



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MECHANOTECHNOLOGY N3

5 April 2024

This marking guideline consists of 6 pages.

QUESTION 1

- 1.1 1.1.1 Speed ratio (SR) = $\frac{\text{Speed of faster pulley (N)}}{\text{Speed of slower pulley (N)}}$
- $$\text{SR} = \frac{1200}{850} \checkmark$$
- $$\text{SR} = 1,41:1 \checkmark \quad (2)$$
- 1.1.2 Speed ratio (SR) = $\frac{\text{Speed of faster pulley (N)}}{\text{Speed of slower pulley (N)}}$
- $$\text{SF} = \frac{P_d}{p}$$
- $$= \frac{65}{50} \checkmark$$
- $$= 1,3 \checkmark \quad (2)$$
- 1.1.3 $\text{CP} = (\text{Pb} + \text{Incr. P}) \times \text{CF}$
- $$\text{CP} = (19,3 + 2,01) \times 0,95 \checkmark$$
- $$= (21,31) \times 0,95$$
- $$\text{CP} = 20,245 \text{ kW/belt} \checkmark \quad (2)$$
- 1.1.4 Number of belts = $\frac{\text{Design power}}{\text{Corrected power/belt}}$
- $$= \frac{65}{20,245} \checkmark$$
- $$= 3,21 \text{ Belts} \checkmark$$
- $$= 3 \text{ belts} \checkmark \quad (3)$$
- 1.2
 - Quick wearing of the belt flanks
 - Wearing of the pulley
 - Uneven loads
 - Excessive friction and heat (Any 3 × 1) (3)
- 1.3
 - Grease or oil on the contact areas
 - Faulty operation of, or adjustments to, the control mechanism
 - Glazing of the friction surfaces due to continual slippage (Any 2 × 1) (2)

- | | | | | |
|-----|-------|--|---------|-------------|
| 1.4 | 1.4.1 | False | | |
| | 1.4.2 | True | | |
| | 1.4.3 | False | | |
| | 1.4.4 | True | | |
| | | | (4 × 1) | (4) |
| 1.5 | 1.5.1 | D – Clutch | | |
| | 1.5.1 | B – centrifugal force on the shoe minus the spring force | | |
| | | | (2 × 2) | (4) |
| | | | | [20] |

QUESTION 2

- | | | | | |
|-----|------------------------------|--|--|------------|
| 2.1 | A – Brake shoe | | | |
| | B – Lever A | | | |
| | C – Electromagnetic solenoid | | | |
| | D – Spiral springs | | | |
| | E – Shaft | | | |
| | | | | [5] |

QUESTION 3

- | | | | |
|-----|--|-------------|-------------|
| 3.1 | <ul style="list-style-type: none">• Solid bearings• Part bearings• Split bearings• Thrust bearings• Guide bearings | (Any 4 × 1) | (4) |
| 3.2 | Friction bearings operate on the principle of sliding friction.✓ There is a relative sliding movement between the shaft and the bearing.✓ Because of the friction between two surfaces, we use a lubricant to separate the surfaces and to overcome friction.✓ Separating the surfaces in this way, by using a film of lubrication, results in a longer bearing life.✓ | | (4) |
| 3.3 | A bearing is a device specially designed to reduce friction between two parts of a mechanism,✓ one of which is moving, the other stationary.✓ It is the support for rotating shaft✓ It provides smooth movement and reduce wear✓ | (Any 2 × 1) | (2) |
| | | | [10] |

QUESTION 4

- | | | | |
|-----|--|--|--|
| 4.1 | <ul style="list-style-type: none">• Lubricates the rolling and sliding contacts• Provides cooling and controls temperature• Prevents rusting of highly finished surfaces• Prevents scuffing and wear• Serves as a seal against moisture and dirt | | |
|-----|--|--|--|

- 4.2
- Inlet valve
 - Outlet valve
 - Plunger/piston
- (3)
- 4.3
- Metal components such as pistons, valves, spark plug electrodes, and even the cylinder head may melt down.
 - Severe distortion of parts and components may occur.
 - The effectiveness of the lubricating oil is reduced.
- (3)
- 4.4
- A simple water pump is mounted to supply water to the block and cylinder head of the engine. This improves the water flow rate.
 - The rate of water circulation is improved by an impeller that is driven by a V-belt off the crankshaft pulley.
 - With the use of the water pump, a smaller volume of cooling water is needed.
 - A smaller quantity of cooling water means that the size of the radiator is reduced.
- (4)
[15]

QUESTION 5

- 5.1 I
- 5.2 K
- 5.3 A
- 5.4 L
- 5.5 J
- 5.6 E
- 5.7 B
- 5.8 C
- 5.9 H
- 5.10 G
- (10 × 1) **[10]**

QUESTION 6

- 6.1
- 6.1.1 It refers to the distance the piston travels in one direction in the cylinder. (1)
- 6.1.2 The turbo is used to obtain a higher air pressure✓ in the cylinders of a diesel or petrol engine.✓ (2)
- 6.2
- To clean the cylinder of exhaust gases.
 - To fill the cylinder with clean air at atmospheric pressure
 - To help cool the cylinder, piston crown and valves by means of air stream.
- (Any 2 x 1) (2)
[5]

QUESTION 7

- 7.1
- Broken core
 - Overloading
 - Corrosion
 - Severe wear
- (4)
- 7.2
- The distance or long travel is limited.
 - The bogie on the rails cannot move in a transverse or sideways direction.
 - The installation of the rails is very expensive.
 - Disruption of crane duties or service when work must be done is very inconvenient.
- (4)
[8]

QUESTION 8

- 8.1
- Hardens the steel
 - Enables the steel to resist wear
 - Enables the steel to cut other metals
- (3)
- 8.2
- The hard outer layer or skin will present a good wear surface.
 - The strong and tough inner core which is not hardened can resist the shock loads the work piece needs to carry.
- (2)
- 8.3
- Overheating causes sagging and collapsing.✓ No colour change when heated.✓ Heat tends to soften the metal.✓
- (3)
[8]

QUESTION 9

- 9.1
- 9.1.1 Horizontal communication takes place when people on the same level communicate with one another.
- 9.1.2 Diagonal communication takes place when people on different levels communicate with one another.
- (2 × 1) (2)
- 9.2
- The right to freedom of association
 - The right to strike
 - The right not to be unfairly dismissed
 - The right to work
 - The right to bargain collectively
 - The right to protection
 - The right to develop
- (Any 4 × 1) (4)

- 9.3
- Plan the business operations
 - Shows whether the business' financial goals are being met
 - Helps to transform goals into reality
 - Serves as a control mechanism when it comes to cutting expenses
- (4)
[10]

QUESTION 10

- 10.1 Some people can solve a problem more easily when they visualise it.✓ Mind mapping is like drawing a map of different but related ideas.✓ You write your idea, problem, or interest in the middle of the page.✓ Think of anything associated with the topic and write about five related but different ideas around it.✓ Again write ideas that are related to the previous five ideas, or in other words keep branching the map outwards.✓ Once you have an idea, you will have to look at the resources available to help turn that idea into a business opportunity.✓ (Any 4 × 1) (4)
- 10.2
- (a) Define the problem
 - (b) Never criticise any idea
 - (c) Don't evaluate or build on any of the ideas
 - (d) Wild and crazy ideas are as valuable as logical ones
 - (e) Try to obtain as many ideas as possible from the group
 - (f) Compile a list of ideas
 - (g) Combine and build on these ideas where possible
- (Any 5 x 1) (5)

[9]

TOTAL: 100