SENIOR CERTIFICATE EXAMINATION
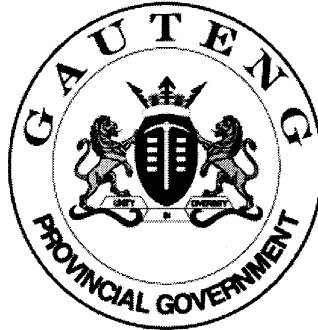

FEBRUARY / MARCH

2007

TECHNIKA (CIVIL)

HG

TECHNIKA CIVIL HG
Question Paper & Answer Book
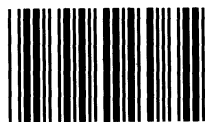
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X05

712-1/0 E

9 pages

GAUTENG DEPARTMENT OF EDUCATION
SENIOR CERTIFICATE EXAMINATION

TECHNIKA (CIVIL) HG

TIME: 3 hours

MARKS: 300

REQUIREMENTS:

- Answer book
- A3-size drawing answer book 712-1/X
- Drawing instruments
- Pocket calculator
- Answer Sheet HG 712-1/1

INSTRUCTIONS:

- Candidates must answer ALL questions in Section A and any TWO questions from Section B.

- All calculations and written answers must be done in your answer book.

- Number your answers exactly as the questions have been numbered.

- Clearly indicate on the drawing paper, the number of the question you are answering.

- Do proper planning.

- Drawings and sketches must be fully dimensioned and neatly finished with titles and labels to conform with the SABS Recommended Practice for Building Drawings.

- Write your examination number on all loose pages, the drawing answer book and your 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 standardised measurements.

- Do not use Tipp-Ex.

- Calculations must be rounded off to the second decimal.

- Detach Answer sheet HG 712-1/1 and place it inside your answer book when finished.

SECTION A
COMPULSORY

Answer ALL questions in this section.

QUESTION 1

1.1   List any FIVE requirements for a solar panel to ensure maximum efficiency.   (5)

1.2   Name the purpose of each of the following parts of a solar heating system:

    1.2.1   Pressure-reducing valve   (2)
    1.2.2   Relief valve   (2)
    1.2.3   Primary flow pipe   (2)

1.3   State FIVE properties with which steel, used for reinforcement in concrete, must comply.   (5)

1.4   List any TEN important duties that an architect performs from the planning stage up to the completion of a project.   (10)

1.5   Describe fully what you would do when setting the line of sight parallel to the air-bubble axis so that the line of sight is horizontal.   (20)

1.6   Draw a neat sketch to illustrate the reading 2 752 as seen through a dumpy level on a surveyor's rod.   (5)

1.7   Identify the following standard abbreviations found on a sewer plan:

    1.7.1   CI   (1)
    1.7.2   BT   (1)
    1.7.3   RC   (1)
    1.7.4   GT   (1)
    1.7.5   SP   (1)

1.8   Name TWO tests that can be carried out on concrete.   (4)

[60]

QUESTION 2

Figure 1 shows a line diagram of a framework with point loads and an overhang.

2.1   Calculate the reactions at supports P and Q.
2.2   Draw the space diagram to a scale of 1:100.
2.3   Draw the vector diagram to a scale of 1 kN = 20 mm.
2.4   Determine graphically the magnitude and nature of the forces acting on each member of the framework.

Copy the table below into your answer book and answer Question 2.4 within the table.

MEMBER	NATURE	MAGNITUDE
AG		
BH		
CK		
DM		
EM		
FG		
FJ		
FL		
GH		
HJ		
JK		
KL		
LM		

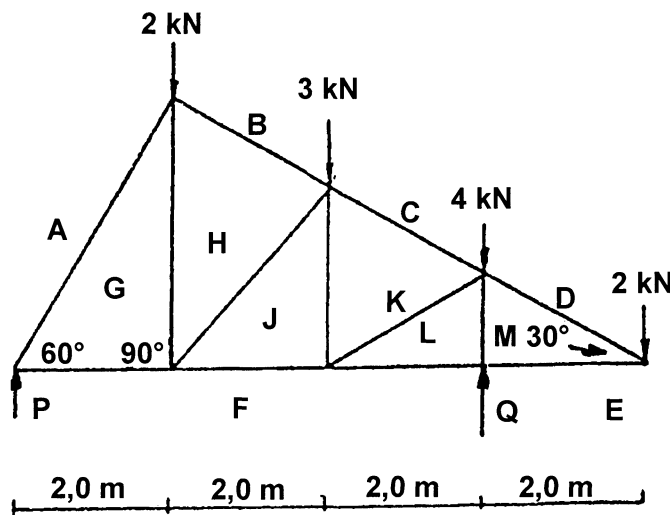**Figure 1**   [60]

QUESTION 3

Figure 2 shows a loaded beam supported at the ends.
The beam has three point loads and a distributed load of 2 kN/m.

