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)

12 November 2019 (X-Paper)
09:00–12:00

REQUIREMENTS: **A4 drawing sheets**
Yellow cover folder (BOE 8/15)

Calculators may be used.

This question paper consists of 4 pages.

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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. Use ONE side of each DRAWING SHEET.
5. Do ALL drawing work in pencil.
6. Insert ALL loose DRAWING SHEETS in the folder– do NOT staple.
7. Write neatly and legibly.

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QUESTION 1: PRINCIPLES OF DESIGN

What are SIX of the steps in the design process? **[6]**

QUESTION 2: SCREW THREADS AND SPRINGS

2.1 A screw with a single left-handed square thread has a major diameter of 140 mm and a minor diameter of 92 mm.

Calculate the pitch. (4)

2.2 Differentiate between *right-handed threads* and *left-handed threads*. (2 + 2) (4)

2.3 Name TWO material shapes used in the manufacturing of a helical spring. (2)

2.4 Name THREE screw threads used in the industry. (3)

2.5 Define the term *lead.* (2)

2.6 A cylindrical-helix compression spring is manufactured according to the following specifications:

Two full right-handed turns (coil) of a helical spring are made of 20 mm square material. The outside diameter is 150 mm and the lead is 60 mm.

Calculate:

2.6.1 The spring length

2.6.2 The lead division

(2 × 2) (4)

[19]

QUESTION 3: GEARS AND KEYS

3.1 Name THREE types of commonly used keys. (3)

3.2 Make a freehand sketch of a single involute spur gear showing the following:

- Three teeth
- Addendum
- Dedendum
- Pitch
- Tooth thickness (10)

3.3 Which formula is used to determine the width of a rectangular key? (1)

3.4 Where is a rectangular key used? (1)

[15]

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QUESTION 4: CAMS

4.1 FIGURE 4 shows a displacement diagram of a cam.

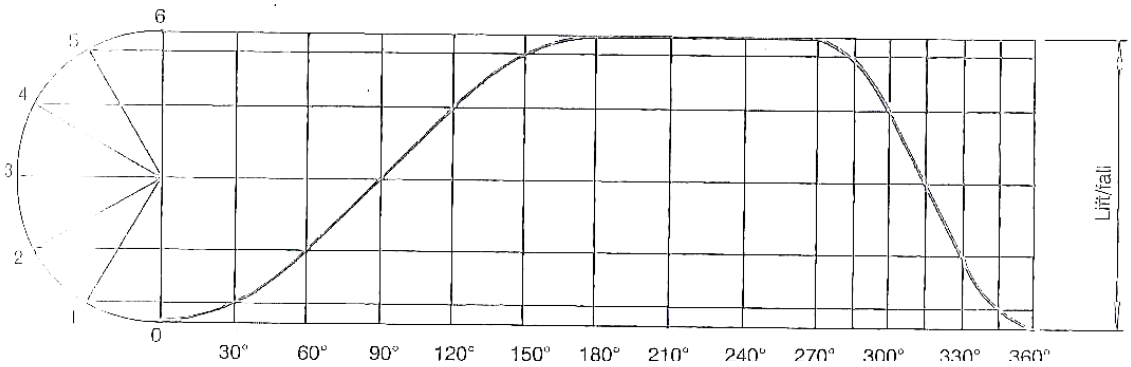

FIGURE 4

Briefly explain the entire performance in ONE revolution. (9)

4.2 Complete the following sentence by writing the missing word or words next to the question number (4.2.1–4.2.3) in the ANSWER BOOK.

A cam is a machine element which generally rotates at a (4.2.1) … speed to produce a controlled (4.2.2) … and (4.2.3) … movement. (3 × 1) (3)

4.3 Name THREE types of followers. (3)

[15]

QUESTION 5: ASSEMBLY AND DETAIL DRAWING

5.1 Give the formula to determine the height of a nut. (2)

5.2 What does the abbreviation ISO stand for? (2)

5.3 Make a freehand sketch of the correct symbol for first-angle orthographic projection. (4)

5.4 What is an *assembly drawing*? (3)

5.5 Why are item numbers placed on an assembly drawing? (3)

5.6 Why is a parts list part of an assembly drawing? (2)

5.7 What is the function of the title and scale on an assembly drawing? (2 + 2) (4)

[20]

TOTAL: 75

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