SENIOR CERTIFICATE EXAMINATION
SENIORSERTIFIKAAT-EKSAMEN

OCTOBER / NOVEMBER
OKTOBER / NOVEMBER

2004

TECHNIKA (CIVIL)
TECHNIKA (SIVIEL)

SG 712-2/0

14 pages
14 *bladsye*

TECHNIKA CIVIL SG
Question Paper & Answer Book

712 2 0 SG

APPROVED BY UMALUSI / *GOEDGEKEUR DEUR UMALUSI*

GAUTENGSE DEPARTEMENT VAN ONDERWYS

SENIORSERTIFIKAAT-EKSAMEN

TECHNIKA (SIVIEL) SG

TYD: 3 uur

PUNTE: 300

BENODIGDHEDE:

- Antwoordboek
- Tekenantwoordboek 712-2/X
- Tekeninstrumente
- Sakrekenaar
- Antwoordblad SG 712-2/1 (1)

INSTRUKSIES:

- Hierdie vraestel bestaan uit TWEE afdelings, Afdeling A en Afdeling B.
- Afdeling A is VERPLIGTEND.
- Kandidate moet Afdeling A en enige TWEE vrae uit Afdeling B beantwoord.
- Alle berekeninge en skriftelike antwoorde moet in jou antwoordboek gedoen word, en alle tekeninge in die tekenantwoordboek.
- Nommer die vrae soos dit op die vraestel voorkom.
- Toon die nommer van die vraag wat jy beantwoord duidelik aan.
- Doen behoorlike beplanning.
- Tekeninge en sketse moet volledig gemaatskryf en netjies met die nodige opskrifte en byskrifte afgewerk word in ooreenstemming met die SABS se Aanbevole Praktyk vir Boutekene.
- Skryf jou eksamennommer op alle los bladsye, die tekenantwoordboek en jou antwoordboek.
- Vir die doel van hierdie eksamen moet die baksteengrootte as 220 mm x 110 mm x 75 mm geneem word.
- Afmetings wat nie genoem of gegee word nie, moet volgens gestandaardiseerde mates geneem word.
- Geen Tipp-Ex mag gebruik word nie.
- Berekeninge moet tot die tweede desimale plek afgerond word.
- Maak asseblief die antwoordblad los en sit dit **in** jou antwoordboek as jy dit voltooi het.

GAUTENG DEPARTMENT OF EDUCATION

SENIOR CERTIFICATE EXAMINATION

TECHNIKA (CIVIL) SG

TIME: 3 hours

MARKS: 300

REQUIREMENTS:

- Answer book
- Drawing answer book 712-2/X
- Drawing instruments
- Pocket calculator
- Answer Sheet SG 712-2/1 (1)

INSTRUCTIONS:

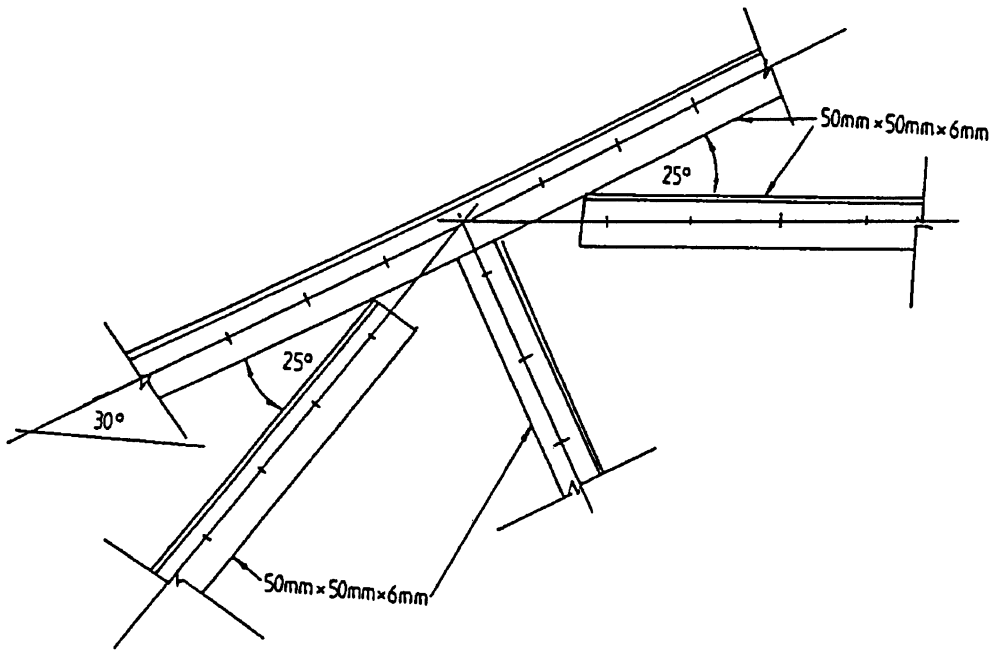
- This question paper consists of TWO sections, Section A and Section B.
- Section A is COMPULSORY.
- Candidates must answer Section A and any TWO questions from Section B.
- All calculations and written answers must be done in your answer book, and the drawings in the drawing answer book.
- Number the questions as they appear in the examination question paper.
- Clearly indicate 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 standardized measurements.
- No Tipp-Ex must be used.
- Calculations to be rounded off to the second decimal figure.
- Please detach the answer sheet and place it **inside** your answer book when you are finished.

