GAUTENG DEPARTMENT OF EDUCATION

SENIOR CERTIFICATE EXAMINATION

TECHNIKA (CIVIL) HG

FEB / MAR 2006

TIME: 3 hours

MARKS: 300

REQUIREMENTS:

- Answer book
- A3 – Drawing answer book 712-1/0X
- 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 Give FIVE requirements to which a solar heating system must comply in order to achieve the most satisfactory results. (10)

1.3 State FIVE properties with which steel, used for reinforcement in concrete must comply. (10)

1.4 Name FIVE aspects to consider when buying a new stand for a dwelling. (5)

1.5 List FIVE points to consider when buying timber for a roof. (5)

1.6 State the function of each of the following components of a solar-heating system:

1.6.1 Pressure-reducing valve (2)

1.6.2 Pressure-relief valve (2)

1.6.3 Full-way valve (2)

1.7 List FOUR characteristics of a damp-proofing course. (4)

1.8 A 100 mm square bar is subjected to a force of 80 kN. Calculate

1.8.1 the stress in the material. (5)

1.8.2 the change of shape E = 200 GPa. (5)
[60]

QUESTION 2

2.1 **Figure 1** 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.

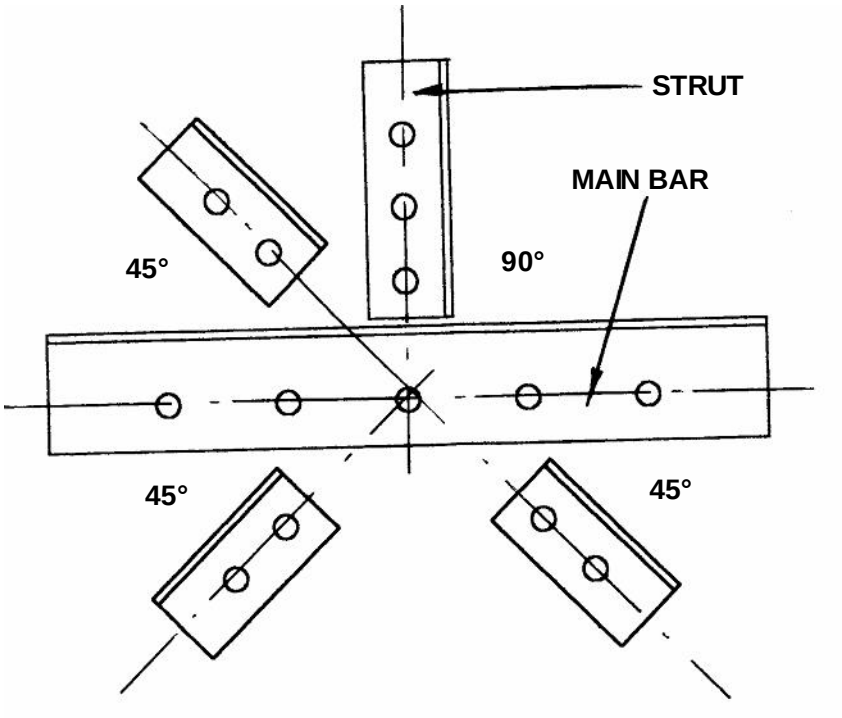


Figure 1 (20)

2.2 Show by means of a sketch the construction of a one-brick foundation wall.

The following must clearly be shown on the sketch:

- Concrete foundation strip
- Foundation wall
- Core filling
- Hard core
- Ground level
- Blinding
- Screed
- Damp-proof
- Concrete floor
- Floor blocks
- Quarter round
- Skirting
- Part of the one-brick outer wall
- Plaster finish on the inside wall (20)

2.3 A solar hot-water heating system consists of a solar collector and an electric storage cylinder which must be installed in a dwelling with a 30 degree pitched roof.

The cold water supply to the electric hot-water storage cylinder is controlled by a pressure reducing valve.

