

**GAUTENG DEPARTMENT OF EDUCATION  
SENIOR CERTIFICATE EXAMINATION**

**TECHNIKA (CIVIL) SG**

**TIME: 3 hours**

**MARKS: 300**

**OCTOBER / NOVEMBER 2005  
OKTOBER / NOVEMBER 2005**

---

---

**REQUIREMENTS:**

Answer script  
Drawing Answer Book 712-2/X  
Drawing instruments  
Pocket calculator

**INSTRUCTIONS:**

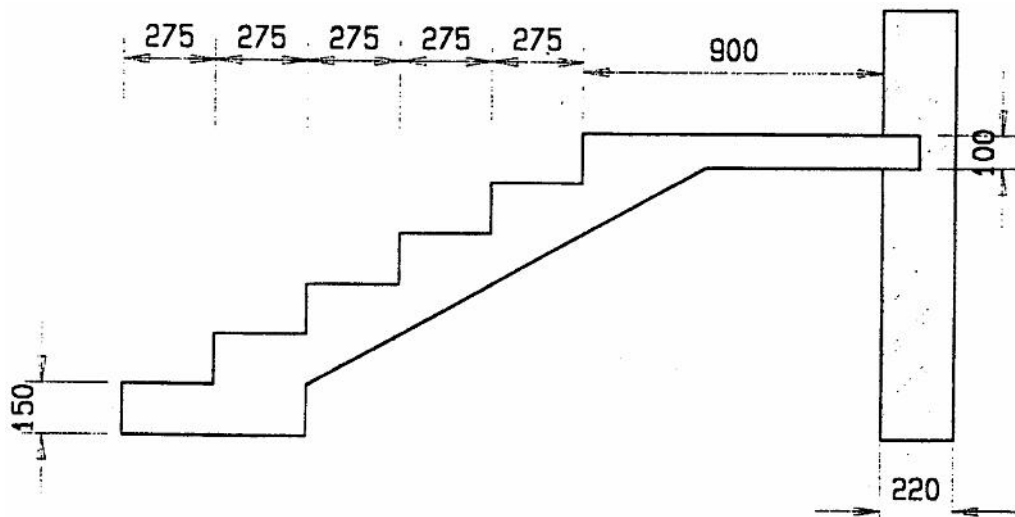
- This question paper consists of TWO sections, A and B.
  - Section A is COMPULSORY.
  - Candidates must answer Section A and any TWO questions from Section B.
  - All calculations and written answers must be done in your answer book.
  - Number the questions as they appear in the examination question paper.
  - Clearly indicate on the drawing paper, the number of the question you are answering.
  - Use both sides of the drawing paper.
  - Drawings and sketches must be fully dimensioned and neatly finished with titles and labels to conform with the SABS Recommended Practice of Building Drawings.
  - Write your examination number on all loose papers, drawing answer book and answer book.
  - For the purpose of this examination, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
  - Measurements not shown or given must be taken as standardized measurements.
  - No correction fluid (e.g. Tipp-Ex) must be used.
  - Calculations to be rounded off to the second decimal.
- 
-

SECTION A  
COMPULSORY

## QUESTION 1

**Figure 1** shows a concrete staircase consisting of six stairs including a landing of 900 mm x 100 mm. The stairs have a rise of 150 mm and a tread of 275 mm and an unplastered outer wall supporting the landing.

Draw, to a scale of 1:10, a vertical section through the total length of this staircase and show the formwork and reinforcing for the erection of this staircase.



**Figure 1**

[60]

