higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL CONSTRUCTION N5

(8060015)

22 April 2021 (X-paper)
09:00–13:00

OPEN-BOOK EXAMINATION

REQUIREMENTS: A2 drawing sheet
Hot-rolled steel sections (BOE 8/2)

Nonprogrammable calculators and drawing instruments may be used.

This question paper consists of 6 pages, 2 diagram sheets and 1 formula sheet.

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TIME: 4 HOURS
MARKS: 100

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 the question paper.
4. Answer QUESTIONS 1, 3, 5 and 7 on the A2 DRAWING SHEET.
5. Make all drawings in pencil with bold outlines.
6. Drawings must be done in accordance with National Standards and be fully labelled with descriptive notes and dimensions (where applicable).
7. All calculations must conform to the relevant SABS/SANS Code of Practices.
8. Work neatly.

QUESTION 1

FIGURE 1, DIAGRAM SHEET 1 (attached), shows a cantilever steel frame secured against a concrete wall at a bus stop. The frame is pitched at 30° and supports three loads.

Use the following scales:

Space diagram: 110 mm = 5,5 m
Vector diagram: 1 mm = 2 kN

1.1 Use the graphical method to obtain the forces in the frame and distinguish between struts and ties. (5)

1.2 Determine the forces and angles at the reactions R and T. (4)

1.3 Draw a table with the headings MEMBER, MAGNITUDE and TYPE and tabulate the answers. (6)
[15]

QUESTION 2

FIGURE 2, DIAGRAM SHEET 1 (attached), shows a lap joint formed by two 90 × 10 mm thick tie bars bolted together by means of SIX M12 Grade 4,6 bolts. The maximum shear stress is 101 MPa.

2.1 Determine the resistance of the bolts due to shearing. The thread of the bolts is within the shearing plane. The pitch of the screw thread is 2 mm. (3)

2.2 Draw a neat sketch to show the thread of the bolt within the shearing plane. (3)

2.3 Make a large, neat drawing to show how a plate tears when a tensile force is applied. (3)
[9]