By making use of a neat line diagram, show the arrangement of all the components of the hot-water system. Indicate also by means of arrows, the direction of flow of water when the system is in use. (20)
[60]

QUESTION 3

Figure 2 below shows the ground plan of a dwelling. It has a hipped roof covered with corrugated iron. The slope is 30 degrees with an open eaves overhang of 500 mm. The 100 mm x 100 mm square gutter with 75 mm diameter downpipes are fixed to a 200 mm asbestos fascia board.

The superstructure is 2 700 mm high and the substructure 300 mm.
The 3-panel door fits into a 100 mm wooden casing and the window sills on the outside are finished off with 30 mm clay tiles.

Draw, to a scale of 1:100, the South and East elevation of this dwelling.

Show by means of a scale drawing how to determine the height of the roof.

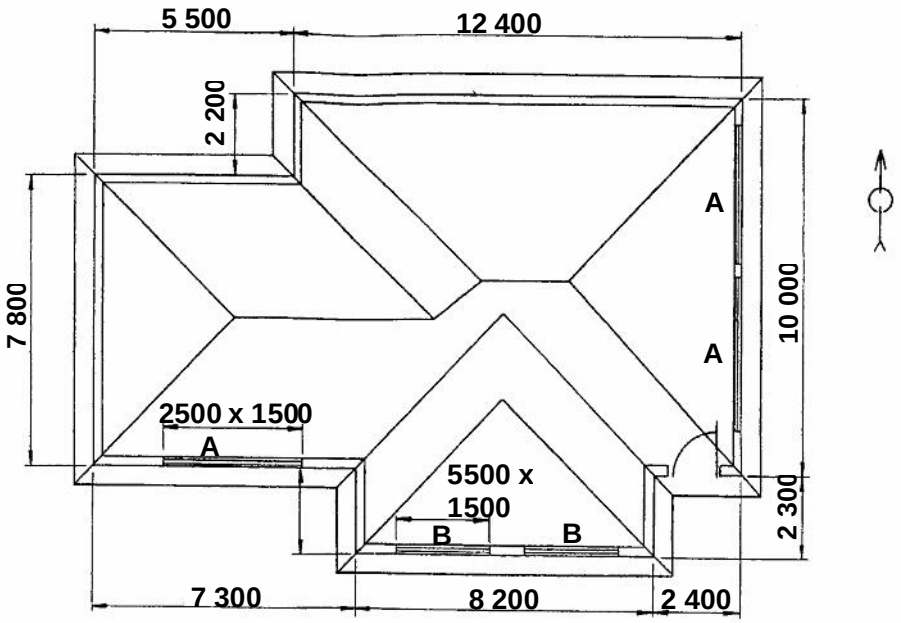


Figure 2 **[60]**

SECTION B

Answer any TWO questions from the section.

QUESTION 4

Figure 3 below shows a simply supported beam with two point loads and distributed loads.

4.1 Calculate the reactions at supports **P** and **Q**.

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

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

4.4 Draw the space-, bending moment and shear force diagrams.

Use the following scales:

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

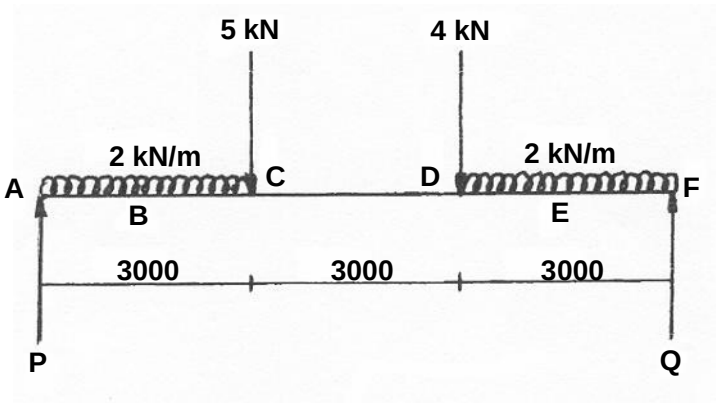


Figure 3 **[60]**

QUESTION 5

Figure 4 below shows a line diagram of a framework.

