higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MECHANOTECHNOLOGY N3

5 APRIL 2018

This marking guideline consists of 6 pages.

QUESTION 1: BELTS AND CHAIN DRIVES

1.1 1.1.1

$$P_{BASIC/BELT} = (\frac{P_{CORRECT}}{CF}) - P_{INCREMENT/BELT}$$

$$P_{BASIC/BELT} = (\frac{22}{0,98}) - 2,5$$

$$P_{BASIC/BELT} = 19,949kW$$ (3)

1.1.2

$$P_D = P_M \times SF$$

$$P_D = 20 \times 1,1$$

$$P_D = 22kW$$

$$n = \frac{P_D}{P_{CORRECTED/BELT}}$$

$$n = \frac{22}{22}$$

$$n = 1$$ (4)

1.2 Speed ratio is the ratio between the speed of the faster pulley and the speed of the slower pulley. (2)

1.3 The purpose of the service factor is to select/design a suitable belt to accommodate the duty demand/s. (2)

1.4

$$P = \frac{2\pi NT}{60}$$

$$T = \frac{3500 \times 60}{2\pi 2000}$$

$$T = 16,711Nm$$ (3)

1.5 1.5.1 True
1.5.2 False
1.5.3 False
1.5.4 False
1.5.5 False
1.5.6 False

(6 × 1) (6)
[20]

QUESTION 2: BRAKES

2.1 Through the use of rods/cables, the brake lever is linked with the brake shoe operating device. When pressure is applied on the pedal, the lever forces the brake shoe outward resulting in the application of brakes, with maximum effect on the linings. Buckle adjusters are used to adjust the length of the rods/cables. (4)

2.2
- Causes quick wear on components
- Too much end thrust on bearings and driven shaft
- Greater force is required on smaller wedge angle
- Continuous slipping cause glazing of the surfaces
- Wear on components leads to faulty operation of the brakes
- Grease or oil on the braking surfaces causes slippage and brake failure

(Any 2) (2)

[6]

QUESTION 3: BEARINGS

3.1 This bearing works through the principle of sliding movement between the shaft and the bearing, causing friction. Lubrication is used on the surface of the bearing to prolong the bearing life span. (2)

3.2
- Radial ball bearings (Single and double row)
- Radial cylindrical roller bearings (Single and double row)
- Thrust ball and roller bearings
- Single row angular contact bearings
- Taper roller bearings
- Needle roller bearings
- Spherical roller bearings

(Any Four) (4)

3.3
- Poor properties of lubricant
- Foaming of oil
- Grease liquidation
- Insufficient lubrication
- Excessive lubrication
- Corrosion
- Excessive speed
- Overheating
- Wear on moving part (Any 6 × 1) (6)

[12]

QUESTION 4: WATER PUMPS, COOLING AND LUBRICATION

4.1 Reciprocating movement is a forward and backward movement, resulting from a circular drive/movement. (2)

4.2 A – Inlet valve
B – Packing
C – Discharge valve/Outlet valve
D – Plunger/Piston (4)

4.3
- The length of the plunger is longer than its stroke, while the length of the piston is shorter than its stroke.
- The packing of the plunger is housed in the stuffing box with soft packing at the end of the cylinder, while the piston has packing rings that are inserted on the rim to prevent leakage. (4)

4.4
- It minimises the chance of an explosion
- It maintains the correct viscosity in the lubricant.
- Cooled air occupies a small volume.
- Lubrication is easier when cooled. (Any 3 × 1) (3)

[13]

QUESTION 5: HYDRAULICS AND PNEUMATICS

5.1 5.1.1 $F = p \times A$

$$F = 580000 \times \frac{3.142(0.155)^2}{4}$$

$$F = 10946kN$$

5.1.2 $V = A \times L$

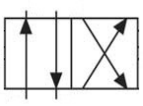
$$V = \frac{\pi \times (0{,}155)^2}{4} \times 0{,}065$$

$$V = 0{,}00123m^3$$

(2 × 2) (4)

5.2 5.2.1

5.2.2



5.2.3

(3 × 2) (6)

[10]

QUESTION 6: INTERNAL COMBUSTION ENGINES

6.1 The compression ratio is the ratio by which the mixture of air and fuel is compressed in the combustion chamber during the compression stroke. (2)

6.2 Induction phase and compression phase (2)

6.3
- To raise the compression pressure in the cylinder
- To ensure that air supply in the cylinder is higher than atmospheric pressure
- To improve the engine's volumetric efficiency (Any 1 × 1) (1)

[5]

QUESTION 7: CRANES AND LIFTING MACHINES

7.1 7.1.1 C
7.1.2 E
7.1.3 A
7.1.4 D

(4 × 1) (4)

7.2
- It can carry heavy loads.
- It does not obstruct traffic.
- Load transportation is possible on a rail (between two points). (3)

[7]

QUESTION 8: MATERIAL AND MATERIAL PROCESSESS

8.1
- To obtain uniformity in steel
- To improve the strength of steel
- To refine steel structure
- To remove strains and stresses caused by cold working (Any 3 × 1) (3)

8.2
- Toughness
- Elasticity
- Plasticity
- Malleability
- Hardness
- Ductility
- Tensile strength (Any 3 × 1) (3)

[6]

QUESTION 9: INDUSTRIAL ORGANISATION AND PLANNING

9.1
- Clock cards
- Production flow charts
- Job cards
- Requisition cards
- Maintenance schedules (Any 4 × 1) (4)

9.2
- Poorly timed presentation
- Disorderly presentation
- Lack of credibility on the source
- Loss of information between management and subordinates
- Unclear message (5)

9.3
- It helps to determine whether enough cash is available.
- It shows the amount of cash available.
- It shows how funds are used in the business.
- The manager can determine whether excess funds can be invested.
- It can help the business obtain credit. (Any 3 × 1) (3)

[12]

QUESTION 10: ENTREPRENEURSHIP

10.1 Brainstorming is the process whereby ideas and alternatives are generated through group discussions without undermining any member's idea. (3)

10.2
- Knowledge and skills
- Friends and contacts
- Finance (3)

10.3
- Competition
- Symbiosis
- Nature of the product
- Expansion potential
- Service businesses
- Convenience and accessibility
- Small manufacturer
- Accessibility for deliveries
- Accessibility by rail
- Distance from your customers (Any 3 × 1) (3)

[9]

TOTAL: 100