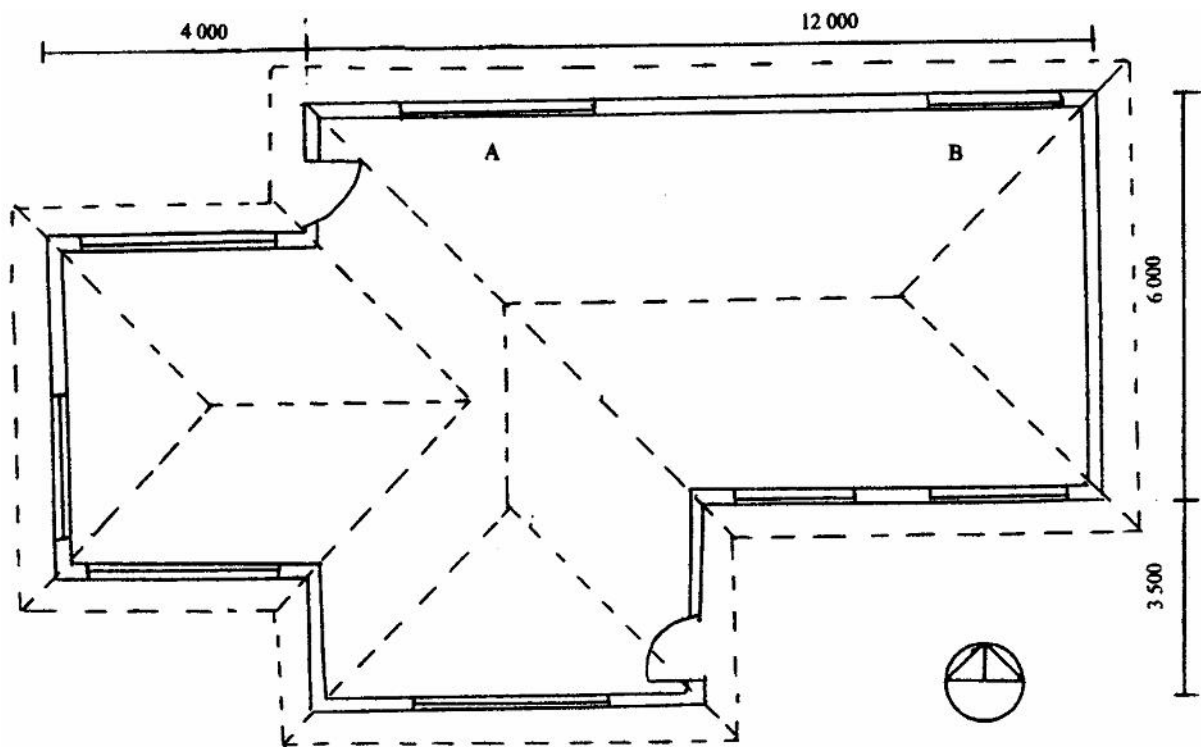
**QUESTION 2**

**Figure 2** shows a ground plan of a house. The dwelling has a corrugated zinc hipped roof, with a 30 degree pitch and a 500 mm open eaves overhang. The 100 mm x 100 mm square gutters with 75 mm downpipes are fixed to a 200 mm asbestos fascia board.

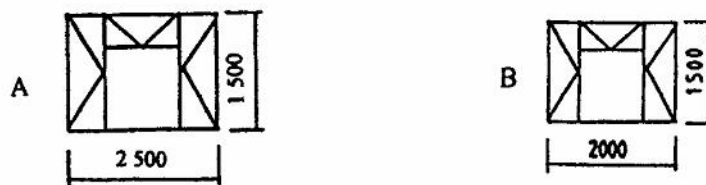
The superstructure is 2 800 mm high and the substructure 300 mm. The outer doors are Z framed, ledged and braced. The 150 mm x 30 mm window sills are finished with clay tiles.

Use the window schedule shown in **Figure 3** for the window sizes.

Draw, to a scale of 1:100, the **North and West elevations** of this dwelling. Also show by means of a scale drawing the method to determine the different roof heights.



**Figure 2**



**WINDOW SCHEDULE**

**Figure 3**

[60]

P.T.O.

**QUESTION 3**

- 3.1 State any FIVE precautions which must be taken into consideration when a sewer has to be laid underneath a building. (5)
- 3.2 Name any FIVE requirements for concrete formwork. (5)
- 3.3 Name the THREE main colours which are used for safety and give an example where each one would be applied in a centre. (6)
- 3.4 Name any FIVE items to be shown on a sewer plan. (5)
- 3.5 Name the standard abbreviations of the following fitments on a sewer plan:
- 3.5.1 Shower
  - 3.5.2 Inspection eye
  - 3.5.3 Vent pipe
  - 3.5.4 Bidet
  - 3.5.5 Bath
  - 3.5.6 Water closet (6)
- 3.6 Name the standard colour code for indicating the following pipes on a sewer plan:
- 3.6.1 New drains
  - 3.6.2 Vents to waste pipes
  - 3.6.3 Existing drains
  - 3.6.4 Waste pipes (4)
- 3.7 Describe the function of a grease trap, as well as where it is installed in a sewerage system. (4)
- 3.8 State FIVE requirements to which reinforcing material must comply. (5)
- 3.9 List any FIVE characteristics of concrete. (5)
- 3.10 Name any THREE main causes of fires. (6)
- 3.11 State FOUR important reasons why steel reinforcement must be used in concrete constructions. (4)
- 3.12 List any FIVE characteristics of glass. (5)

**[60]****TOTAL FOR SECTION A: [180]**

## SECTION B

Candidates must answer any TWO questions from this section.

## QUESTION 4

**Figure 4** below shows a space diagram of a simply supported beam with two point loads.

- 4.1 Draw the complete space diagram to a scale of 1:100.
- 4.2 Draw a vector diagram to a scale of 1 kN = 6 mm.
- 4.3 Determine graphically the magnitude and nature of the forces in each member of the framework.

