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)

18 February 2025 (X-paper)
09:00–12:00

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

Non-programmable scientific calculators may be used.

This question paper consists of 5 pages.

063Q1S2518

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MECHANICAL DRAUGHTING AND TECHNOLOGY
NQF LEVEL 4
(First paper)
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 only a black or blue pen.
5. Write neatly and legibly.

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QUESTION 1: PRINCIPLES OF DESIGN

1.1 The principles of engineering design encompass a set of fundamental guidelines and concepts that engineers follow when creating products, systems and structures.

Name SIX principles of the engineering design process. (6)

1.2 It is important to make sure that the correct design process according to your own workplace instructions is used.

Name TWO main models used in the engineering design process. (2)
[8]

QUESTION 2: SCREW THREADS AND SPRINGS

2.1 State THREE main functions of a helical spring. (3)

2.2 Give TWO examples of a helical spring. (2)

2.3 Left hand screw threads are used in certain situations.

Mention where, with ONE example (2)

2.4 Two turns of a left-handed square thread have a nominal diameter of 140 mm and a pitch of 60 mm.

Calculate the following:

2.4.1 The length of the square thread

2.4.2 The pitch divisions

(2 × 2) (4)
[11]

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QUESTION 3: GEARS AND KEYS

3.1 There are various types of gears used in the engineering industry.

Describe a worm-gear assembly. (4)

3.2 In engineering design several terms are generally used for the construction or design of spur gears.

Define the following terms:

3.2.1 Module

3.2.2 Pressure angle

(2 × 2) (4)

3.3 It is necessary to calculate various dimensions of the key and keyway.

Give the formula for the calculation of the width of a keyway. (3)

[11]

QUESTION 4: CAMS

4.1 Different types of followers are used depending on the most suitable purpose.

Name the follower mostly used and give TWO reasons why (3)

4.2 Several terms are used in the design and construction of cams.

Define the following terms:

4.2.1 Cam follower

4.2.2 Lift

4.2.3 Base diameter

4.2.4 Cam rotation

(4 × 2) (8)

[11]

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QUESTION 5: ASSEMBLY AND DETAIL DRAWING

5.1 Detail drawings are generally used for the manufacturing of various components.

Name all the necessary information that must be shown on these drawings. (6)

5.2 Give THREE reasons why a projection system symbol should be used. (3)

5.3 On a drawing what does M30 mean? (2)

5.4 Write down the formula to use to get the height of a hexagonal bolt. (3)

5.5 What does the abbreviation ISO stand for? (3)

5.6 What is the function of a key in an assembled machine? (2)

5.7 Briefly describe what is meant by each of the following machining processes:

5.7.1 Turning

5.7.2 Tapping (2 × 3) (6)

5.8 Any drawing without dimensions and text is seen as incomplete.

Elaborate on the following:

5.8.1 Dimensions

5.8.2 Text

5.8.3 Line types (3 × 2) (6)

5.9 Explain what is meant by *auxiliary section.* (3)

[34]

TOTAL: 75

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