GAUTENG DEPARTMENT OF EDUCATION

SENIOR CERTIFICATE EXAMINATION

TECHNIKA (CIVIL) HG

TIME: 3 hours

OCTOBER / NOVEMBER 2005
OKTOBER / NOVEMBER 2005

MARKS: 300

REQUIREMENTS:

- Answer book
- Drawing answer book 712-1/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 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 and 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 both your 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 standardized measurements.
- No Tipp-Ex must be used.
- Calculations to be rounded off to the second decimal.

SECTION A
COMPULSORY

QUESTION 1

1.1 Name FIVE reasons why building regulations are necessary. (10)

1.2 List FOUR reasons why steel reinforcement must be used in a concrete construction. (4)

1.3 Name any TWO density tests that can be carried out on a sewerage system. (2)

1.4 State FOUR properties with which steel, used for reinforcement in concrete must comply. (4)

1.5 List FIVE materials suitable for roof covering. (10)

1.6 Name the FOUR ingredients of concrete. (4)

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

1.7.1 Pressure-reducing valve (2)
1.7.2 Relief valve (2)
1.7.3 Primary flow pipe (2)

1.8 State any FOUR important characteristics needed when a gusset plate must be drawn in an angle-iron framework. (4)

1.9 What is understood by the term **typographical surveying**? (2)

1.10 Define the term **surveying**. (2)

1.11 Why do some solar collectors have a double glass cover? (2)

1.12 List FIVE ways in which possible injuries on a building site can be prevented. (10)
[60]

QUESTION 2

The first floor of a building consists of a 150 mm thick concrete floor which is supported by a 250 mm x 500 mm concrete beam. The total height of the floor and beam is 500 mm.
The floor is reinforced by 19 mm diameter round bars and the concrete beam by means of an I beam.
Draw, to a scale of 1:10, a vertical section through the beam and part of the floor on both sides of the beam to show the formwork, steel reinforcement and the top section of the prop in position.
Show also how the floor penetrates the one-brick-thick unplastered external wall. **[60]**

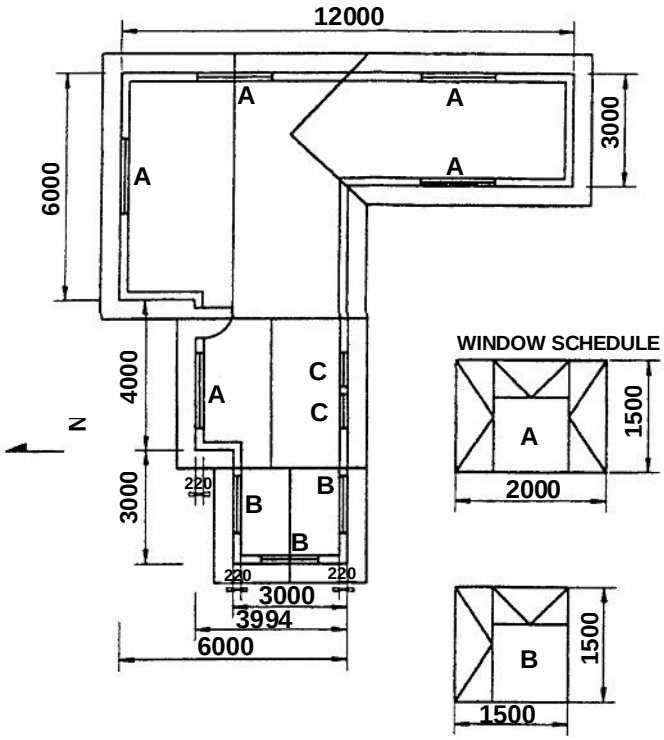
QUESTION 3

The plan of a dwelling is shown in **Figure 1** below. The dwelling has a gabled roof covered with corrugated iron. It also has open eaves with an overhang of 500 mm and a pitch of 30 degrees. The roof has 100 mm x 100 mm square gutters, 75 mm downpipes and 200 mm fascia and barge boards.
The superstructure is 2 800 mm high and the substructure 450 mm of which four layers of bricks are above ground level.
The dwelling has a framed Z-batten door. All windows are finished off with 150 mm x 30 mm clay tile window sills on the outside and must be placed in the correct position as shown on the ground plan.

Use the window schedule for window sizes.

Draw, according to a scale of 1:100, a NORTH and WEST elevation of this dwelling.

Show by means of a scale drawing the method to determine the different heights of the roof.



[60]

Figure 1

SECTION B

Answer any TWO questions from this section.

QUESTION 4

Figure 2 below shows a simply loaded beam supported at the ends.

