higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

MECHANICAL DRAUGHTING AND TECHNOLOGY

(First paper)

NQF LEVEL 4

18 February 2025

This marking guideline consists of 4 pages.

Copyright reserved

QUESTION 1

1.1
- Functionality
- Safety
- Reliability
- Efficiency
- Sustainability
- Ergonomics
- Aesthetics
- Cost-effectiveness (Any 6 × 1) (6)

1.2
- System engineering design
- Component engineering design
- Descriptive design model
- Prescriptive design model
- Industrial design model (Any 2 × 1) (2)

[8]

QUESTION 2

2.1
- It provides elasticity.✓
- It stores and releases mechanical energy.✓
- It controls motion.✓
- It supports loads. (Any 3 × 1) (3)

2.2 Automotive suspension springs
Mechanical clock springs (2 × 1) (2)

2.3 Where safety is priority✓:
- Nut on circular blades
- In flammable gas tanks
- In machines where part has to be moved in the opposite direction

(Any 1 + 1) (2)

2.4 2.4.1 Length of the square thread = (Pitch × number of turns) + $\frac{\text{Pitch}}{2}$

$= (60 \times 2) + \frac{60}{2}$ ✓

$= 150$ mm✓

2.4.2 Pitch divisions $= \frac{\text{Pitch}}{12}$

$= \frac{60}{12}$ ✓

$= 5$ mm ✓

(2 × 2) (4)

[11]

QUESTION 3

3.1
- A worm-gear assembly is a mechanical system consisting of TWO main components, a worm gear✓
- and a worm-wheel gear.✓
- This assembly is used to transmit motion and power between TWO non-intersecting,✓
- perpendicular shafts, typically at right angles to each other.✓ (4)

3.2 3.2.1 The module of a gear is defined as the ratio ✓of the pitch diameter to the number of teeth ✓ on the gear.

3.2.2 This is the angle that defines the contact ✓ point between the gear teeth and the mating ✓ gear.

(2 × 2) (4)

3.3 Formula:
Width of key
W✓ = ¼✓ × D ✓or D/4 (3)
[11]

QUESTION 4

4.1 The flat-end follower ✓ because it wears more slowly ✓than knife-edge follower & takes up less space✓ (3)

4.2 4.2.1 This mechanical component is used in conjunction with a cam✓ to convert the rotary motion of the cam into linear motion. ✓

4.2.2 This refers to the vertical or linear displacement ✓that moves up ✓ the extend of the cam follower as it moves along the cam's surface.

4.2.3 This refers to the circle with the smallest radius✓ from the cam centre ✓ to any part of the cam profile.

4.2.4 It is the angular movement✓ of the camshaft or cam within the mechanical system. ✓

(4 × 2) (8)
[11]

Copyright reserved

QUESTION 5

5.1
- Dimensions✓
- Machining symbols and instructions✓
- Surface finishes✓
- Part/Item numbers✓
- Title and scale✓
- Geometric tolerances✓ (6)

5.2
- Projection system method clarification✓
- Standardisation✓
- Compliance with standards✓ (3)

5.3 Metric✓ 30✓ (2)

5.4 Formula:
Height of bolt
H✓ = 0.7✓ × D ✓ (3)

5.5 International ✓ Organisation ✓ for Standardisation✓ (3)

5.6 It is used to transmit rotational motion✓ between an element and a rotating shaft✓ (2)

5.7 5.7.1 Turning is a machining process✓ which is usually carried out on a lathe✓ to machine cylindrical, conical and other surfaces of revolution✓.

5.7.2 Tapping is the process in which a hole is drilled✓ using a spiral drill and then a thread ✓is cut into the inside surface of the hole using taps. ✓ (2 × 3) (6)

5.8 5.8.1 The size ✓of the object is communicated by means of dimensions✓.

5.8.2 Text is used to give information ✓needed other than size, such as materials, part numbers, manufacturing process, surface finish, etc✓

5.8.3 Different line types are used to indicate different aspects✓ of the drawing. Different line types are the alphabet of drawing✓ (3 × 2) (6)

5.9 Auxiliary section is used as an aid ✓ to engineering drawings as it shows certain details on a particular plane✓ to explain the shape of the object at that plane✓ (3)
[34]

TOTAL: 75

Copyright reserved