3.1   Calculate the reactions at supports P and Q.

3.2   Calculate the bending moments at points A, B, C, D and E.

3.3   Calculate the shear forces at points A, B, C, D and E.

3.4   Draw the space, shear force and bending moment diagrams.

Use the following scales for the diagrams:

Space diagram   :   1:100

Shear force diagram   :   5 mm = 1 kN
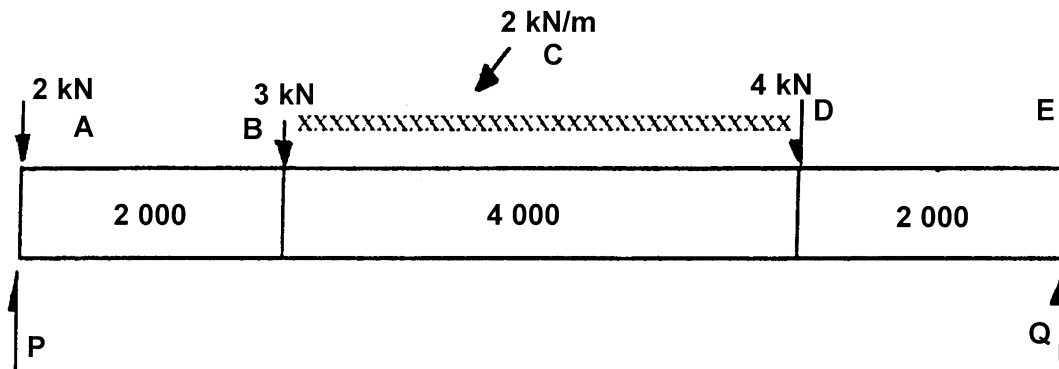
Bending moment diagram   :   1 kN/m = 2 mm

Figure 2   [60]

TOTAL FOR SECTION A: [180]

SECTION B

Answer any TWO questions from this section.

QUESTION 4

Figure 3 shows a floor plan of a dwelling. The dwelling has a hipped roof, covered with corrugated iron and has closed eaves with an overhang of 500 mm and a pitch of 30 degrees. The roof has 100 mm x 100 mm square gutters with 75 mm downpipes. The gutters are attached to a 200 mm x 30 mm fascia board.

The superstructure is 3 000 mm high and the substructure has six layers of bricks of which only two layers are above ground level.

The outer doors are framed, ledged and braced.

Use the window schedule for window sizes. The window sills on the outside are finished off with 150 mm x 30 mm clay tiles.

Draw to a scale of 1:100 the **North and East elevations** of the dwelling.
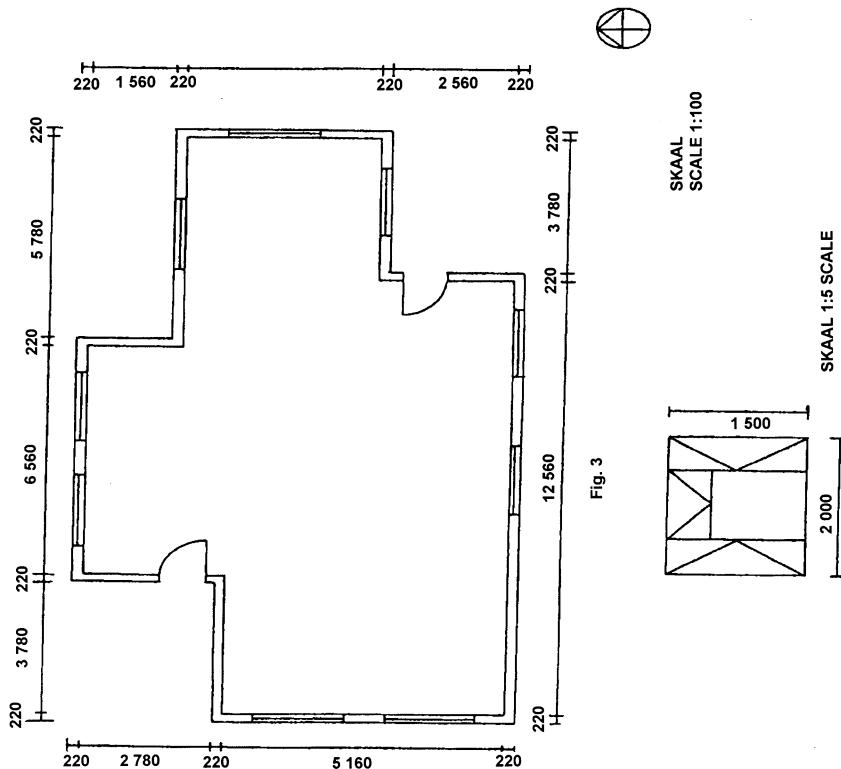Show by means of a scale drawing the method to determine the roof height.

