higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL CONSTRUCTION N5

(8060015)

2 December 2019 (X-Paper)
09:00–13:00

REQUIREMENTS: **Answer book (8/13)**
A2 drawing sheets
Hot-rolled steel sections (BOE 8/2)

Nonprogrammable calculators may be used.

This question paper consists of 5 pages, 2 diagram sheets,
1 formula sheet and 2 addenda.

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NATIONAL CERTIFICATE
BUILDING AND STRUCTURAL CONSTRUCTION N5
TIME: 4 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.

2. Read ALL the questions carefully.

3. QUESTIONS 1, 2 and 6 must be done in the ANSWER BOOK.
   QUESTIONS 3 and 4 must be done on the drawing paper (supplied).
   QUESTION 5 must be done on ADDENDUM 1 (attached).

4. Number the answers according to the numbering system used in this question paper.

5. ALL drawings must be done in pencil with bold outlines.

6. The drawings must be done in accordance to the 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. Write neatly and legibly.

QUESTION 1

DIAGRAM SHEET 1, FIGURE 1 (attached) shows a U-shaped figure supporting a rectangular steel plate.

Calculate the following:

1.1 The distance of the neutral axis about A–B (5)

1.2 The second moment of area for the given figure (7)

1.3 The profile modulus about the x–x axis (2)

1.4 The maximum bending moment for the given section. Use a bending stress of 145 MPa. (2)

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QUESTION 2

DIAGRAM SHEET 1, FIGURE 2 (attached) shows a steel beam supported on TWO reactions, 9 metres apart, then extends a further 2 metres to form a balcony. The steel beam will be required to carry THREE point loads and TWO uniformly distributed loads.

Select a suitable I-section parallel flange steel beam to ensure the building is safe.

Use the following scales:

Load diagram: 140 mm = 11 m
Shear force: 2 mm = 1 kN
Bending moment: 3 mm = 1 kN.m
The permissible bending stress for grade 43 mild steel is 160 MPa.
The maximum shear stress must not exceed 100 MPa.

2.1 Calculate the value of the reactions at RL and RR. (4)

2.2 Determine the values of the shear forces at each intersection. Draw the shear force diagram. Insert all the values on the diagram. (4)

2.3 Calculate and draw the bending moment diagram. Insert the value of the bending moment's maximum in the diagram. (6)

2.4 Calculate the maximum section modulus for the loaded beam. (3)

2.5 Select a suitable I-section parallel flange for the loaded beam from the BOE 8/2 steel tables. (1)

2.6 Calculate the maximum shear stress in the chosen steel beam which should not exceed 100 MPa. (3)

[21]

