higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

MECHANICAL DRAUGHTING AND TECHNOLOGY
NQF LEVEL 4
(First paper)

15 November 2024

This marking guideline consists of 5 pages.

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QUESTION 1: PRINCIPLES OF DESIGN

1.1
- Functionality defects
- Usability defects
- Incorrect tolerances
- Material selection issues (Any 2 × 1) (2)

1.2
- Identify the problem or need.
- Research and gather information.
- Generate concepts.
- Evaluate and select concepts.
- Develop detailed designs.
- Build a prototype.
- Test and evaluate.
- Refine and finalise.

OR

- Find the problem/need
- Identify all functions and limitations that apply to the need
- Brainstorm different solutions
- Create concepts from these ideas
- Identify benefits of these concepts
- Select best concept based on needs of design
- Detail design and model
- Improve design (8)

[10]

QUESTION 2: SCREW THREADS AND SPRINGS

2.1 2.1.1 Length of square thread = (pitch × number of turns) + $\frac{\text{pitch}}{2}$ ✓
(✓ ✓)

$= (56\text{ mm} \times 2) + \frac{56\text{ mm}}{2}$

$= 140\text{ mm}$✓

2.1.2 Pitch divisions = $\frac{\text{pitch}}{12}$ ✓

$= \frac{56\text{ mm}}{12}$ ✓

$= 4{,}67\text{ mm}$ ✓ ✓

(2 × 4) (8)

2.2
- Variable pitch compression springs
- Conical compression springs
- Cylindrical compression springs
- Tapered compression springs
- Hourglass compression springs
- Barrel compression springs
- Convex compression springs
- Concave compression springs
- Straight coil compression springs
- Volute compression springs
- Torsional compression springs (Any 3 × 1) (3)

2.3 Length of the spring = (lead × number of turns) + material size ✓
= (76 mm × 2) ✓ + 28 mm ✓
= 180 mm ✓ (4)
[15]

QUESTION 3: GEARS AND KEYS

3.1
- Worm gears
- Helical gears
- Spur gears
- Bevel gears
- Rack and pinion gears
- Internal gears
- Planetary gears
- Herringbone gears
- Involute gears
- Screw gears
- External gears
- Epicyclic gears
- Hypoid gears (Any 4 × 1) (4)

3.2
- Automotive transmissions
- Industrial machinery
- Aerospace
- Wind turbines
- Mining equipment
- Machine tools
- Marine propulsion
- Railway systems (8)

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3.3
- Square
- Woodruff
- Taper
- Parallel
- Gib head
- Rectangular (Any 3 × 1) (3)

[15]

QUESTION 4: CAMS

4.1
- Automotive engines
- Manufacturing machinery
- Printing and packaging
- Textile industry
- Automation and robotics
- Conveyor systems
- Machine tools
- Automated packaging
- Aerospace industry
- Paper-feed mechanisms
- Medical devices (Any 3 × 1) (3)

4.2 Constant velocity refers to a situation in which an object is moving✓ in a straight line✓ at an unchanged speed✓ and at a consistent rate✓ without any acceleration✓ or deceleration.✓ (6)

4.3
- Disk or plate cams
- Cylindrical cams
- Heart cams
- Face cams
- Radial cams
- Yoke cams (Any 3 × 1) (3)

4.4
- Constant velocity
- Uniform acceleration and retardation
- Simple harmonic motion (3)

[15]

QUESTION 5: ASSEMBLY AND DETAIL DRAWINGS

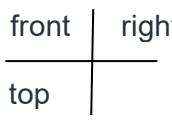
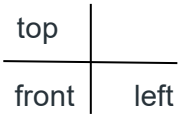
5.1
- Size specification
- Tolerance clarification
- Assembly and fit
- Reference for machining
- Quality control
- Communication (Any 4 × 1) (4)

5.2
- Provide a visual representation of how multiple components come together to form a complete product
- Label and identify each component, making it easy to identify and locate specific parts
- Serve as a reference for quality control and inspection processes
- Serve as a permanent record of the product's design and assembly instructions
- Used in cost estimation processes
- May be required for legal or regulatory compliance and quality standards

(Any 4 × 2) (8)

5.3
- Full sectional drawing
- Half-sectional drawing (2)

5.4

NO	First Angle Projection	Third Angle Projection
1	Front view is at the top of the horizontal axis.	Front view at the bottom of the horizontal axis.
2	Top view at the bottom of the horizontal axis.	Top view at the top of horizontal axis.
3	Right view is at the left side of vertical axis.	Left view is at the left side of vertical axis.
4		

(4)

5.5
- To indicate the size (scale)
- To indicate the projection system (first-angle or third-angle projection)
- To identify the assembly
- For quality control
- For communication and quick reference to its purpose and relevance to the project

(Any 2 × 1) (2)

[20]

TOTAL: 75

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