Figure 3   **[60]**

QUESTION 5

A reinforced concrete beam is shown in **Figure 4**.

Make use of the following specifications to complete this section of the question:

Reinforcement for the beam:

3 main bars, each with a diameter of 20 mm
2 anchor bars, each with a diameter of 12 mm
2 shear reinforcement bars each with a diameter of 20 mm
Stirrups, each with a diameter of 8 mm, as needed for the beam

Reinforcement for the columns:

Four main bars each with a diameter of 16 mm
Stirrups, each with a diameter of 8 mm, as needed for each column

5.1 To a scale of 1:20, draw a longitudinal section through A – A, to show the necessary reinforcement in the concrete beam and the columns in position. (26)

5.2 Draw, to a scale of 1:5, a horizontal section through B – B, to clearly show one stirrup and the actual concrete cover. (13)

5.3 List FOUR important factors that have to be taken into consideration when bending steel. (8)

5.4 Name FOUR important reasons why steel reinforcing is used in concrete constructions. (8)

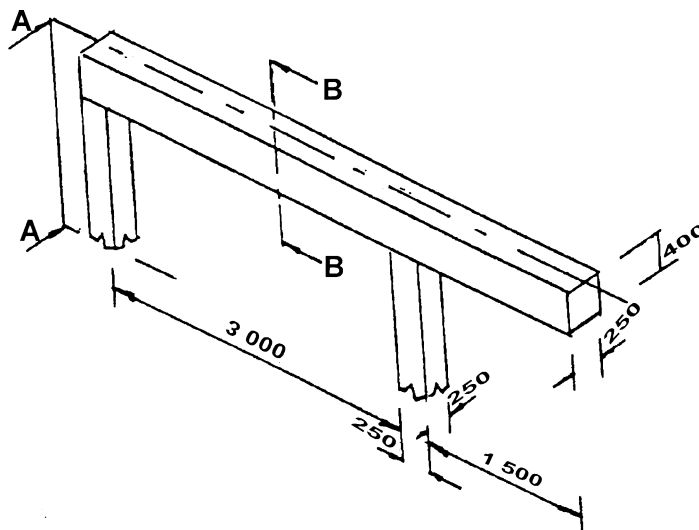5.5 Explain the following reinforcement details: **9R1201-300**. (5)

Figure 4 **[60]**

P.T.O.

QUESTION 6

6.1   Draw a neat, well proportioned sectional sketch of a septic tank that is connected to a French drain. (20)

6.2   The floor of a basement of a building is 2 700 mm below ground level and is 100 mm thick. The total height from the basement floor to the 100 mm concrete floor of the building at ground level is 3 000 mm.

The exterior wall of the building is one-and-a-half bricks thick, and plastered on the inside with vertical damp-proofing built in half-brick thickness from the exterior wall.

Draw, using a scale of 1:20, a vertical section through the exterior wall and part of the two concrete floors to show the necessary damp-proofing needed to ensure that no moisture penetrates the basement level. (20)

6.3   **Answer Sheet HG 712-1/1** shows a partial plan of a dwelling with an outbuilding. Standard abbreviations are used to show the sanitary fitments.

Use **Answer Sheet HG 712-1/1** and draw a suitable and effective drainage system for the dwelling. Show all drainage details by means of standard abbreviations. (20)

[60]

QUESTION 7

The first floor of a building comprises a concrete slab with a thickness of 150 mm supported by a 300 mm x 500 mm concrete beam. The total height of the floor and beam is 500 mm.

Draw to a scale of 1:10 a vertical section through the beam and slab and parts of the floor on both sides of the beam to show the formwork, the reinforcing and the top and bottom parts of the prop in position. [60]

TOTAL FOR SECTION B: [120]

TOTAL: 300

ANSWER SHEET HG 712-1/1
ANTWOORDBLAD HG 712-1/1

EXAMINATION NO.
EKSAMENNOMMER

SK
WC
ST
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SK
WC

HWB
WB

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B

HWB
WB

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WT

OWB

AANSLUITING
CONNECTION

HEINING FENCE

HOOFRIOOL   MAIN SEWERAGE

END / *EINDE*