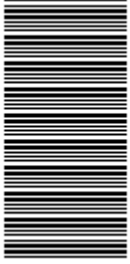


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**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

**FITTING AND TURNING
NQF LEVEL 4**

SUPPLEMENTARY EXAMINATION

(6011044)

**13 March 2015 (Y-Paper)
13:00-16:00**

This question paper consists of 10 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. ALL drawings must be neat and in good proportion
 5. ALL work you do not want to be marked must be clearly crossed out.
 6. Write neatly and legibly.
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QUESTION 1: DIAGNOSE AND REPAIR FAULTS ON MACHINES

- 1.1 Choose a description from COLUMN B that matches a statement or activity in COLUMN A. Write only the letter (A–E) next to the question number (1.1.1–1.1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.1.1	The purpose of a preventative maintenance programme	A	serves to reduce human error during process operations
1.1.2	Machines should be isolated mechanically and electrically during maintenance	B	must be disposed of in an appropriate and safe manner
1.1.3	The provision of clear and concise operating procedures	C	ensure that company rules, regulations and procedures are followed
1.1.4	Hazardous waste could be harmful to human health	D	to minimise major repairs in a production plant
1.1.5	The maintenance foreman in a factory	E	ensure safety of yourself and others

(5 × 1) (5)

- 1.2 One of the major causes of machine breakdown is bearing failure.

Indicate THREE reasons why ball and roller bearings fail.

(3)

- 1.3 The breakdown of machinery leads to a loss of production which in turn decreases the profit generated by an organisation.

1.3.1 State TWO root causes of the failure and breakdown of machines and equipment in a factory.

(2)

1.3.2 Briefly explain how each cause you have mentioned in QUESTION 1.3.1 can be rectified.

(2)

- 1.4 A roller bearing inside a gearbox collapses and has to be removed and replaced.

1.4.1 Would you regard this as a minor or a major repair?

1.4.2 Motivate your answer by giving ONE reason.

(2 × 1) (2)

- 1.5 Good and effective housekeeping is necessary in all work environments.

Identify THREE benefits of a good housekeeping practice.

(3)

- 1.6 Preventative maintenance is regularly carried out on machines and equipment in a factory.

Briefly explain what is meant by preventative maintenance.

(1)

- 1.7 Operational procedures provide an important guide to the safe and effective use of machines and equipment and must be adhered to.

Indicate TWO possible consequences of workers not adhering to operational procedures.

(2)
[20]

QUESTION 2: MAINTAIN FLUID POWER AND PNEUMATIC SYSTEMS

- 2.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (2.1.1–2.1.5) in the ANSWER BOOK.

2.1.1 The reservoir of a hydraulic system allows air bubbles to escape from the hydraulic fluid.

2.1.2 The actuator of a hydraulic system is also referred to as the input mechanism.

2.1.3 Hydraulic systems operate faster than pneumatic systems because of their lightweight construction.

2.1.4 Pneumatic systems are preferred over hydraulic systems in food processing plants as they are unlikely to contaminate the food products.

2.1.5 The air receiver on a pneumatic system serves to pressurise the air.

(5 × 1) (5)

- 2.2 Illustrate the difference between a compressor and a hydraulic pump by making simple sketches of the symbols of these components.

(4)

- 2.3 Bongani maintains the hydraulic equipment in an extrusion plant.

Name TWO hazards that Bongani could encounter whilst working on high pressure hydraulic equipment.

(2)

- 2.4 Identify TWO components of a basic pneumatic system.

(2)

2.5 Cavitation is disruptive in a hydraulic system and is primarily caused by air entering the system.

Briefly describe how you would remedy the following causes of cavitation in hydraulic systems:

2.5.1 Suction strainer clogged or too small

2.5.2 Unsuitable or degraded hydraulic fluid

2.5.3 Suction line too long

(3 × 1) (3)

2.6 A pressure relief valve is a safety device that is installed on the air receiver of a pneumatic system.

2.6.1 Briefly explain the purpose of installing a pressure relief valve on the air receiver.

2.6.2 What could the result be if the maximum operating pressure of the air receiver is exceeded?

(2 × 2) (4)
[20]

QUESTION 3: PRODUCE COMPLEX COMPONENTS USING LATHES

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 (3.1.1–3.1.5) in the ANSWER BOOK.

3.1.1 The thread pitch gauge is used to ...

- A measure the outside diameter of a screw thread.
- B check the module of a screw thread.
- C determine the root diameter of a screw thread.
- D check the pitch of a screw thread.

3.1.2 A dial test indicator may be used to ...

- A indicate the speed at which the chuck is rotating.
- B measure the width of a machined groove.
- C accurately set up workpieces on a four-jaw chuck.
- D test the clearance on a machine slide.