5.1 Calculate the reactions at supports **P** and **Q** on the framework.

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

5.3 Draw the space diagram to a scale of 1:100.

5.4 Draw a vector diagram to a scale of 10 mm = 1 kN.

Draw the table below in your answer book and answer Question 5.2 within the table.

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

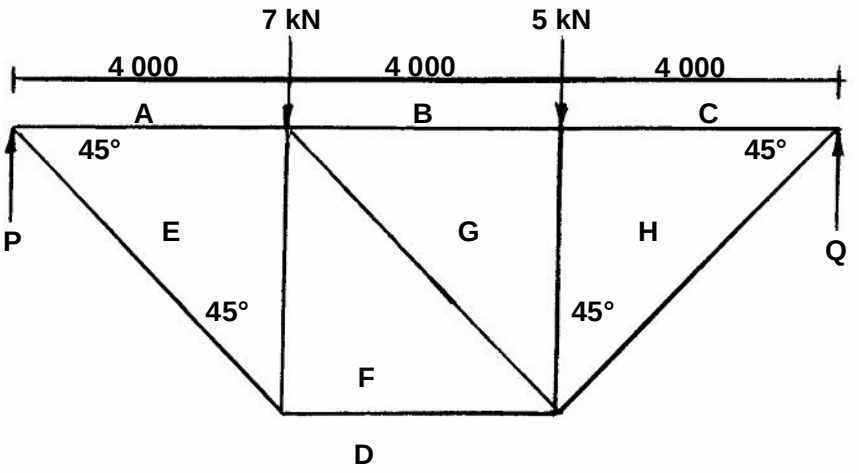


Figure 4 **[60]**

QUESTION 6

6.1 Determine the position of the centroid of the lamina shown in **Figure 5**, in relation to sides **MN** amd **MO**.

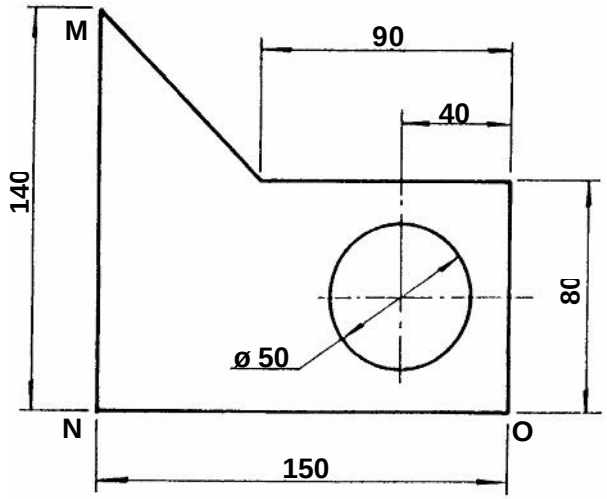
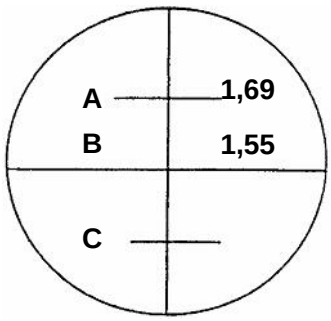


Figure 5 (20)

6.2 A reading is given at **A** and **B** on a surveying rod. Calculate the reading at **C** as well as the horizontal distance from the rod to the dumpy level.



(10)

6.3 Describe how you would proceed to measure the slumping in a slump test. (10)

6.4 Describe fully how you would go about setting the line of sight parallel to the air-bubble axis so that the line of sight is horizontal. (20)
[60]

QUESTION 7

The first floor of a building consists of a 150 mm thick concrete floor which is supported by a 300 mm x 500 mm-concrete beam. The total height of the floor and beam is 500 mm.

Use a scale of 1:10 and draw 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 and bottom sections of the prop in position. **[60]**

TOTAL: 300

END