AFDELING A
VERPLIGTEND

VRAAG 1

1.1 **Figuur 1** toon 'n aansluiting van 'n staaldakkap. Teken, volgens 'n skaal van 1:5, 'n gedetailleerde tekening van die verbinding vir hierdie dakkap se knoopplaat deur van die volgende afmetings gebruik te maak:

Hoofstang en stutte	:	50 mm x 50 mm x 6 mm
Boutdiameter (D)	:	20 mm
Boutsteek van hoofstaaf en stutte	:	4 D
Naatrand	:	1.5 D
Standaard kontramerke	:	28 mm (40)



Figuur 1

1.2 Die muur van 'n gebou moet deur middel van leunskore gestut word. Teken 'n isometriese aansig volgens 'n skaal van 1:10 wat die bopunt sowel as die onderpunt van hierdie skoor illustreer.

Gebruik die volgende afmetings vir die tekening:

Muurplaat	228 mm x 75 mm
Klos	200 mm x 100 mm x 100 mm
Naald	300 mm x 100 mm x 100 mm
Leunskoor	228 mm x 228 mm
Muurhak	8 mm diameter (20)

[60]

SECTION A
COMPULSORY

QUESTION 1

1.1 **Figure 1** shows a junction of a steel roof truss. Draw, to a scale of 1:5, a detailed drawing of the junction of this truss gusset plate by using the following measurements:

Main bar and struts	:	50 mm x 50 mm x 6 mm
Bolt diameter (D)	:	20 mm
Bolt pitch of main bar and struts	:	4 D
Border seam	:	1.5 D
Standard back marks	:	28 mm

(40)