4.1 Calculate the reactions at supports **LR** and **RR**.

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

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

4.4 Draw the space, bending moments and shear force diagrams

Use the following scales for the diagrams:

Space diagram	:	1:100
Bending moment diagram	:	1 kN/m = 2 mm
Shear force diagram	:	1 kN = 5 mm

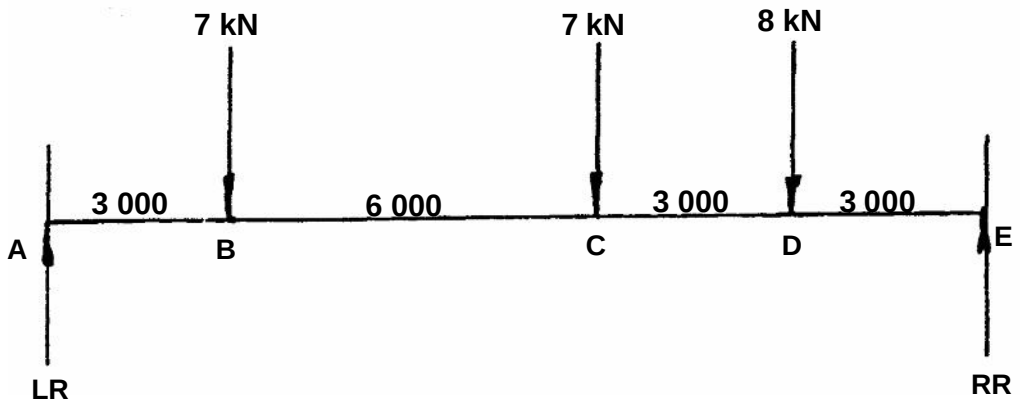


Figure 2 **[60]**

QUESTION 5

Figure 3 below shows a line diagram of a simply supported steel roof truss with three vertical loads.

5.1 Draw the space diagram using a scale of 1:100.

5.2 Draw the forces diagram using a scale of 1kN = 10 mm.

5.3 Determine graphically the magnitude and nature of the forces in each member of the framework.

Draw the table below in your answer book and answer Question 5.3 within the table.

MEMBER	MAGNITUDE	NATURE
AF		
EF		
FG		
BG		
GH		
CH		
HJ		
EJ		
JK		
DK		
EK		

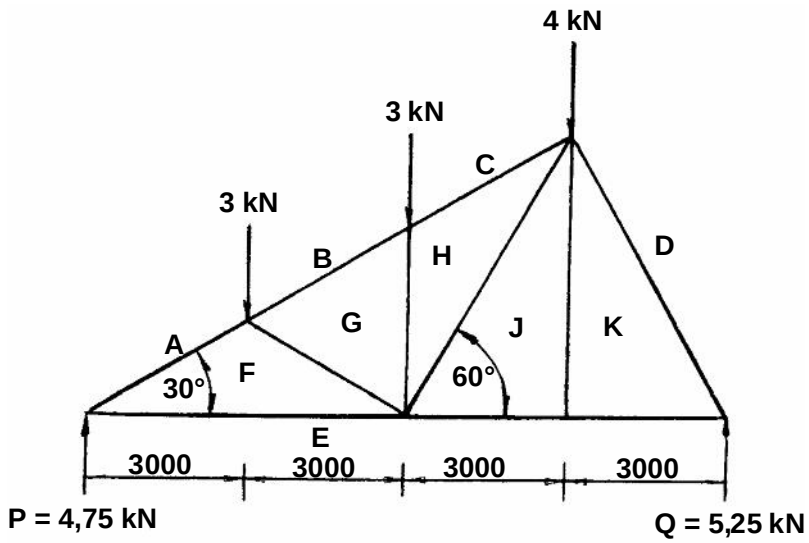


Figure 3 **[60]**

QUESTION 6

6.1 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. Show also how the wall, shore, wall-plate, cleat and needle fit together. (20)

6.2 A solar hot-water system consists of a solar collector and a horizontal electric hot-water geyser that must be installed in a dwelling with a 30-degree pitched roof. A pressure-reducing valve controls the cold water supply to the system.

By making use of a neat line diagram show the arrangement of all the components of this system.
Indicate also, by means of arrows, the direction of water flow when the system is in use.

Show clearly on the sketch the interconnection between the geyser and the hot-water cylinder. (20)

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

Clearly show the following:

- 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 the weight of an object. (4)

7.2 Define **load**. (3)

7.3 Define **strain**. (3)

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 20 mm diameter rod 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 types of steel bars used for concrete reinforcement. (8)

7.10 Interpret the following annotated code on a plan to ensure that the correct steel 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. Show also the stirrups to hold the reinforcement in place. (7)

[60]

TOTAL: 300

END

CANDIDATE'S NUMBER / *KANDIDAAT SE NOMMER*

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SENIORSERTIFIKAAT-EKSAMEN

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TECHNIKA (CIVIL)
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HG

DRAWING ANSWER BOOK
TEKENE ANTWOORDBOEK

712-1/X

4 pages / *bladsye*

QUESTION *VRAAG*	MARKS *PUNTE*	INITIAL *PARAFEER*
TOTAL / *TOTAAL*		