



**higher education  
& training**

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

# **MARKING GUIDELINE**

**NATIONAL CERTIFICATE  
MECHANOTECHNOLOGY N3  
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**This marking guideline consists of 6 pages.**

## QUESTION 1: BELTS AND CHAIN DRIVES

- 1.1 1.1.1  $NR = \frac{N_{MOTOR}}{N_{MACHINE}}$   
 $NR = \frac{1150}{570}$   
 $NR = 2,02 : 1$  (2)
- 1.1.2
  - Medium duty
  - 8-hr period  
Therefore, CF = 1,1 (2)
- 1.1.3  $P_D = P_{motor} \times SF$   
 $P_D = 50 \times 1,1$   
 $P_D = 55 kW$  (2)
- 1.1.4
  - $N_{MOTOR} = 1150$  r/min
  - $P_D = 55$  Kw  
Therefore, D = 200 mm (1)
- 1.2 1.2.1 True  
1.2.2 True  
1.2.3 False  
1.2.4 False (4 × 1) (4)
- 1.3
  - Direct drive
  - Reverse gear
  - Speed reduction
  - Neutral (Any 3 × 1) (3)
- 1.4
  - The amount of shock and vibration the coupling can handle
  - Alignment variation
  - The magnitude of the load to be driven (light or heavy)
  - Coupling's torque capacity
  - Coupling's ability to resist current flow (insulation)
  - Angular displacement to be accommodated by coupling (Any 3 × 2) (6)

[20]

**QUESTION 2: BRAKES**

- 2.1 The hydraulic system uses incompressible fluid to transmit the braking effort from the pedal, which has a direct link to the master cylinder, to all wheel cylinders. The pressure in the system is then increased as the hydraulic fluid is being equally distributed in all directions when the pedal is depressed by the operator. (4)
- 2.2
- Too much end thrust is exerted on the drive shaft and bearings.
  - Slippage occurs.
  - Excessive force is needed for disengagement.
  - Wear on parts leads to faulty operations.
  - Slippage causes glazing. (Any 1 × 1) (1)
- [5]**

**QUESTION 3: BEARINGS**

- 3.1
- Radial load
  - Axial load
  - Combined loads (3)
- 3.2
- A – Shaft ring  
 B – Ball and cage thrust assembly  
 C – Housing ring (3)
- 3.3
- Contamination
  - Pollution
  - Excessive clearance between shaft and bearing
  - Shaft not being round
  - Rollers or balls not being the same size
  - Rollers or balls not perfectly round
  - Insufficient lubrication (Any 3 × 1) (3)
- [9]**

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

- 4.1
- |       |   |  |
|-------|---|--|
| 4.1.1 | D |  |
| 4.1.2 | F |  |
| 4.1.3 | A |  |
| 4.1.4 | G |  |
| 4.1.5 | C |  |
- (5 × 1) (5)

- 4.2
- To extend the oil life span
  - To remove contamination from the oil
  - To prevent clogging and slipping of parts
  - To prevent wear on parts
- (Any 3 × 1) (3)
- 4.3
- Uses a smaller volume of cooling water
  - Improved flow rate through water pump
  - Reduced radiator size
- (Any 2 × 1) (2)
- 4.4
- The Fan unit is faulty
  - The cooling air is too hot or day temperature too high
  - Vehicle is idling and but not moving
  - The water pipes are blocked
  - The engine is not tuned correctly
  - The thermostat is faulty
  - The water pump is faulty
- (Any 5 x 1)

**[15]****QUESTION 5: HYDRAULICS AND PNEUMATICS**

- 5.1 5.1.1
- $$A = \frac{\pi d^2}{4}$$
- $$d = \sqrt{\frac{0,00185 \times 4}{\pi}}$$
- $$d = 0,0485$$
- $$d = 485mm$$
- $$d = 48,5mm$$
- (2)
- 5.1.2
- $$p = \frac{F}{A}$$
- $$F = 480000 \times 0,00185$$
- $$F = 888N$$
- (2)
- 5.2
- Poor mechanical efficiency in the system
  - Increased fluid temperature
  - Sluggish valve movement/action
- (3)
- 5.3
- A hydraulic motor creates energy through torque and rotating motion by using a pump to convert hydraulic energy into mechanical energy.
- (2)

**[9]**

**QUESTION 6: INTERNAL COMBUSTION ENGINE**

- 6.1 A – Inlet port  
B – Diesel Injector  
C – Exhaust port  
D – Conrod (4)
- 6.2 Compression stroke (2)  
**[6]**

**QUESTION 7: CRANES AND LIFTING MACHINES**

- 7.1 A crane's main function is to move/displace complex and heavy loads from one point to another. (2)
- 7.2
- Prevents corrosion on the steel rope
  - Supports the steel strands
  - Absorbs shocks
  - Lubricates the steel rope from the inside (4)
- 7.3
- Possesses better resistance to fatigue
  - Is more flexible
  - Has a rotational flexibility (Any 2 × 1) (2)  
**[8]**

**QUESTION 8: MATERIAL AND MATERIAL PROCESSES**

- 8.1
- Copper will have a hard outer layer
  - Will have a strong and tough inner core
  - Will resist shock loads (2)
- 8.2
- Low Density
  - Low Cost
  - Toughness
  - Form complex shapes
  - Low thermal conductivity
  - Chemical resistance
  - Flexibility
- 1) (Any 4 × (4)
- 8.3 8.3.1 Black  
8.3.2 Orange (2 × 1) (2)  
**[8]**

**QUESTION 9: INDUSTRIAL ORGANISATION**

- 9.1
- Clock cards
  - Production flow charts
  - Job cards
  - Requisition cards
  - Maintenance schedules (5)
- 9.2
- Objective
  - Accurate
  - Brief
  - Insightful or/and open-minded
  - Clear (Any 4 × 1) (4)
- 9.3 Any aspect of the work which causes unhappiness in a worker as a result of unfair treatment, prejudice etcetera; it is brought to the attention of management. (3)
- [12]**

**QUESTION 10: ENTREPRENEURSHIP**

- 10.1 Entrepreneurship is a process whereby, after identifying opportunities and gathering the necessary resources, an entrepreneur creates a business in the face of uncertainty and risk in order to generate growth and profit. (4)
- 10.2 Good qualities of an entrepreneur are aspects that make him/her progressive in the business environment. The professional way in which he/she conducts himself and his/her business in a way that gives him/her the competitive advantage over his/her competitors. (2)
- 10.3 Knowledge and skills  
Contacts and friends  
Finance (Any 2 × 1) (2)
- [8]**
- TOTAL: 100**