centres. He must use a driving plate.

List the important components needed to go with the driving plate. (3)

5.2 You have just received a job instruction to machine a part on the lathe and certain actions or activities must be performed in preparation for the machining process.

List THREE of the activities needed before the turning operation can take place. (3)

5.3 The cutting speed for a mild steel cylindrical shaft is 20 m/min. If this work-piece has a diameter of 650 mm, calculate the rotational speed in r/s.

Use the formula:  $S = \pi \times D \times N$  (3)

5.4 The turning job is completed and you are required to clean the machine.

5.4.1 Name the cleaning medium or substance you will use.

5.4.2 Briefly explain why it is necessary to do this. (2 x 1) (2)

5.5 Name the instrument that is used to set up the work-piece and cutting tool in order to achieve the correct centre height. (1)

**[12]**

**QUESTION 6: MILLING MACHINES**

- 6.1 Name THREE factors that will influence the chip size during a milling operation. (3)
- 6.2 A 60 mm diameter cutter with 8 teeth has a cutting speed of 21 m/min and a feed of 0,06 per tooth.  
Calculate the feed rate cut in mm/min. Given:  $S = \pi \times D \times N$  and  $f = f_t \times T \times N$  (3)
- 6.3 A gear with 100 teeth must be machined on the milling machine.  
Calculate the required indexing using the Brown and Sharpe dividing head and a set of appropriate change gears.  
Formulae: Indexing =  $40/N$   
Brown and Sharpe indexing plate
- Plate 1 – 15, 16, 17, 18, 19, 20 holes
  - Plate 2 – 21, 23, 27, 29, 31, 33 holes
  - Plate 3 – 37, 39, 41, 43, 47, 49 holes
- (4)
- 6.4 Give TWO reasons why quality checks are applied after completion of the milling machine operation. (2)

**[12]**

**QUESTION 7: CNC LATHES AND MILLING**

- 7.1 Once you are sure that you understand the drawing, you need to determine the machining sequence in which the operation will take place.  
List THREE steps in the CNC machining sequence. (3)
- 7.2 Name the TWO different types of commands (codes) in a part programme. (2)
- 7.3 An artisan is setting the CNC machine for machining a workpiece. The component has design requirements to be considered.  
State TWO of these design requirements. (2)
- 7.4 The programme has been set on the centre lathe and the operator notices that there are mistakes on the programme.  
List the steps he will apply manually to edit the programme on the CNC controller. (5)
- 7.5 Calculate the depth of a cut per tooth required for a 30 mm diameter carbide milling cutter with 4 flutes, when cutting alloy steel at 820 r/min. The cutting speed for alloy steel is given as 60 m/min.  
Formula:  $MMP = \frac{m/min}{r/min \times FL}$  (2)
- 7.6 The dry run with air cutting is used to detect motion errors and determine whether the spindle direction correlates with the tool tip. Determining the difference between rapid and feed motions is impossible because the execution is at dry run feed.  
Name the steps you will follow to rectify this problem on a CNC lathe. (4)
- 7.7 Martha has completed the dry run cycle on a CNC lathe and she notices that the machine has displayed an error.
- 7.7.1 Briefly explain what she can do to pinpoint exactly which line contains the error. (1)
- 7.7.2 List the steps she will follow to execute this using normal cycle with single block. (5)
- 7.8 The machine programme normally uses one of two types of programming methods.  
Explain briefly what is meant by the *absolute programming method*. (2)

**[26]****TOTAL: 100**