



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

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NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL CONSTRUCTION N5

(8060015)

22 July (X-Paper)
09:00 – 13:00

This question paper consists of 6 pages and a 1-page formula sheet.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

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

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Drawings MUST be done according to the latest building regulations.
4. Drawings MUST be fully dimensioned and labelled.
5. Use both sides of the drawing paper if needed.
6. Number the answers correctly according to the numbering system used in this question paper.
7. Write neatly and legibly.

QUESTION 1: FRAMEWORK

FIGURE 1 shows a loaded roof truss. The roof is supported on rollers at R and means of a hinge at RL.

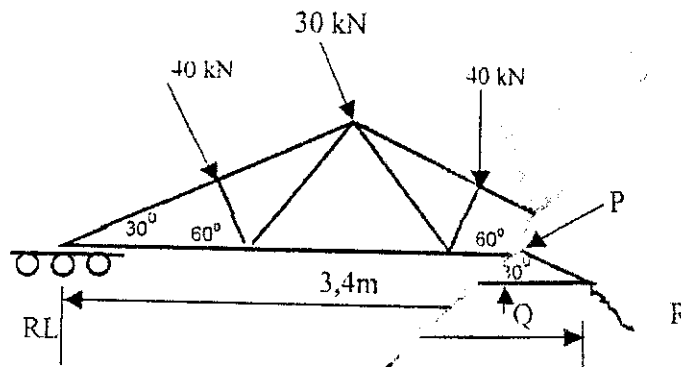


FIGURE 1

- 1.1 Determine the magnitude and directions of the reactions if the roof is loaded as shown.
- 1.2 Determine the size of the forces in the members marked P and Q. Distinguish between tension and compression forces in the members. Tabulate the results.

[14]

QUESTION 2:

SECTION PLUS

FIGURE 2 shows a cross section through a steel section. The dimensions are given in mm.

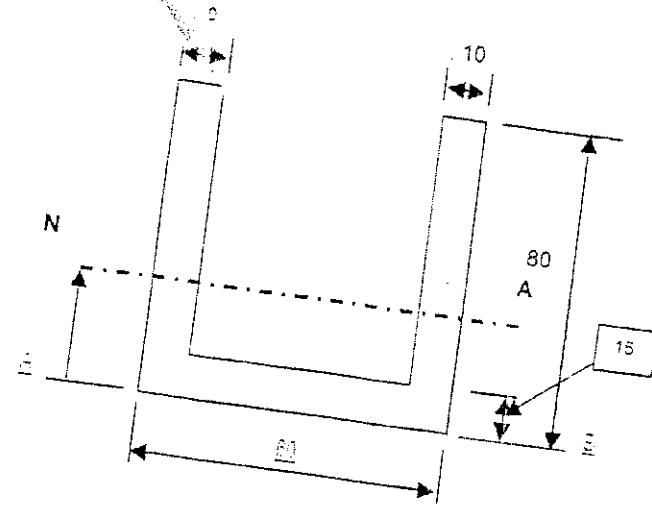


FIGURE 2

Calculate the following:

- 2.1 The moment of inertia of the profile about the neutral axis N-A
- 2.2 The profile modulus (z) about the neutral axis N-A

[10]

PTO

QUESTION 3: LOADED BEAMS

FIGURE 3 shows a loaded simply supported beam.

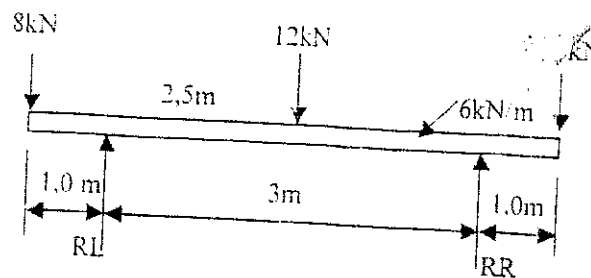


FIGURE 3

- 3.1 Calculate the reactions of RL and RR. (2)
- 3.2 Make the necessary calculations and draw, to a suitable scale, a shear force diagram and a bending moment diagram. (6)
- 3.3 Determine the maximum shear force and bending moment values. (2)
- 3.4 Select from the steel tables the smallest, suitable I-section with tapered flanges for the loaded beam. (6)

Investigate with regard to bending and shearing. The maximum bending stress of grade 43 steel is 155 MPa and shear stress is 100 MPa.

NOTE: Ignore the self-weight of the beam.

(6)
[16]

QUESTION 4

Illustrate, by means of neat, labelled drawings, the following types of reinforced concrete foundations:

- 4.1 Pad foundation (4)
- 4.2 Ground beam with pad foundations (4)
- 4.3 Two piles with pile cap (4)
- 4.4 Cantilever foundation (4)

(4)
[16]

QUESTION 5

Explain, by means of neat sectional drawings, the method of construction of fixing the following typical floor coverings to a reinforced concrete floor:

- 5.1 Timber floor with tongued and grooved jointed floor boards (7)
- 5.2 Glazing floor tiles (7)
- [14]**

QUESTION 6

A hollow square steel stanchion with base plate is bolted to the centre of a concrete base foundation. The welded connection between the stanchion and the base plate is strengthened by means of two gusset plates which are welded to the stanchion and the base plate.

Draw, to scale 1:5, in first-angle orthographic projection, a front view with the gusset plate and stanchion in view, showing a vertical section through the holding down bolts as well as the stanchion and also draw the top view to show the construction details clearly.

Use the following details:

Base plate	400 mm x 400 mm x 25 mm with Ø22 mm holes drilled 25 mm from the edges at the corners.
Stanchion	200 mm x 200 mm x 10 mm
Holding down bolts	M20
Gusset plates	400 mm x 200 mm x 8 mm
Concrete base	500 mm x 500 mm x 200 mm

Show at least 350 mm of the stanchion above the gusset plates.

Insert the welding symbols.

[20]

QUESTION 7

- 7.1 Make a neat schedule drawing, with the necessary column headings, to show a bending schedule for a reinforced concrete beam. Insert typical information values. (6)
- 7.2 Explain, by means of simple and neat drawings, the difference between an open-well staircase and a straight flight of steps. (4)
- [10]**

TOTAL: 100