higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

FITTING AND TURNING
NQF LEVEL 3

20 NOVEMBER 2017

This marking guideline consists of 7 pages

QUESTION 1: BEARINGS

1.1 Any relevant/appropriate answer
- A place for everything and everything in its place
- General and routine work done to maintain cleanliness and tidiness around the workplace; measures should be in place to avoid accidents (2)

1.2 A ï Outer race or raceway/ring
B ï Cage
C ï Rivet
D ï Rolling element/ball
E ï Inner race or raceway/ring (5)
(Language and terminology used by candidate when answering must be considered.) Any relevant/appropriate answer

1.3 Any relevant/appropriate answer
Ball and roller bearings are generally cleaned using a paintbrush with diesel, paraffin or mineral spirits (rust-prevention solvent). Lightly lubricate the bearing after cleaning to ensure all surfaces are covered with oil for easy inspection. (2)

1.4 Any appropriate answer
- Easy to replace
- Used where starting torques are high
- Become noisy when they failing
- Can be pre-packed with grease with seals
- Support combination of loads
- Longer lasting (Any 3 × 1) (3)

[12]

QUESTION 2: COUPLINGS

2.1 2.1.1 Oldham coupling (1)

2.1.2 Any relevant/appropriate answer e.g. (D-male part and E ï slot)
A ï Flange A
B ï Metal or rubber part
C ï Flange B
D ï Tongue/Slipper/Spigot
E ï Groove/Recess (5)

2.2
- Straight edge and feeler gauge method
- Rim and face method
- Reverse indicator method
- Laser
- Clock gauges/ Dial test indicators (Any 3 × 1) (3)

2.3 Any relevant/appropriate answer
Shaft run-out occurs when a shaft is not exactly round (or eccentric) due to operational damage (off-centre). (1)

[10]

QUESTION 3: BRAKES AND CLUTCHES

3.1 Any relevant/appropriate answer
- Stops the vehicle or machine within a certain distance
- Stops the vehicle or machine in emergencies
- Keeps the vehicle or machine stationary on a slope
- Slows down the speed of the vehicle or machine (4)

3.2 Any relevant/appropriate answer
- Higher braking force can be applied
- Better cooling
- Wear can be seen without removing the unit (Any 2 × 1) (2)

3.3

CAUSE	REMEDY
• Worn linings	• Replace the clutch unit
• Dirt or oil on the friction surface	• Clean the friction surface
• Faulty clutch unit installed	• Replace with correct unit
• Wear	• Replace the clutch unit
• Not enough pressure applied	• Release bearing/ clutch cable replacement
• Overloading	• Lighten the load being moved
• Broken clutch parts	• Replace broken parts

Any relevant/appropriate answer (Any 2 × 2) (4)
[10]

QUESTION 4: BELT DRIVES, CHAIN DRIVES AND GEAR DRIVES

4.1 A ï Arc of contact/Contact angle
B ï Driven pulley/Large pulley
C ï Driver pulley/Small pulley
D ï Idler/Guide/Jockey pulley (4)

A- PCD
D- Tensioner

4.2

ADVANTAGES	DISADVANTAGES
• Operate in adverse conditions	• Noisy
• Do not slip	• Wear causes elongation
• Easy to install	• Speed limitations
• Very efficient	• Break without warning
• Less expensive than gear drives	• Flexible in one plane
• Chain drives do not deteriorate with age as do belt drives	• Sprockets need replacing due to wear.
• Require little adjustment compared to frequently adjusting belt drives	• Backlash is significant: a chain does not perform well on applications requiring precision positioning.
• Provide better shock absorption compared to gear drives	○
• Virtually any length chain can be obtained (splicing)	
• Bearing loads are generally lower than for belts as there is no slack side tension.	
• They tend to be self-cleaning.	

Any 3 + 3) (6)

4.3 Any relevant/appropriate answer
- A driven gear can rotate in the same direction as the driver gear.
- The distances of gears can vary. (2)

4.4 4.4.1
- Velocity ratio is the ratio of the speed of the driven gear to the speed of the driver or the ratio of the number of teeth of each gear.
- The ratio of the number of revolutions per minute of the driving gear wheel to the number of revolutions per minute of the driven gear.
- The ratio of a distance through which a part of a machine moves to that which the driving part moves during the same time.

