



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N2

30 JULY 2018

This marking guideline consists of 8 pages.

SECTION A**QUESTION 1****NOTE: Candidates should only answer QUESTION 1.1 OR QUESTION 1.2.**

1.1	1.1.1	False		
	1.1.2	True		
	1.1.3	True		
	1.1.4	False		
	1.1.5	False	(5 × 1)	[5]

OR

1.2	1.2.1	False		
	1.2.2	True		
	1.2.3	False		
	1.2.4	False		
	1.2.5	True	(5 × 1)	[5]

QUESTION 2

2.1	• Axial misalignment • Radial misalignment • Angular misalignment			(3)
2.2	2.2.1 Nylon sleeve coupling 2.2.2 Flexible couplings 2.2.3 Nylon sleeve		(3 × 1)	(3) [6]

QUESTION 3

3.1	• Standardisation and the interchangeability of parts are facilitated. • Faulty machining and workmanship are accepted within certain limits. • Production is accelerated. • Production costs are cut down.			(4)
3.2	Interchangeability of parts is the substitution of a manufactured part✓ with a similar part manufactured from the same drawing✓.			(2) [6]

QUESTION 4

- 4.1 4.1.1 The ability of the material to resist galling or seizing under poor lubrication conditions
- 4.1.2 The ability of the material to flow during the running-in process
- 4.1.3 The ability of the material to withstand the pressure experienced under loaded conditions
- (3 × 1) (3)
- 4.2 Oil enters the bearing through an oil hole.✓ The oil is then distributed in the bearing along oil grooves.✓
- (2)
[5]

QUESTION 5

- 5.1 • Drip-feed lubricator
 • Siphon-wick lubricator
 • Sight-feed lubricator
 • Needle lubricator
- (Any 3 × 1) (3)
- 5.2 It is the temperature at which oil gives off vapour to burn continuously when ignited.
- (1)
- 5.3 • They control the direction of flow.
 • They control the pressure of flow.
- (2 × 1) (2)
[6]

QUESTION 6

- 6.1 • They are used to prevent the leakage of steam, compressed air, oil, water or gases in a system.
 • They prevent dirt and dust from entering into components of a system.
- (2 × 1) (2)
- 6.2 • It has a low resistance to fatigue.
 • It has a good resistance to acid corrosion.
 • Its hardness and strength decreases at low temperatures.
 • It has a low melting point.
 • It has good embedability properties.
- (Any 3 × 1) (3)
- 6.3 • PVC tape
 • Sisal string
 • Teflon
 • Copper jointing compound
- (4 × 1) (4)
[9]

QUESTION 7

- 7.1
- It is used to move a liquid from a lower to a higher level.
 - It is used to impart energy to a fluid
- (Any 1 × 1) (1)
- 7.2
- 7.2.1
- A – Outlet
 - B – Inlet
 - C – Gear
 - D – Casing
- (4 × 1) (4)
- 7.2.2
- Rotary pump
- (1)
[6]

QUESTION 8

- 8.1
- It is to compress air in a container so that it can be used for driving pneumatic power tools and machinery.
- (1)
- 8.2
- As the lobed rotors turn, air is drawn into the inlet of the compressor✓. Air is then transferred along the outside, between the rotors and compressor casing towards the outlet✓. Due to the meshing of the rotors, pressure is built up at the outlet✓ and the air is forced out of the compressor✓.
- (4)
- 8.3
- Reciprocating compressors
 - Rotary compressors
- (2 × 1) (2)
[7]

QUESTION 9

- 9.1
- 9.1.1
- Caused by excessive heat or chemical fumes
- 9.1.2
- Caused by fluid contaminating the belt
- 9.1.3
- Caused by improper installation
- (3 × 1) (3)
- 9.2
- Cycloid gear tooth profile
 - Involute gear tooth profile
- (2 × 1) (2)
- 9.3
- Single-strand or multiple-strand roller chains
 - Silent chains
 - Leaf chains
- (3 × 1) (3)
- 9.4
- To reduce the speed
 - To increase the torque
- (2 × 1) (2)
[10]

TOTAL SECTION A: 60

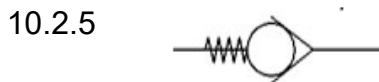
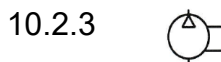
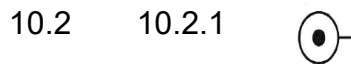
SECTION B

Answer any TWO of the following three questions.

