



**higher education  
& training**

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

# **MARKING GUIDELINE**

**NATIONAL CERTIFICATE  
MECHANOTECHNOLOGY N3**

**22 NOVEMBER 2019**

**This marking guideline consists of 6 pages.**

**QUESTION 1: POWER TRANSMISSION**

- 1.1 1.1.1  $N_R = \frac{N_{motor}}{N_{pump}} \checkmark$   
 $= \frac{700}{442} \checkmark$   
 $= 1,584 : 1 \checkmark$  (3)
- 1.1.2 SF = 1,3 [soft start @ 15 hrs vs reciprocating pumps (heavy duty)] (2)
- 1.1.3  $P_{DESIGN} = P_{MOTOR} \times SF \checkmark$   
 $= 79 \times 1,3 \checkmark$   
 $= 102,7 \text{ kW} \checkmark$  (3)
- 1.1.4  $D = 300 \text{ mm} \checkmark$  [ $N_{MOTOR}$  @ 700 r/min and  $P_{DESIGN}$  @ 103 kW] – from tables  $\checkmark$  (2)
- 1.1.5  $L_{BELT} = [(D + d) \times 1,57] + (2 \times C) \checkmark$   
 $= [(475 + 300) \times 1,57] + (2 \times 1\,300) \checkmark$   
 $= 3\,816,75 \text{ mm} \checkmark$  (3)
- 1.2 1.2.1 It is the circular distance from the left side of the gear tooth to the same place on the right side of the tooth or vice versa. (2)
- 1.2.2 It is the height of the gear tooth that is below the pitch circle line. (2)
- 1.2.3 It is the length from the centre of the gear tooth to the centre of the next tooth.  
OR  
It is the distance from one edge of one gear tooth to the left edge of the next tooth. (2)
- 1.3 Double helical gear (1)  
**[20]**

**QUESTION 2: BRAKES**

- 2.1 The brake uses fluid to transmit the braking effort from the foot pedal. When the operator depresses the brake, it forces the piston into the master cylinder and as a result the pressure in the hydraulic system is distributed equally in all directions from the fluid reservoir which is connected to the master cylinder. (4)
- 2.2
- The brake's operation depends on the flow of electric current.
  - Without electric power, the system is dysfunctional. (Any 1 × 1) (1)
- [5]**

**QUESTION 3: BEARINGS**

- 3.1
- Part bearings
  - Split bearings
  - Solid bearings
  - Thrust bearings
  - Guide bearings (5 × 1) (5)
- 3.2
- 3.2.1 Double-row radial cylindrical bearing (1)
- 3.2.2
- A Outer ring
  - B Roller/Cylindrical roller
  - C Inner ring (3 × 1) (3)
- 3.2.3 Heavy loads (1)
- [10]**

**QUESTION 4: WATER PUMPS, COOLING AND LUBRICATION**

- 4.1
- Worn external packings
  - Worn internal packings
  - Exposed strainer (above water surface)
  - Faulty foot valve
  - Faulty foot-valve spring
  - Loose/Faulty pipe flanges (Any 5 × 1) (5)
- 4.2
- 4.2.1 Syphon wick lubricator (1)
- 4.2.2
- A Wick
  - B Centre well
  - C Oil
  - D Container (4 × 1) (4)
- [10]**

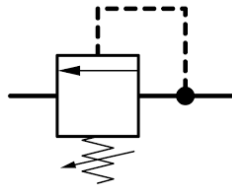
**QUESTION 5: HYDRAULICS AND PNEUMATICS**

5.1 Pressure exerted on the surface of a liquid is transmitted equally in all directions.

OR

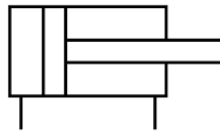
In an enclosed system, liquid is transmitted with equal force in all directions. (2)

5.2 5.2.1



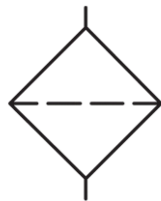
(2)

5.2.2



(2)

5.2.3



(2)

5.2.4



(2)  
**[10]**

**QUESTION 6: INTERNAL-COMBUSTION ENGINE**

6.1 6.1.1 A fuel injector (1)

- 6.1.2
- A Valve spring
  - B Nozzle pressure adjustment
  - C Pressure channel
  - D Nozzle
  - E Cone valve face; also accept Pressure phase (5 × 1) (5)

- 6.2
- It fills the cylinder with clean air.
  - It displaces the exhaust air from the cylinder.
  - It keeps the cylinder cooled. (3 × 1) (3)
- [9]**

**QUESTION 7: CRANES AND LIFTING MACHINES**

- 7.1 A load limiter is a safety device used on a steel rope as an overload protector, so that there is no undesired strain on the rope or crane. (2)
- 7.2
- Wear
  - Plastic flow over the length of the rope.
  - Plastic flow and wear at the crossing sections of the rope.
  - Broken wires
  - Damaged core
  - Kinks
  - Overwinding
  - Weakened materials
  - Dried-out rope
  - Corrosion
  - Mechanical damage (from cut wires)
  - Overload
- (Any 4 × 1) (4)
- 7.3
- |       |                             |  |             |
|-------|-----------------------------|--|-------------|
| 7.3.1 | Hoist/Lift the hook signals |  |             |
| 7.3.2 | Lower the hook signals      |  |             |
| 7.3.3 | Slew right -hand signals    |  |             |
|       |                             |  | (3 × 1) (3) |
- [9]**

**QUESTION 8: MATERIALS AND MATERIAL PROCESSES**

- 8.1 Ferrous metals contain iron.✓  
Example: carbon steel, cast iron, stainless steel, etc.✓
- Nonferrous metals do not contain any iron as a basic metal. They are also nonmagnetic and corrosion resistant.✓  
Example: zinc, lead, tin, antimony, etc.✓ (2 × 2) (4)
- 8.2 Colour-coding of metals is used to distinguish between different types of metals from each other. (2)
- [6]**

**QUESTION 9: INDUSTRIAL ORGANISATION AND PLANNING**

- 9.1
- Downward communication
  - Upward communication
  - Horizontal communication
  - Diagonal communication
- (4 × 1) (4)
- 9.2 A grievance procedure is a procedure that is followed by a worker or employee in order to bring his/her grievance (unfair treatment) to the notice of management.
- (2)
- 9.3
- Clock cards
  - Production flow charts
  - Job cards
  - Requisition cards
  - Maintenance schedules
- (5 × 1) (5)
- [11]**

**QUESTION 10: ENTREPRENEURSHIP**

- 10.1 A small business enterprise is a type of business in which one person has complete control of proceedings. This person is also the manager. Business funding comes from the owner's capital and he/she bears all the risks and solely benefits from all the profits.  
The business is not a separate legal entity because the owner is personally liable for all claims against the business.
- (3)
- 10.2
- Daily activities
  - Identifying people's needs
  - Generating ideas from other sources
  - Using creative processes or methods
- (4 × 1) (4)
- 10.3 DAILY ACTIVITIES
- Knowledge and skills
  - Contracts
  - friends
  - Finance
- (Any 3 × 1) (3)
- [10]**
- TOTAL: 100**