3.1.3 The compound slide method may be used to ...

- A align the spindle of the centre lathe.
- B machine internal and external tapers.
- C support long thin workpieces.
- D correctly align the headstock.

3.1.4 The outside micrometer can be used to measure the ... accurately.

- A external radius on a workpiece
- B depth of a groove
- C thickness of a key
- D width of a keyway

3.1.5 A vernier protractor is used to ...

- A measure the diameter of a cylinder.
- B test the roundness of a shaft.
- C check the angle of a workpiece.
- D gauge the flatness of a workpiece.

(5 × 1) (5)

3.2 Parting off is the operation used to cut off a piece of a bar held in the chuck of a centre lathe.

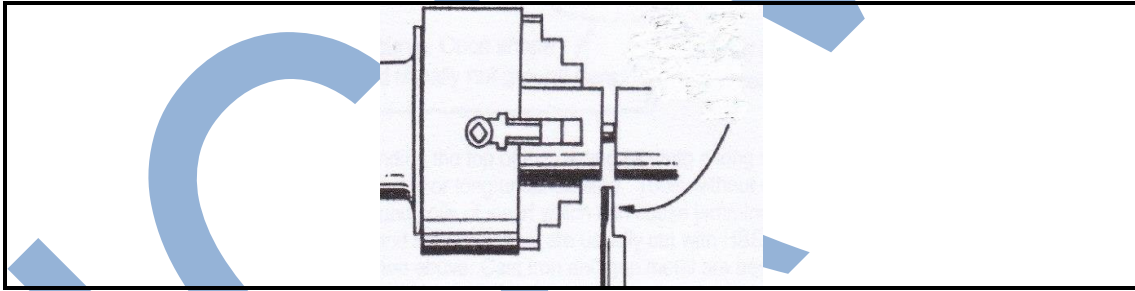


FIGURE 1

3.2.1 Describe TWO important rules that must be observed when setting up the parting tool.

(2)

3.2.2 What could the result be if any of the above rules are not adhered to? State ONE fact.

(1)

3.3 A steel pin with a diameter of 45 mm must be machined on a centre lathe.

Calculate the speed of the machine spindle in revolutions per minute if the cutting speed for steel is 22 m/min.

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

(3)

3.4 Indicate THREE important factors that determine the quality of parts produced on the centre lathe.

(3)

3.5 Upon completion of a job, it is necessary for Philani to record information on an inspection report.

Identify TWO pieces of information that Philani would compile in this report.

(2)

3.6 Safe working habits must be developed by employees rather than to suffer the consequences of an accident. The machining process on a centre lathe is producing long continuous shavings.

3.6.1 What is the possible consequence of this hazard? (1)

3.6.2 State THREE control measures you would recommend to be put in place to overcome this hazard. (3)
[20]

QUESTION 4: PRODUCE COMPLEX COMPONENTS USING MILLING MACHINES

4.1 Choose a statement from COLUMN B that matches a 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	Parallel bars are made of hardened steel	A	used to make work set-ups at right angles to the table
4.1.2	The V-block and a strap clamp	B	can be the most time-consuming part of the job
4.1.3	Workpieces that are too large	C	used to provide clearance under the workpiece
4.1.4	Setting up a workpiece on the milling machine	D	bolted directly to the machine table
4.1.5	The angle plate	E	used to support circular workpieces during milling

(5 × 1) (5)

4.2 A milling cutter with 14 teeth has a diameter of 60 mm. The cutting speed is 26 metres per minute and the feed is set at 0,05 mm per tooth.

Calculate the feed used in mm/min.

Use the formulae: $S = \pi \times D \times N$ and $f = f_t \times T \times N$ (5)

4.3 A dividing head is an attachment used on a milling machine.

Name TWO functions of a dividing. (2)