QUESTION 10

10.1	HYDRAULIC SYSTEM	PNEUMATIC SYSTEM
	Uses liquid	Uses air
	Closed circuit – liquid returns to tank	Open-ended circuit – air released to atmosphere
	Requires small cylinders	Requires large cylinders
	Higher system pressure	Lower system pressure
	Slower operation	Faster operation
	Self-lubricating	Requires lubrication
	Suitable for fire risk areas	Dangerous for fire risk areas
	High operating costs	Low operating costs

(Any 3 × 2) (6)



(5 × 1) (5)

- 10.3
- Check the oil level in the compressor.
 - Ensure that air supply is cool and clean.
 - Inspect the receiver for leakages.
 - Open drain valve to release any moisture.
 - Make sure the intake filter is always clean.
 - Check hoses and fittings for leaks and damage.
- Any (4 × 1) (4)

- 10.4
- Air is readily available
 - Pneumatic equipment are very reliable
 - Pneumatic systems are easily adapted
 - Compressed air is safer than electrical or hydraulic power
 - Reciprocating motion is easily achieved in pneumatic systems
 - Pneumatic systems can be easily adjusted to produce different speeds
 - Installation and maintenance costs are low
 - Can operate under harsh conditions
- (Any 5 × 1) (5)
[20]

QUESTION 11

- 11.1
- To support long, slender workpieces between centres
 - To maintain concentricity of long workpieces while machining
 - To reduce vibration or chatter, ensuring better finish of the workpiece
 - To support workpieces against the pressure of heavy machining
- (Any 2 × 1) (2)
- 11.2
- 11.2.1
- Long tapers can be turned
 - Cross-slide can be fed automatically
- (2 × 1) (2)
- 11.2.2
- Only external tapers can be turned
 - As the centres are misaligned, uneven wear takes place
- (2 × 1) (2)
- 11.3
- 11.3.1 Absolute dimensioning
- 11.3.2 Incremental dimensioning
- (2 × 1) (2)
- 11.4
- 11.4.1
- $$\begin{aligned} \text{Set - over} &= \frac{D - d}{2} \times \frac{\text{length of workpiece}}{\text{length of taper}} \\ &= \frac{135 - 80}{2} \times \frac{340}{210} \checkmark \\ &= 27,5 \times 1,62 \\ &= 44,55 \text{ mm } \checkmark \end{aligned}$$
- (2)
- 11.4.2
- $$\tan \frac{\theta}{2} = \frac{X}{L}$$
- $$\tan \frac{\theta}{2} = \frac{27,5}{210}$$
- $$\tan \frac{\theta}{2} = 0,131 \checkmark$$
- $$\theta = \tan^{-1} 0,131 \times 2 \checkmark$$
- $$\theta = 14,92^\circ \text{ or } 14^\circ 55' \checkmark$$
- (3)

$$11.5 \quad L = f \times N \times t$$

$$f = \frac{L}{N \times t} \checkmark$$

$$f = \frac{350}{110 \times 8} \checkmark$$

$$f = 0,4 \text{ mm/rev} \checkmark \quad (3)$$

$$11.6 \quad S = \pi DN$$

$$= \pi \times 0,05 \times 950 \checkmark$$

$$S = 149,23 \text{ m/min} \checkmark \quad (2)$$

- 11.7
- The lead of the screw thread
 - The diameter of the screw thread

(2 × 1) (2)
[20]

QUESTION 12

- 12.1 12.1.1 A – Slitting saw
B – Side and face cutter
C – Slot drill
D – End mill

(4 × 1) (4)

- 12.1.2 A – Cutting material to length/cutting narrow grooves or slots
B – Cut steps/cut slots
C – Cut keyways/cut blind slots
D – Milling slots/cutting profiles/facing narrow surfaces

(4 × 1) (4)

$$12.2 \quad \text{Indexing} = \frac{N}{9^\circ}$$

$$= \frac{65}{9}$$

$$= 7 \frac{2}{9} \checkmark$$

$$= 7 \left[\frac{2}{9} \times \frac{6}{6} \right] \checkmark$$

$$= 7 \frac{12}{54} \checkmark$$

Indexing = 7 full turns of the crank handle and 12 holes in a 54 hole circle. (5)

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12.3	12.3.1	It is a process in which a workpiece rotates so that a number of equally spaced divisions can be machined.		
	12.3.2	It is a slot that is drilled on a workpiece which does not go all the way through to the other side of the workpiece	(2 × 1)	(2)
12.4	<ul style="list-style-type: none">• Reciprocating table• Rotating table		(2 × 1)	(2)
12.5	<ul style="list-style-type: none">• Coolant is dirty• Dirt underneath the wheel guard• Grinding wheel is too soft• Incorrect wheel dressing• Workpiece sliding off the magnetic chuck		(Any 3 × 1)	(3)
				[20]
			TOTAL SECTION B:	40
			GRAND TOTAL:	100