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 7 pages.

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QUESTION 1: POWER TRANSMISSION

1.1 1.1.1

$$N_R = \frac{N_M}{N_B}$$

$$N_R = \frac{1300}{750} \checkmark$$

$$N_R = \mathbf{1,733:1} \checkmark$$ (2)

1.1.2 $SF = \mathbf{1,1}$ (1)

1.1.3 $P_D = P_M \times SF$

$P_D = 55 \times 1{,}1 \checkmark$

$P_D = \mathbf{60,5} \checkmark½ \ \boldsymbol{kW} \checkmark½$ (2)

1.2
- Double cover
- Polyester or Nylon cord
- Cord support cushion
- Fibre loaded base (Any 3 × 1) (3)

1.3
- Quick wearing of the flanks.
- Wearing of the pulleys.
- Uneven loads on the bearings.
- Excessive friction and heat between the belt and the pulley. (Any 3 × 1) (3)

1.4
A – Worm and worm-wheel gear
B – Single helical gear
C – Double helical gear
D – Spiral gear
E – Bevel gear
F – Spur gear
G – Rack and pinion gear (7 × 1) (7)

1.5
- Too much end thrust
- Slippage often occurs (2)

[20]

QUESTION 2: BRAKES

- Brakes require frequent attention.
- Adjusters must be adjusted frequently.
- Dust and water can affect its operation.
- Cable and rods tend to stretch more often.
- It has a slow response. **[5]**

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QUESTION 3: BEARINGS

3.1 A – Outer ring
B – Inner ring
C – Cage
D – Ball roller (4)

3.2
- Radial loads
- Axial loads
- Combined loads (3)

3.3
- First figure – Type of bearing
- Second figure – Width series
- Third figure – Diameter series (3)

[10]

QUESTION 4: MATER PUMPS, COOLING AND LUBRICATION

4.1
- Centrifugal water pump
  - Has a rotating impeller.
  - Constant supply of water.
- Reciprocating water pump
  - Uses linear suction and compression movement
  - derived from the rotating motion of the crank shaft. (2 × 2) (4)

4.2 4.2.1 Centrifugal pump (1)

4.2.2 A – Eye
B – Cover or casing or housing
C – Impeller (3 × 1) (3)

4.3
- Impeller
- Casing
- Shaft
- Mechanical seal
- Stuffing box
- Balancing disc
- Stages (Any 2 × 1) (2)

4.4
- More air can be stored in the reservoir.
- There is less chance of explosion.
- Lubrication is easier.
- The correct viscosity of the lubricant is maintained. (Any 3 × 1) (3)

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4.5
- To prevent excessive wear.
- To prevent clogging and sticking control valves and pistons.
- To extend the oil life.
- To remove all oil deterioration products. (Any 2 × 1) (2)

[15]

QUESTION 5: HYDRAULICS AND PNEUMATICS

5.1 5.1.1

$$A = \frac{\pi d^2}{4}$$

$$d = \sqrt{\frac{A \times 4}{\pi}}$$

$$d = \sqrt{\frac{0{,}00159 \times 4}{\pi}} \checkmark$$

$$d = \mathbf{44{,}994\ mm} \checkmark$$

5.1.2 $F = 400 \times 10^3 \times 0{,}00159$ ✓

$F = \mathbf{636\ N} \checkmark$

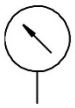
(2 × 2) (4)

5.2
- To convert mechanical energy into pressure energy.
- To push the hydraulic fluid and create flow. (Any 1 × 1) (1)

5.3
- Air production and distribution system
- Air consumption system (2)

5.4
- Absorbs pulsations
- Smooths the air flow
- Serves as a reservoir for excess compressor's output (Any 2 × 1) (2)

5.5



(1)

[10]

QUESTION 6: INTERNAL COMBUSTION ENGINES

6.1
- Carburettor system
- Injector system (2)

6.2
- The power output is lower.
- Manufacturing costs are very high.
- Diesel engines cause more pollution.
- The engine is noisier. (Any 3 × 1) (3)

[5]

QUESTION 7: CRANES AND LIFTING MACHINES

7.1 Drop refers to the mechanical advantage that is caused by increasing the number of sheaves on a rope line. (1)

7.2
- It creates safer working conditions.
- The crane is protected from fatigue/abuse.
- It reduces maintenance costs.
- It improves productivity. (Any 3 × 1) (3)

7.3 The behaviour of the material after a stress is applied to it reaches a critical value. (1)

7.4
- The mass to be handled.
- The number drops that the steel rope makes.
- The maximum length per drop.
- The size of the grooves. (Any 3 × 1) (3)

[8]

QUESTION 8: MATERIAL AND MATERIAL PROCESSES

8.1
- Thermoplastics
  - Soften when heated, and solidify when cooled.
  - Can be recycled.
- Thermosetting plastics
  - Undergo a chemical change during moulding.
  - Can never be softened by re-heating. (Any 2 × 1) (2)

8.2 8.2.1 Hardness – The ability to withstand scratching, cutting, rubbing or indentation.

8.2.2 Tensile strength – The ability to resist forces acting to pull it apartand resist withstand stretching load without breaking.

(2 × 1) (2)

8.3 Removes stress and strains induced by hardening
Reduce brittleness
Increase toughness (Any 2 × 1) (2)

8.4 Very soft and flexible
flattens easily. (Any 1 × 1) (1)

[7]

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QUESTION 9: INDUSTRIAL ORGANISATION AND PLANNING

9.1 Message not coded properly.
Message not decoded properly.
Poor listening skills.
Misuse of communication channel.
Mistrust
Acceptability
Frankness
Noise
Distraction
Personality
Attitude
Language
Emotion
Prejudice
Fear
Fatigue
Physical handicaps (Any 4 × 1) (4)

9.2 To advance economic development, social justice, labour peace and democratisation of the workplace.
To give effect to, and regulate, the fundamental rights conferred by Section 27 of the Constitution.
To give effect to oblifgations inqured by the republic.
To provide a framework within which employees, their trade unions, employers' organisations can bargain collectively and formulate industrial policy.
To promote orderly collective bargaining, employee participation in the workplace, effective resolution of Labour Relations Act. (Any 1 × 1) (1)

9.3 Book keeping
Storage and release of information
Cost accounting
Archive control
Statistics
Office work (Any 2 × 1) (2)

9.4 It is concise
Feedback occurs immediately
Its possible to determine whether the message is received correctly
(Any 2 × 1) (2)

9.5 To plan business' operations.
Show that the business' financial goals are being met.
Help to transform goals into reality.
Serves as a control mechanism. (Any 3 × 1) (3)

[12]

QUESTION 10: ENTREPRENEURSHIP

10.1 Entrepreneur refers to a person who identifies an opportunity,✓ takes the risk✓ to gather the required resources✓ and start a business✓ in order to make a profit✓ and create jobs.✓ (Any 3 × 1) (3)

10.2
- Knowledge and skills
- Contacts
- friends
- Finance

(Any 3 × 1) (3)

10.3 10.3.1 False
10.3.2 False

(2 × 1) (2)
[8]

TOTAL: 100

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