Draw the table below in your answer book, then answer **Question 4.3** on the table.

MEMBER	MAGNITUDE	NATURE
AE		
BG		
CH		
DH		
DF		
DE		
EF		
FG		
GH		

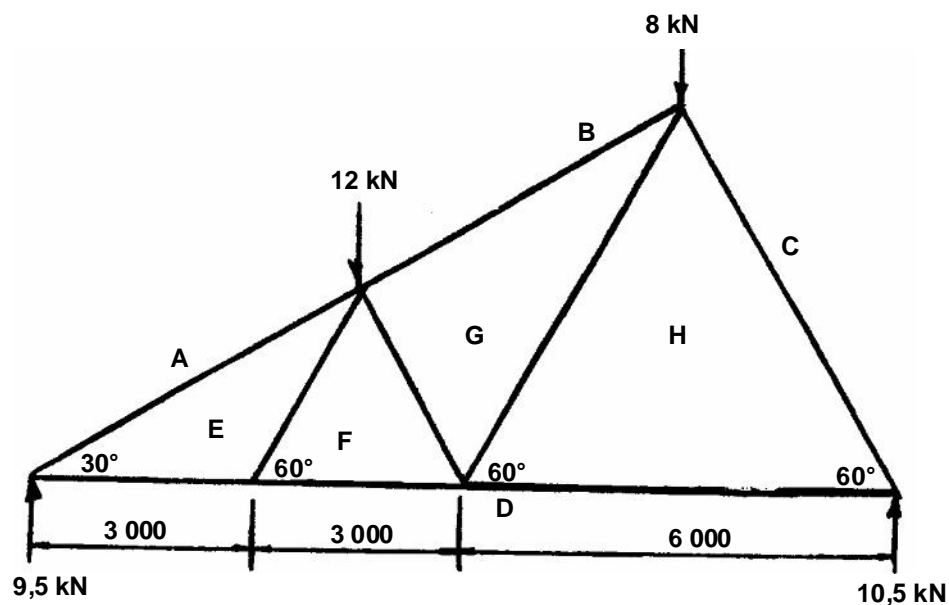


Figure 4

[60]

P.T.O.

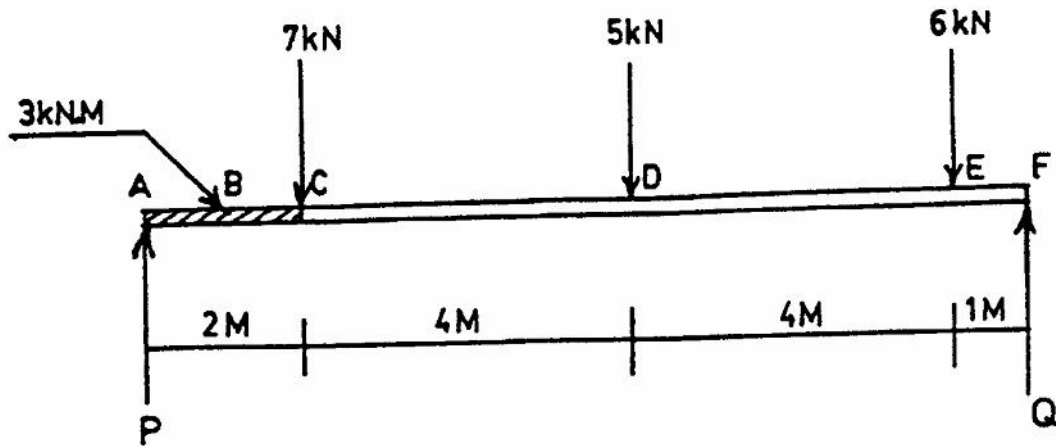
**QUESTION 5**

**Figure 5** shows a beam supported at points **P** and **Q**. The beam has two point loads and a uniform distributed load of 3 kN/m.

- 5.1 Calculate the reactions at supports **P** and **Q**.
- 5.2 Calculate the bending moments at points **A**, **B**, **C**, **D**, **E** and **F**.
- 5.3 Calculate the shear forces at points **A**, **B**, **C**, **D**, **E** and **F**.
- 5.4 Draw the space, bending moment and shear force diagrams.

