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

4 November 2022

This marking guideline consists of 6 pages.

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QUESTION 1: PRINCIPLES OF DESIGN

1.1

- Basic technology is very recent and is not fully understood; engineers discover new things during the design process.
- Initial goals or objectives are unclear; they are only clarified as the design progresses.
- The objectives are in conflict.
- It is too costly.
- There is too little time for the design proposal.
- The product and/or its package is unsafe or harmful to people or environment.
- The product has shortcomings or problems.
- The product is not appropriate for environment or circumstances.
- Maintenance is a problem.
- The product design is too complicated for users.

(Any 5 × 1) (5)

1.2

1. Identify the need
2. Define the problem
3. Investigation
4. Develop solutions
5. Analyse and select a solution
6. Designing
7. Making
8. Evaluating
9. Present results

(Any 4 in logical order) (4)
[9]

QUESTION 2: SCREW THREADS AND SPRINGS

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2.1 Spring length = (Lead × number of turns)✓ + material size✓

= (65 × 2) + 26✓

= **156 mm**✓ (4)

2.2
- Completely drawn
- Conventional
- Conventional in section
- Schematic
- True helical curves
- Left hand / Right hand
- Round / Square material (Any 4 ×1) (4)

2.3
- Square thread
- V-screw thread
- Acme screw
- Buttress screw (Any 3 × 1) (3)

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

= (48 × 2) + $\frac{48}{2}$√

= **120 mm**✓ (2)

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

= $\frac{48}{12}$√

= **4 mm**✓ (2)
[15]

QUESTION 3: GEARS AND KEYS

3.1
- Gives a positive drive with no slippage
- A compact system
- Ability to transmit relatively large forces
- A long working life
- Little maintenance
- Little radial force on the bearings
- Gears can change direction between input and output shaft (Any 3 × 1) (3)

3.2 3.2.1 **Pressure angle**

Pressure angle is the acute angle formed between the line of action✓ and the common tangent to the two pitch circles which passes through the pitch point.✓ (2)

3.2.2 **Module**

The module of a gear is the pitch-circle diameter divided by the number of teeth on the gear.✓✓ (2)

3.2.3 **Base circle**

The base circle is the circle from which the involute is generated.✓✓ (2)

3.2.4 **Circular pitch**

The circular pitch is the distance from a particular point on one tooth to the corresponding point on the next tooth.✓ It is measured along the circumference of the pitch circle.✓ (2)

3.2.5 **Diametrical pitch**

The diametrical pitch is the number of teeth on the gear divided by the pitch-circle diameter.✓✓ (2)

3.3
- Rectangular keys
- Feather keys
- Tapered keys
- Woodruff keys
- Parallel keys

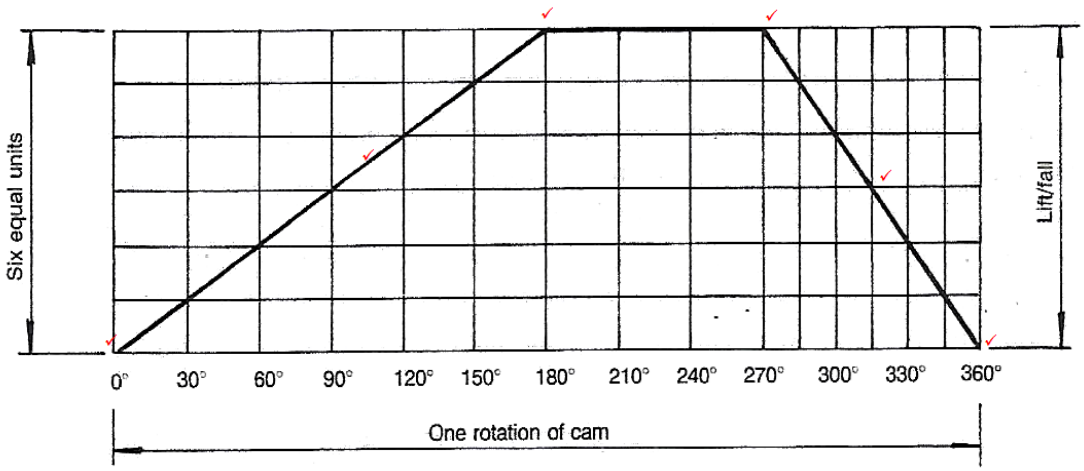
- Gib-head keys (Any 2 × 1) (2)

[15]

QUESTION 4: CAMS

4.1
- Constant velocity✓ (1)
- Simple harmonic✓ (1)
- Uniform acceleration and retardation✓ (1)

4.2.



CONSTANT VELOCITY MOTION-DISPLACEMENT DIAGRAM (6)

4.3
- Stroke height✓ (1)
- Type of motion✓ (1)
- Performance✓ (1)

4.4 A cam is a machine element which generally rotates at a uniform speed to produce a controlled up-and-down movement.✓✓ (2)

4.5 Dwell is used to describe the state when the follower remains in the same position, i.e., there is no upwards or downwards movement.✓✓ (2)

[16]

QUESTION 5: ASSEMBLY AND DETAIL DRAWING

5.1
- Dimensions✓ (1)
- Machining symbols✓ (1)
- Surface texture symbols✓ (1)

5.2 To indicate the various items or parts on the assembly✓✓ (2)

5.3
- First-angle orthographic projection✓
- Third-angle orthographic projection✓ (2)

5.4 Detail drawings are generally used for the manufacture of various components.✓✓ (2)

5.5 To identify the different components on the assembly drawing✓✓ (2)

5.6 Conventional representation is the symbolic representation of different, commonly used mechanical components for assembly drawing.✓✓ (2)

5.7
- Bolts
- Nuts
- Studs
- Drilled and threaded holes
- Webs
- Ribs
- Shaft
- Keys (Any 4 × 1) (4)

5.8
- Front view✓
- Right view✓
- Top view✓ (3)

[20]

TOTAL: 75