4.4 The drawing in FIGURE 2 below specifies that a 12 mm keyway must be cut on the top of a shaft, 60 mm in diameter.

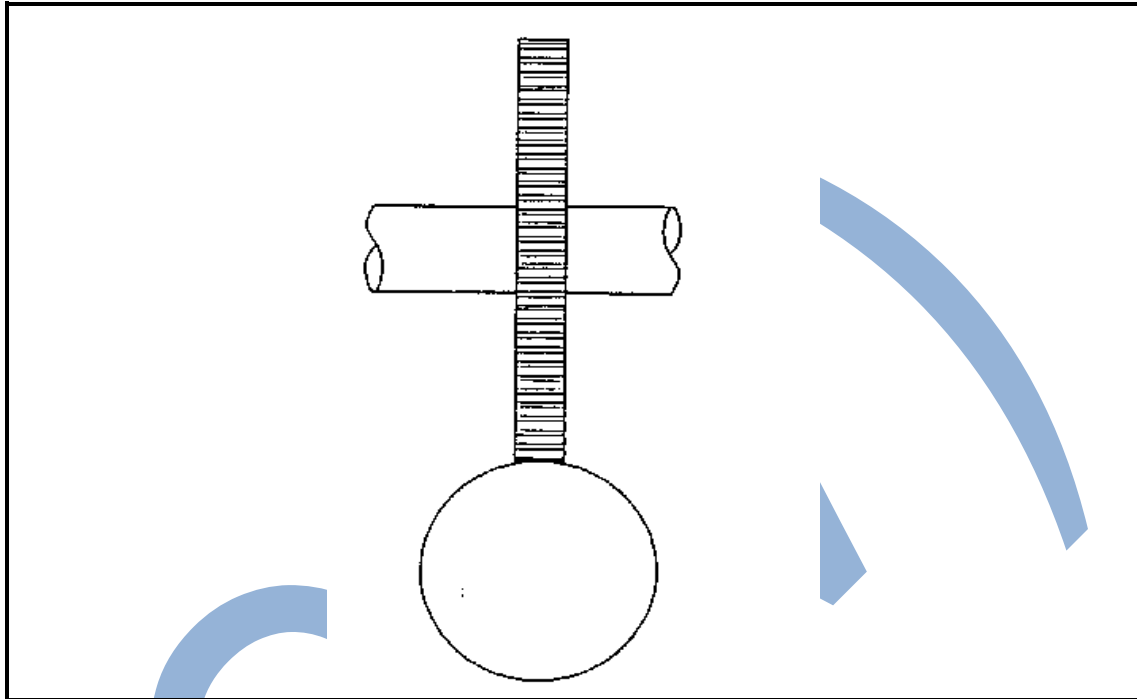


FIGURE 2

- 4.4.1 Explain step by step how you would centralise a 12 mm cutter to the shaft before you cut a keyway. (4)
 - 4.4.2 Name the type of cutter shown in FIGURE 2. (1)
 - 4.4.3 What instrument would you use to measure the depth of the keyway accurately? (1)
 - 4.4.4 State TWO reasons why it is necessary to have a keyway on a shaft. (2)
- [20]**

QUESTION 5: PRODUCE COMPLEX COMPONENTS BY PERFORMING INTERNAL AND EXTERNAL GRINDING OPERATIONS

5.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (5.1.1–5 1.5) in the ANSWER BOOK.

5.1.1 An external grinding operation may be performed on a grinding machine.

5.1.2 The ring test must be performed before mounting a new or used wheel on a grinding machine.

5.1.3 A hard wheel is used when grinding hard materials.

5.1.4 The speed of the grinding machine spindle must exceed the maximum speed of the grinding wheel.

5.1.5 With offhand grinding, the workpiece is applied manually to the grinding wheel.

(5 × 1) (5)

5.2 Indicate TWO factors that you would consider when selecting a grinding wheel for a specific job. (2)

5.3 Menzi, the machine operator, is accurately grinding a rectangular block of steel on a horizontal surface grinding machine.

5.3.1 What safety equipment must Menzi wear to protect his eyes? (1)

5.3.2 After removing the rectangular block from the magnetic chuck on completion of the task Menzi sees scratches on it.

State TWO faults that could have caused the scratching on the workpiece. (2)

[10]

QUESTION 6: WRITE SIMPLE COMPUTER NUMERICAL CONTROLLED PROGRAMMES AND SET AND OPERATE A CNC MACHINE

- 6.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–E) next to the question number (6.1.1–6.1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
6.1.1	The feed rate setting	A	preparatory functions to prepare for a specific machining cycle
6.1.2	M commands	B	located in the centre of the work spindle nose; cannot be changed
6.1.3	Canned cycles	C	the speed at which the cutting tool advances into the workpiece
6.1.4	G codes	D	on-off functions of the CNC motor
6.1.5	The zero point (M) of CNC lathes	E	sequences of machine cycles that act as shortcuts to simplify the programme

(5 × 1) (5)

- 6.2 Indicate TWO disadvantages of the CNC lathe when compared to a conventional lathe. (2)

- 6.3 The first component manufactured on the CNC lathe must conform with the drawing specifications. (2)
- State TWO aspects that must be checked on the first component produced. (2)

- 6.4 The Occupational Health and safety Act prescribes that workers shall maintain two important criteria as far as health and safety is concerned. (1)
- Identify ONE of these criteria. [10]

TOTAL: 100