(Any relevant/appropriate answer)

4.4.2
- Mechanical advantage is the difference of the applied force and the work done; in other words, it allows a machine to do more work with less effort.
- The ratio of load and effort.

(2 × 1) (2)

4.5
- If a point is taken on the edge of a circle, and the circle is rolled along a straight line, the curved line formed by that point is called a cycloid curve.
- If an imaginary line is unwinded from a circle, the curved line formed by the end of the line is called an involute curve.

NOTE: Full marks only if correct explanation is given. (2 + 2) (4)
[18]

QUESTION 5: PIPES, PIPE FITTINGS AND VALVES

5.1
5.1.1 False
5.1.2 True
5.1.3 True
5.1.4 False
5.1.5 True

(5 × 1) (5)

5.2 A valve regulates or controls the flow volume and/or direction of liquids or gases in a pipe system or other applicable systems. (1)
Any relevant/appropriate answer

5.3
- Use correct tools and equipment.
- Switch off the machine before replacing or working on a valve.
- Release or relieve the pressure in the system.
- Isolate the machine by using tags.
- Wear PPE.

Any relevant/appropriate answer (Any 4 × 1) (4)
[10]

QUESTION 6: CENTRE LATHE

6.1 Any relevant/appropriate answer
- Facing
- Parallel turning
- Taper turning
- Drilling
- Boring
- Grooving
- Thread cutting
- Knurling
- Parting off
- Give marks to mentioning internal and external thread cutting. (Any 5 × 1) (5)

6.2 D = 50 mm = 50/1 000 = 0,05 m

N = 900 rpm

S = ´ × D × N
= ´ × 0,05 × 900✓✓
= 141,372 m/min✓ (3)

6.3 Any relevant/appropriate answer
- Finish required
- Type of material being cut
- Type of tool being used
- Diameter of the workpiece
- The condition of the machine.
- The coolant being used.(lubricating method e.g. when using a steady)
- The speed being worked at. (4)

6.4

PROBLEMS	POSSIBLE CAUSES
• Tool breaks	• Wrong tool material, high feed pressure
• Excessive tool wear	• No cutting fluid used, wrong tool angle, high feed pressure
• Tool chatter	• Work piece or tool not clamped securely, tool is blunt
• Material not cutting properly	• The cutting tool not set centre height
• Lathe not working properly	• The tailstock not fixed properly

Any relevant/appropriate answer (Any 3 × 2) (6)

6.5
- Fixed steady
- Travelling steady (2)

[20]

QUESTION 7: MILLING MACHINE

7.1 Any relevant/appropriate answer
- Machining dovetails, grooves and splines
- Making spur, bevel and spiral gears
- Performing drilling, boring and profile cutting operations
- Making flat surfaces, squaring
- Mass production of workpieces (Any 3 × 1) (3)

7.2
- Wear goggles/safety glasses.
- Clamp the workpiece securely.
- Never leave the running machine unattended.
- Make sure the cutting tool is secured.
- Do not make any adjustments while the machine is running. (Any 4 × 1) (4)

7.3 Any relevant/appropriate answer
- Roughing cutter
- End mill cutter
- Slot drill cutter
- Ball nose cutter
- T-slot cutter
- Dovetail cutter
- Slitting saw
- Helical cutter
- Rose-cutter
- Fly-cutter (Any 4 × 1) (4)

7.4 S = ´ × D × N

N = S/´ × D ✓
= 24/´ × 0,025 ✓✓
= 305,577 r/min ✓

f = fã × T × N
= 0,051 × 4 × 305,577✓
= 62,334 mm/min✓
S = ¶ x D x N Give the candidate a mark for converting the formula to
N= S / ¶ x D (6)

7.5
- Solid
- Split (2)

7.6 Soluble oil (1)
Any relevant answer

[20]
TOTAL: 100