higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

NOVEMBER EXAMINATION

FITTING AND TURNING
NQF LEVEL 4

30 NOVEMBER 2015

This marking guideline consists of 8 pages.

QUESTION 1: PUMPS

1.1
- Ensure that the correct safety devices are installed.
- Do not operate the pump while valve inlets and outlets are closed.
- Do not use the pump for any other purpose than for which it was designed.
- Do not start the pump without priming it first or checking that it is primed.

(Any 2 x 1) (2)

1.2
- An impeller with curved vanes, which is immersed in fluid, is rotated.
- Fluid flows in at the inlet towards the impeller centre.
- The impeller rotates and forces the fluid to move outwards along the impeller's vanes.
- This centrifugal force increases the pressure and velocity at the outlet.

(4 x 1) (4)

1.3 1.3.1 Some centrifugal pumps contain a diffuser which converts some of the liquid's velocity into flow pressure.

1.3.2 It prevents leakages from pumps.

(2 x 1) (2)

1.4
- To prevent accidental operation until necessary maintenance is carried out
- To prevent possible injuries to workers
- To prevent further damage to the machine

(Any 2 x 1) (2)

[10]

QUESTION 2: COMPRESSORS

2.1 2.1.1 Rotary screw, vane compressor, reciprocating compressor, lobe compressor (Any ONE example)

2.1.2 Single-stage centrifugal compressor, multi-stage centrifugal compressor, single-stage reciprocating compressor, multi-stage reciprocating compressor (Any ONE example) (1)

2.2.1
- A positive displacement compressor forces atmospheric air into a chamber through a one-way intake valve. (1)
- As the chamber volume decreases during rotation, it places the air under pressure, making it compressed.

(2)

2.2.2
- A negative displacement compressor has impellers which, as they spin, create a centrifugal force that accelerates and then decelerates the captured air.
- The acceleration and deceleration of the captured air pressurises it.

(2)

2.3
- Check and replace oil filters if necessary.
- Check oil levels and top up if necessary.
- Check operating temperatures.
- Check the condition and tension of drive belts.
- Clean air/oil coolers. (Any 2 x 1) (2)

2.4
- Removes moisture
- Cools air (2 x 1) (2)

[10]

QUESTION 3: HYDRAULICS AND PNEUMATICS

3.1
3.1.1 B
3.1.2 E
3.1.3 D
3.1.4 A
3.1.5 C

(5 x 1) (5)

3.2
- Leakage of hydraulic fluid which can cause damage to the eyes, intoxication and risk of slipping
- Excessive noise which can damage hearing
- Electrical shock
- Accidental machine movement which can cause severe injury (Any 2 x 1) (2)

3.3
- An electric motor converts electrical energy into mechanical energy to run a compressor.
- The compressor, through mechanical movement, converts mechanical energy into potential energy in the storage of the compressed air.
- The actuator converts potential energy into mechanical energy. (3 x 2) (6)

3.4
- Pressure source
- Service unit
- Throttle valve
- Directional control valves
- Linear and rotary actuators
- Pressure gauges
- Regulator valves
- Flow control valves
- Piping (Any 4 x 1) (4)

3.5
- Pneumatic systems operate under pressurised air, while hydraulic systems operate under pressurised liquid.
- Pneumatic systems work in an open-ended circuit, which means the air is released into the atmosphere, while hydraulic systems work on a closed circuit where the fluid is directed back to the reservoir.
- Pneumatic systems require a larger cylinder than hydraulic systems to produce the same output as a hydraulic system.
- Pneumatic systems use a low-pressure fluid in comparison to hydraulic systems.
- Pneumatic systems are much faster than hydraulic systems.
- Pneumatic systems can operate under very high temperatures while hydraulic systems cannot.
- Hydraulic systems are self-lubricating whereas pneumatic systems require a lubricant for their moving parts.
- Pneumatic systems are more suitable for fire-risk areas whereas hydraulic systems can be very dangerous in fire risk areas.
- Operating costs of pneumatic systems are much lower than operating costs of hydraulic systems. (Any 3 x 1) (3)

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QUESTION 4: SURFACE GRINDING

4.1
4.1.1 E
4.1.2 C
4.1.3 A
4.1.4 B
4.1.5 D

(5 x 1) (5)

4.2 4.2.1
- Insufficient coolant
- Grinding wheel too hard or too soft
- Cut is too heavy
- Table feed is too slow (Any 2 × 1) (2)

