higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# NATIONAL CERTIFICATE (VOCATIONAL)

## MECHANICAL DRAUGHTING AND TECHNOLOGY

(First paper)

**NQF LEVEL 4**

(12050694)

**4 November 2022 (X-paper)**
**09:00–12:00**

**Non-programmable scientific calculators may be used.**

**This question paper consists of 4 pages.**

065Q1N2204

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**TIME: 3 HOURS**
**MARKS: 75**

## INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Start each question on a new page.
5. Use only a blue or black pen.
6. Write neatly and legibly.

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## QUESTION 1: PRINCIPLES OF DESIGN

1.1 State FIVE reasons why design changes occur. (5)

1.2 The design process follows a logical order of activities.

State FOUR activities in logical order. (4)

**[9]**

## QUESTION 2: SCREW THREADS AND SPRINGS

2.1 A helical spring, made of 26 mm square material, has an outside diameter of 175 mm and a lead of 65 mm.

Calculate the spring length for TWO full left-handed turns (coils). (4)

2.2 Name FOUR methods that can be used to represent helical compression springs on a drawing. (4)

2.3 State any THREE types of screw threads used in industry. (3)

2.4 TWO turns of a left-handed square thread have a nominal diameter of 145 mm and a pitch of 48 mm.

Calculate the following:

2.4.1 The length of the square thread

2.4.2 The pitch divisions

(2 × 2) (4)

**[15]**

## QUESTION 3: GEARS AND KEYS

3.1 State THREE advantages of using gear drives in industry. (3)

3.2 Several terms are generally used for the construction or design of spur gears.

Define the following terms:

3.2.1 Pressure angle

3.2.2 Module

3.2.3 Base circle

3.2.4 Circular pitch

3.2.5 Diametrical pitch

(5 × 2) (10)

3.3 Different types of keys and keyways are used in industry.

State any TWO keys used. (2)

**[15]**

## QUESTION 4: CAMS

4.1 There are THREE basic types of displacement diagrams which correspond to the THREE types of motion used for cams.

Name the THREE types of displacement diagrams used in industry. (3)

4.2 Make a freehand drawing of a constant velocity motion-displacement diagram. In this diagram, lift takes place from 0 degrees to 180 degrees; dwell takes place from 180 degrees to 270 degrees; the fall takes place from 270 degrees to 360 degrees. (6)

4.3 When constructing a displacement diagram, certain details must be known.

State the details that must be known. (3)

4.4 Define a *cam.* (2)

4.5 Explain the term *dwell,* as applied to a cam. (2)

**[16]**

## QUESTION 5: ASSEMBLY AND DETAIL DRAWING

5.1 State THREE details that should be shown on a detail drawing. (3)

5.2 Describe the function of item numbers on an assembly drawing. (2)

5.3 What are the TWO orthographic projection systems used in the engineering industry for drawings? (2)

5.4 Explain the purpose of detail drawings. (2)

5.5 What is the function of the *parts list* on a drawing? (2)

5.6 Define the term *conventional representation.* (2)

5.7 Drawing conventions are applied to items on an assembly.

List any FOUR items that are shown in conventional representation on an assembly drawing. (4)

5.8 State the THREE primary views in third-angle orthographic projection. (3)

**[20]**

**TOTAL: 75**

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