

higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE
AUGUST EXAMINATION
FITTING AND MACHINING THEORY N2

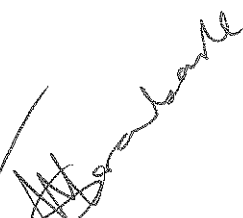
22 JULY 2014

This marking guideline consists of 8 pages.

√ = ½ mark

✓ = 1 mark

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QUESTION 1: OCCUPATIONAL SAFETY

1.1	1.1.1	True		
	1.1.2	False		
	1.1.3	False		
	1.1.4	False		
	1.1.5	True		
			(5 x 1)	(5)

OR

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

QUESTION 2: COUPLINGS

2.1	<ul style="list-style-type: none"> • Flange • Gear • Marine • Chain • Fluid 			(5)
2.2	<ul style="list-style-type: none"> • Efficient operation of machinery • Cost savings of the maintenance materials • Lengthens the life-span of components • Minimize downtime and the need for overtime • Less vibration 			(2)
			(Any 2 x 1)	[7]

QUESTION 3: LIMITS AND FITS

3.1.1	0,01 mm		
3.1.2	0,08 mm		
3.1.3	0,02 mm		
3.1.4	0,05 mm	(4 x 1)	(4)
3.2	Clearance fit		(1)
			[5]

QUESTION 4: BEARINGS

4.1	4.1.1	Embeddability Compatibility	(Any 1)	
	4.1.2	High load carrying ability		
	4.1.3	Embedability Resistance to seizure Corrosion resistant	(Any 1)	
	4.1.4	Low coefficient of friction Heat resistant No lubrication required	(Any 1)	
	4.1.5	Low coefficient of friction Self-lubricating Corrosion resistant High operating temperatures Can be mixed with other materials	(Any 1) (5 x 1)	(5)
4.2		<ul style="list-style-type: none"> • Ball • Roller • Spherical roller • Needle roller • Taper 	(Any 3 x 1)	(3) [8]

QUESTION 5: LUBRICATION AND VALVES

5.1	Oil ring lubrication or splash feed lubrication	(1)
5.2	The ring is in rolling contact with the shaft ✓ and the lower part is dipped in the oil. ✓ As the shaft rotates the oil is brought up by the ring and is distributed along the shaft. ✓ Gradually, the oil drips back into the sump due	

to gravity. ✓ (4)

- 5.3
- A valve is used to control the direction of flow.
 - A valve is used to control pressure.
- (2)

- 5.4 Normally open valves are designed to be opened when in use whereas a normally closed valve is closed during normal use. (2)
- [9]

QUESTION 6: PACKING, STUFFING BOXES, JOINTS AND WATER PIPE SYSTEMS

- 6.1
- 6.1.1 Corrugated expansion
 - 6.1.2 Expansion U-Joint / Expansion bend
 - 6.1.3 Full Loop
 - 6.1.4 Horseshoe
- (4)

- 6.2
- Clean all surfaces thoroughly
 - Ensure no damage to the oil ring or the surfaces
 - Use the correct seal
 - Lubricate the seal before fitting
 - Protective sheath to be used when fitting a ring seal or o-ring over a sharp ridge or threaded section
 - Tighten up lightly ensuring that the ring seal fits squarely
- (Any 4 x 1) (4)
- [8]

QUESTION 7: PUMPS

- 7.1
- open and close valves gradually
 - use an air chamber in the delivery line
- (2)

The question is not in the N2 syllabus, do not mark the question. paper will count out of 98 marks

- 7.2
- 7.2.1 C
 - 7.2.2 B
 - 7.2.3 A
 - 7.2.4 D
- (4)
- [4]

QUESTION 8: COMPRESSORS

- 8.1 Ensure the intake of clean air, free of dirt and other foreign matter. **NOT WATER**
- 8.2 Used for draining water or moisture, which accumulates inside the air receiver.
- 8.3 Cools air between the low pressure and high pressure stages before entering the high-pressure cylinder.

- 8.4 Cools air after the high-pressure stage of compression before being stored in the air receiver.
- 8.5 Allows the compressor to be switched off automatically, after the prescribed pressure has been reached.

(5 x 1)

[5]**QUESTION 9: V-BELT, CHAIN, GEAR DRIVES AND REDUCTION GEARBOXES**

- 9.1
- Transmits motion over long distances
 - Transmits motion to more than one drive at a time
 - Easier to maintain
 - Relative cheap
- (Any 2 x 1) (2)
- 9.2
- Destructive to the chain (shorter life span)
 - Detrimental to smooth running (low efficiency)
 - Causes whipping and vibration (chain could come off the sprocket)
 - Could ruin the sprockets (cause unnecessary wear)
- (Any 2 x 1) (2)
- 9.3
- Solid sprocket
 - Solid sprocket with spokes
 - Split sprocket with spokes
- (3)
[7]

