higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# MARKING GUIDELINE

## NATIONAL CERTIFICATE

## MECHANOTECHNOLOGY N3

## 2 AUGUST 2019

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

## QUESTION 1: POWER TRANSMISSION; CLUTCHES AND COUPLING OF SHAFTS

1.1 1.1.1 D = 355 mm and d = 200 mm (1)

1.1.2 L = [(D + d) × 1,57] + correction factor

= [(355+ 200) × 1,57] + (2 × 760)✓

= 2 391,35✓½ mm✓½

(2)

1.1.3 CF = 0,9 (Table ….) (1)

1.1.4 $P_D$ = Pm × SF
= 15 × 1,1✓
= 16,5✓½ kW✓½ (2)

1.2 1.2.1 To determine the increase in belt size so that is suitable for the duty demand

1.2.2 To take up slack in the belt
To increase the angle of contact.
(2 × 1) (2)

1.3 Refers to the slackness/movement of the belt (1)

1.4
- Positive clutch
- Friction clutch
- Centrifugal clutch
- Hydraulic clutch (4)

1.5
- Low operating costs (economical)
- Range of speed variations
- Smooth and quiet in operation
- Simple design
- Protected against overloads (5)

1.6
- Muff
- Flange

(2)
**[20]**

## QUESTION 2: BRAKES

- Dust is not easily thrown out.
- It is difficult to cool the drum.
- When too hot, the brake drum expands excessively.
- Brake friction causes wear on the inside of the drum.
- Brake drums are too large, therefore difficult to handle.
- Due to heat, the braking efficiency diminishes at high temperatures (Any 5 × 1) **[5]**

 

## QUESTION 3: BEARINGS

3.1 3.1.1 Double direction thrust ball bearing (1)

3.1.2 Axial loads (1)

3.1.3 A – Housing ring
B – Ball and cage trust assembly
C – Centre ring (3)

3.2
- Speed of operation
- Space available around the bearing
- Acting direction of load
- Nature and size of misalignment between shaft and housing
- Magnitude of load (5)

**[10]**

## QUESTION 4: WATER PUMPS, COOLING AND LUBRICATION

4.1
- Keeps the engine cooled
- Reduces noise in engine parts
- Prolongs the engine life-span
- Absorbs shocks between the engine parts
- Reduces the power loss
- Prevents welding and seizure
- Keeps the engine clean
- Serves as a sealant
- Reduces oxidation and rust (Any 5 × 1) (5)

4.2 In direct cooling the heat from the combustion process (engine) is transferred directly✓ from the cylinder/s to the fins✓ around the cylinder.

In indirect cooling the heat from the engine is transferred to the water✓ circulating around it. The water goes through a radiator✓ where it is cooled by the air flow (or a fan).✓ (5)

4.3
- As a result of the water pump a smaller volume of cooling water is required.
- Water flow rate is improved.
- Water circulation is improved by the impeller.
- The size of the radiator is reduced. (4)

**[14]**

## QUESTION 5: HYDRAULICS

5.1 5.1.1

$$p = \frac{F}{A} \checkmark$$

$$F = p \times \frac{\pi \times d^2}{4}$$

$$F = 680 \times 10^3 \times \frac{\pi \times (0,2)^2}{4} \checkmark$$

= 23,363 kN ✓

5.1.2 V = AL n ✓

$= \frac{\pi}{4}$ x $(0,02)^2$ x 0,05 x 3 ✓

= 0,00471✓½ $m^3$✓½

(2 × 3) (6)

5.2
- Atmospheric pressure
- Applied pressure (2)

5.3
- Pressure relief valve
- Flow control valve
- Directional control valve (3)

5.4

(2)
**[13]**

## QUESTION 6: INTERNAL COMBUSTION ENGINES

6.1 Carburettor (1)

6.2 A – Choke butterfly
B – Discharge nozzle
C – Venturi
D – Throttle butterfly (4)
**[5]**

## QUESTION 7: CRANES AND LIFTING MACHINES

7.1
- Number of drops a rope can make.
- Maximum length per drop.
- The braking force of the rope
- The rope must withstand distortion and crushing.
- The rope must resist corrosion
- The maximum velocity.
- The hoisting drum and pulley diameter.
- The rope must resist abrasion.
- Mass the rope can handle.
- Size of the grooves and/or pulleys. (Any 4 × 1) (4)

7.2 7.2.1 The crane driver's cabin, crane jib and counter-weight rotate in a clockwise✓ and anticlockwise motion. ✓

7.2.2 Sideways movement of the crane✓ along rail✓

(2 × 2) (4)
**[8]**

## QUESTION 8: MATERIALS AND MATERIAL PROCESSESS

8.1
- Thermoplastics get soft when they are heated, and solidify again once cooled.
- Thermosetting plastics go through a chemical change during moulding, and can never be softened by reheating again. (2)

8.2
- Toughness
- Hardness
- Wear resistance (3)

**[5]**

## QUESTION 9: INDUSTRIAL ORGANISATION AND PLANNING

9.1 To provide the correct materials✓ in correct quantity✓ at the right place at the right time✓ (3)

9.2
- Equipment and facilities
- Product and/or service
- Mechanisation
- Condition of raw materials
- The extend of power used
- Layout and flow of production in the workplace (6)

9.3
- Wrong timing
- Order of presentation
- Lack of clarity
- Loss of information
- Credibility of the source (Any 3 × 1) (3)

**[12]**

## QUESTION 10: ENTREPRENEURSHIP

10.1 Entrepreneurship refers to a situation where an entrepreneur,✓ after having identified an opportunity,✓ assembles the necessary resources and creates a new business✓ in the face of uncertainty and risks, with the ultimate goal of making profit and achieving growth.✓ (Any 3 × 1) (3)

10.2
- Define the problem.
- Never criticise any ideas.
- Don't build/evaluate on any of the ideas.
- Accommodate wild and crazy ideas too.
- Accommodate as many ideas as possible.
- Compile a list of all ideas obtained.
- Combine ideas received and build on them. (Any 5 × 1) (5)

**[8]**

**TOTAL: 100**