4.2.2
- Increase the flow of the coolant.
- Use a softer or harder wheel depending on material.
- Take smaller or lighter cuts.
- Increase the table feed.
- Dress the grinding wheel more often. (Any 2 × 1) (2)

4.3 To prevent tiny pieces of metal, grinding grains or grit or coolant from damaging the eyes or to protect the eyes. (1)

[10]

QUESTION 5: CENTRE LATHES

5.1
- Centres
- Carrier
- Carrier pin (3)

5.2
- Material must be ready.
- Decide on the machine and clamping method
- Set machine to correct feeds and speeds.
- Select tools.
- Verify the quality checks with the supervisor or person in charge.

(Any 3 x 1) (3)

5.3
$S = \pi \times D \times N$
$20 = \pi \times 0{,}65 \times N$ ✓
$N = \frac{20}{\pi \times 0{,}65}$
$= \frac{9{,}793}{60}$ ✓
$= \mathbf{0{,}163\ r/s}$ ✓ (3)

5.4 5.4.1 Oil, Paraffin or oil-based substance
5.4.2 To prevent corrosion

(2 x 1) (2)

5.5 Vernier height gauge, dial test indicator or surface height gauge

(any 1 x 1) (1)

[12]

QUESTION 6: MILLING MACHINES

6.1
- Spindle speed
- Tool diameter
- Feed rate
- Cut depth
- Surface cutting speed (Any 3 x 1) (3)

6.2 $S = \pi \times D \times N$

$N = \frac{S}{\pi \times D}$

$= \frac{21}{\pi \times 0,06}$

$= \mathbf{\underline{111,39\ r/min}}$ ✓

$f = ft \times T \times N$

$= 0,06 \times 8 \times 111,39$ ✓

$= \mathbf{\underline{53,47\ mm/min}}$ ✓ (3)

6.3 $\text{Indexing} = \frac{40}{N}$

$= \frac{40}{100}$

$= \frac{2}{5}$ ✓

$= \frac{2}{5} \times \frac{3}{3}$ ✓

$= \frac{6}{15}$ ✓

Answer = 0 full turns of the crank handle, 6 holes on a 15- hole circle from plate 1. ✓ (4)

6.4
- To ensure that all the specifications, dimensions, tolerances and shapes for specific milling jobs are met.
- To make sure that defects are not repeated.
- To minimise the risk of injuries and related incidents. (Any 2 x 1) (2)

[12]

QUESTION 7: CNC LATHES AND MILLING

7.1
- Acquire the correct material in the correct size and quantity as specified on the drawing.
- Decide how the work-piece will be clamped.
- Set the machine to the correct feeds and speeds.
- Select the correct equipment and tools.
- Determine the machining process.
- When the job is done, isolate the machine from the electrical supply.
- Clean the work area and the machine. (Any 3 x 1) (3)

7.2
- M-command (M-code)
- G-command (G-code) (2 x 1) (2)

7.3
- The quantity of components that must be manufactured
- The tolerance needed for the component
- The type of surface finish
- The diameter variations that can influence the tool selection (Any 2 x 1) (2)

7.4
- Activate the desired programme that has to be altered.
- Ensure that the program protect key is switched to the off position.
- Scroll to the information that has to be changed.
- Type in the correct value on the keypad.
- Press ALTER on the keypad to change the value. (5 x 1) (5)

7.5
$$MMP = \frac{m/min}{N \times FL}$$
$$= \frac{60}{820 \times 4} \quad ✓$$
$$= \mathbf{\underline{0{,}0183\ mm}} \quad ✓$$ (2)

7.6
- Set the geometry offsets.
- Increase the workshift offset so that all motion occurs away from the chuck.
- Set machine lock OFF and dry run ON. All machine functions and motions must be active.
- Set feed rate override switch to minimum. (4 x 1) (4)

7.7 7.7.1 By running the programme block by block (one line at a time) (1)

7.7.2
- Set the geometry offsets.
- Set the workshift in the correct position.
- Set all functions for normal machine execution.
- For safety, set the feed rate override switch to minimum.
- Check the distance-to-go value to detect potential motion errors.

(5 x 1) (5)

7.8 This is to make a reference point on the component which is then identified as the work-piece zero. The work-piece zero is used as a reference from which all the other dimensions are taken. (2)

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TOTAL: 100