TOTAL SECTION A: 60**SECTION B****QUESTION 10: PNEUMATICS AND HYDRAULICS**

- 10.1 Ensures that the normal working pressure is not exceeded by relieving excess fluid pressure in the tank. (1)
- 10.2
- Noise factor
 - Cost factor / Reliability
 - Power to weight ratio required
 - Cleanliness factor
 - Speed factor
 - Rigidity factor
 - Safety
 - Adaptability
 - Availability
- (5)
(Any 5 x 1)
- 10.3
- 10.3.1 – 2/2 Way Directional Control Valve
 - 10.3.2 - 4/3 Way Directional Control Valve
 - 10.3.3 - 5/2 Way Directional Control Valve
 - 10.3.4 - 3/2 Way Directional Control Valve
 - 10.3.5 - 4/2 Way Directional Control Valve
- (5)

- 10.4
- Hose fittings and pipes are not loose
 - Hoses and fittings must seat correctly
 - Oil and air filters are clean
 - Hoses and pipings are clean prior to installation
 - Release system pressure to tool before disconnecting
 - All guards to be fitted
 - Before start check that persons are clear of danger
- (Any 5 x 1) (5)
- 10.5
- Lubricator
 - Water trap
 - Drain valve
 - Filter
 - Pressure regulator
- (Any 4 x 1) (4) [20]

QUESTION 11: CENTRE LATHE

- 11.1
- Setting up time is reduced
 - Concentricity is guaranteed
 - Batch production of large amounts is possible
 - Mandrels can be modified to suit a large range of work
 - Setting up can be delegated to unskilled operators
- (Any 4 x 1) (4)
- 11.2
- Graduated sleeve method
 - Dial test indicator method
- (2)
- 11.3
- $$\tan \frac{\theta}{2} = \frac{X}{L}$$
- $$X = L \times \tan \frac{\theta}{2} \quad \checkmark$$
- $$= 280 \times 0,0524 \quad \checkmark$$
- $$= 14,67 \text{ mm} \quad \checkmark$$
- (3)
- 11.4
- 11.4.1 $Lead = No. of starts \times Pitch$
- $$= 2 \times 5$$
- $$= 10 \text{ mm} \quad \checkmark$$
-
- $$Pitch \text{ diameter} = OD - \frac{1}{2} \times Pitch$$
- $$= 100 - \frac{1}{2} \times 5 \quad \checkmark$$
- $$= 97,5 \text{ mm} \quad \checkmark$$

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$$\begin{aligned}\tan \theta &= \frac{\text{Lead}}{\text{Pitch circumference}} \\ &= \frac{10}{\pi \times 97,5} \quad \checkmark \\ &= 0,033 \quad \checkmark\end{aligned}$$

$$\begin{aligned}\therefore \theta &= \tan^{-1} 0,033 && (3) \\ &= 1,87^\circ \quad \text{Or } 1.89^\circ\end{aligned}$$

$$\begin{aligned}11.4.2 \quad \text{Leading angle} &= 90^\circ - (\text{Helix} + \text{clearance angle}) \\ &= 90^\circ - (1,87 + 3) \quad \checkmark \\ &= 85,13^\circ \quad \text{Or } 85.11^\circ && (1)\end{aligned}$$

$$\begin{aligned}11.4.3 \quad \text{Following angle} &= 90^\circ + (\text{helix} - \text{clearance angle}) \\ &= 90^\circ + (1,87^\circ - 3^\circ) \quad \checkmark \\ &= 88,87^\circ \quad \text{Or } 88.89^\circ && (1)\end{aligned}$$

11.5 11.5.1 Incremental – each tool movement refers to the previous/ last tool position (1)

11.5.2 Absolute – each tool movement refers to a fixed point or origin (zero point) (1)

- 11.6
- Material type
 - Stock length
 - Information from a drawing
 - Operating sequence
 - Tooling required
 - Dwell time
 - Coolant application
 - Sizes according to dimensioning position
 - Cutting speed

(Any 4 x 1) (4)
[20]

QUESTION 12: MILLING MACHINES AND SURFACE GRINDERS

- 12.1 12.1.1 Square milling
12.1.2 T-Slot milling
12.1.3 Ball milling cutter
12.1.4 End milling cutter (4)

- 12.2 12.2.1 Simple indexing (1)

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12.2.2

$$\frac{40}{N} = \frac{40}{13} = 3\frac{1}{13} \quad \checkmark$$

$$= 3 \text{ turns and } \frac{1}{13} \text{ of a turn} \quad \checkmark$$

$$\frac{1}{13} \times \frac{3}{3} = \frac{3}{39} \quad \checkmark$$

Required indexing = 3 turns of crank & 3 holes in a 39 hole circle. ✓

(4)

NO FORMULA USED NO MARKS

- 12.3
- Deeper cuts can be made as the force of the cutter is downwards.
 - A finer finish is obtained
- (2)

- 12.4
- Vibration in the arbor is unavoidable
 - A finer feed is to be used
 - Material with hard scales could cause damage to the cutter teeth
- (Any 2 x 1) (2)

- 12.5
- Amount of material to be ground
 - Hardness of the material
 - Wet or dry grinding
 - Surface area
- (Any 4 x 1) (4)

- 12.6
- V: Vitrified
 - B: Resinoin or synthetic
 - R: Rubber bonding
 - E: Shellac
 - S: Silicates
- (Any 3 x 1) (3)
- [20]**

TOTAL SECTION B: 40
GRAND TOTAL: 98