**Use the following scales:**

- Space diagram : 1:100
- Shear force diagram : 3 mm = 1 kN
- Bending moment diagram : 1 kN/m = 3 mm



**Figure 5**

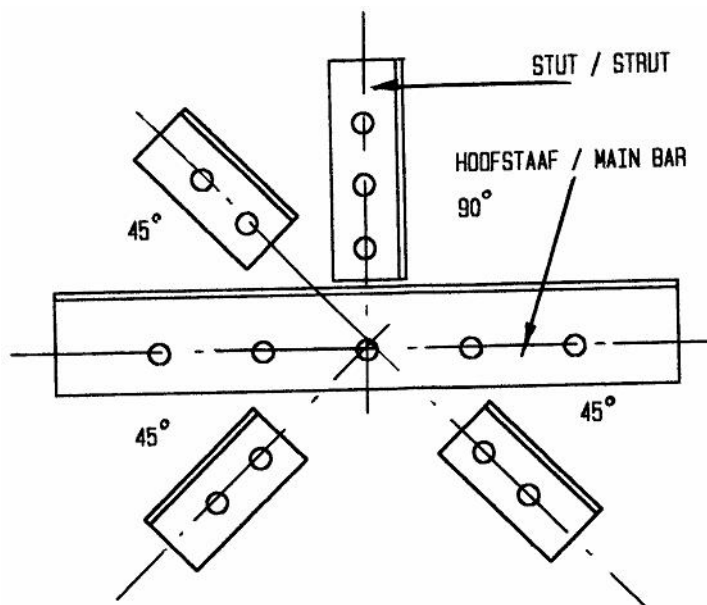
[60]

**QUESTION 6**

6.1 **Figure 6** shows the junction of the beams of a roof truss. Draw, to a scale of 1:5, a detailed drawing of this junction to show the gusset plate which must be used.

**Use the following measurements:**

- ◆ Diameter of the bolts (D) : 18 mm
- ◆ Seam lap : 1.5 D
- ◆ Bolt pitch for the main beam : 5 D
- ◆ Bolt pitch of the struts : 3 D
- ◆ Main beam is 89 mm x 89 mm x 6 mm, with the standard back mark 55 mm.
- ◆ The struts are 63 mm x 63 mm x 6 mm, with the standard back mark 35 mm.



**Figure 6**

(20)

6.2 Raking shores must support the wall of a building. Using a scale of 1:10, draw an isometric view to illustrate the top and bottom ends of the shoring.

**Use the following dimensions for the drawing:**

- Wall-plate : 228 mm x 75 mm
- Cleat : 200 mm x 100 mm x 100 mm
- Needle : 300 mm x 100 mm x 100 mm
- Raking shore : 228 mm x 228 mm
- Wall hook : 8 mm diameter

(20)

- 6.3 Show by means of a sketch, the construction of the window sill of a metal window.

The following must be clearly shown:

- ◆ One-brick wall
- ◆ Plaster finish on the inside
- ◆ Damp-proofing
- ◆ Window sill tiles on the inside
- ◆ Clay tiles on the outside
- ◆ Face bricks
- ◆ Metal window

(20)  
[60]

### QUESTION 7

- 7.1 Describe the difference between the **mass** and **weight** of an object. (2)
- 7.2 Define **load**. (2)
- 7.3 Define **strain**. (2)
- 7.4 What do you understand by the term **deformation** or **change in length**? (2)
- 7.5 Define **safety factor**. (2)
- 7.6 Deduce the formula for **maximum strain** from the standard formula. (4)
- 7.7 Calculate Young's modulus for a rod 20 mm in diameter and 500 mm long, which changes 0,2 mm in length under a load of 33 kN. (12)
- 7.8 List FIVE requirements of concrete reinforcement. (10)
- 7.9 Sketch FOUR different reinforcement bars. (8)
- 7.10 Interpret the following annotated code on a plan to ensure the correct bars will be used for reinforcement: **9R 12 01 300**. (5)
- 7.11 Sketch a horizontal section of an L-shaped reinforced concrete beam with SEVEN main bars. Also show the stirrups to hold the reinforcement in place. (7)
- 7.12 List FOUR important reasons why steel reinforcement must be used in a concrete construction. (4)

[60]

**TOTAL FOR SECTION B: [120]**

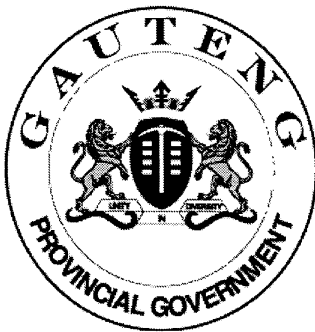
**TOTAL: 300**

**END**



CANDIDATE'S NUMBER / KANDIDAAT SE NOMMER

SENIOR CERTIFICATE EXAMINATION  
*SENIORSERTIFIKAAT-EKSAMEN*



OCTOBER / NOVEMBER  
*OKTOBER / NOVEMBER*

2005

TECHNIKA (CIVIL)  
*TECHNIKA (SIVIEL)*

DRAWING ANSWER BOOK  
*TEKENE ANTWOORDBOEK*

SG

712-2/X

4 pages / *bladsye*

QUESTION VRAAG	MARKS PUNTE	INITIAL PARAFEER
TOTAL / TOTAAL		