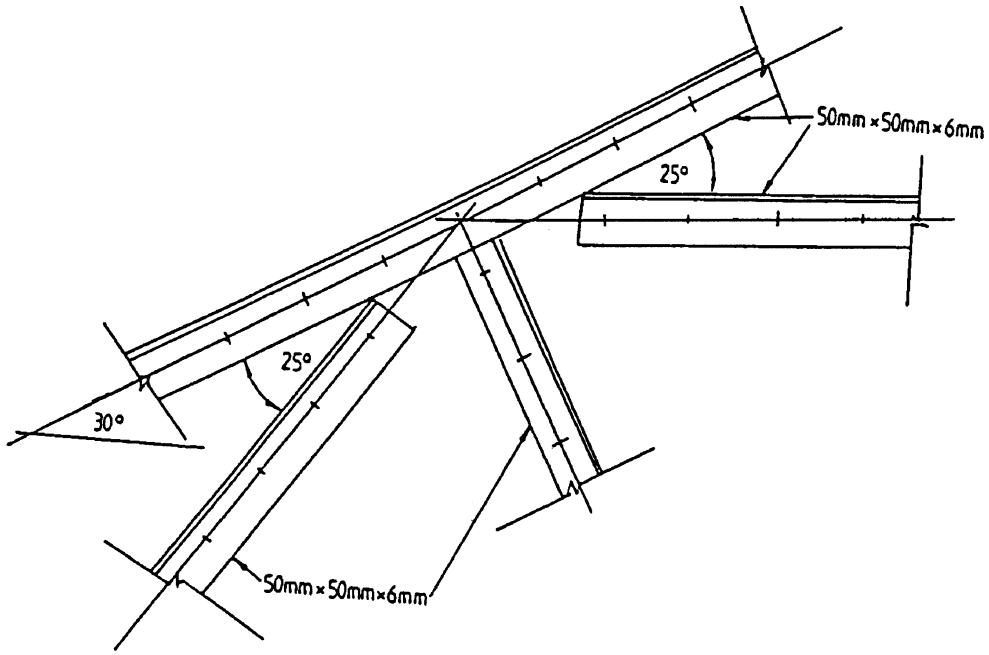


Figure 1

1.2 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)
[60]

VRAAG 2

2.1 Noem enige SEWE gegewens wat van terreinplanne verkry kan word. (7)

2.2 Noem enige VYF belangrike faktore om in ag te neem wanneer 'n nuwe standplaas (erf) aangekoop word. (5)

2.3 Noem DRIE vereistes vir bewapening in beton. (3)

2.4 Noem DRIE verskillende soorte skore. (3)

2.5 Noem VIER bestanddele van mortel (dagha). (4)

2.6 Noem VIER onderdele wat aan die bopunt van leunskore aangetref word. (4)

2.7 Noem enige NEGE lede van 'n bouspan. (9)

2.8 Noem VYF belangrike aspekte wat in ag geneem moet word wanneer hout vir dakkonstuksies aangekoop word. (5)

2.9 Noem VIER gebruike van glas in die boubedryf. (4)

2.10 Noem die kleure van die volgende komponente op bouplanne:

2.10.1 Bestaande riole (1)
2.10.2 Nuwe riole (1)
2.10.3 Vuilpype (1)
2.10.4 Vuilwaterpype (1)

2.11 Gee die standaardafkortings vir die volgende onderdele:

2.11.1 Vuillugpyp (1)
2.11.2 Luguitlaatpyp (1)
2.11.3 Handewasbak (1)
2.11.4 Hospitaalopwasbak (1)
2.11.5 Weekstaalpyp (1)
2.11.6 Vuilwaterpyp (1)
2.11.7 Bodemdiepte (1)
2.11.8 Vetvanger (1)

2.12 Noem VIER gebruike van 'n bukswaterpas. (4)
[60]

QUESTION 2

2.1 Name any SEVEN facts that can be obtained from site plans. (7)

2.2 List any FIVE important points to consider when buying a property stand. (5)

2.3 Name THREE requirements for reinforcing used in concrete. (3)

2.4 Name THREE different types of shoring. (3)

2.5 List FOUR components of mortar (dagha). (4)

2.6 Name FOUR parts found at the top of a raking shore. (4)

2.7 Name any NINE members of a building team. (9)

2.8 List FIVE important points to consider when buying timber for roof construction. (5)

2.9 Name FOUR uses for glass in the building industry. (4)

2.10 Name the colour of the following components on building plans:

2.10.1 Existing sewerage (1)
2.10.2 New drainage (1)
2.10.3 Soil pipes (1)
2.10.4 Waste pipes (1)

2.11 Give the standard abbreviations for the following parts:

2.11.1 Soil vent pipe (1)
2.11.2 Outlet ventilation pipe (1)
2.11.3 Wash-hand basin (1)
2.11.4 Hospital slop sink (1)
2.11.5 Mild steel pipe (1)
2.11.6 Waste pipe (1)
2.11.7 Invert depth (1)
2.11.8 Grease trap (1)

2.12 List FOUR uses of a dumpy level. (4)

[60]

VRAAG 3

Figuur 2 hieronder toon 'n grondplan van 'n gebou wat opgerig moet word. Bereken die hoeveelheid stene wat benodig sal word vir:

3.1 Die fondasiemure

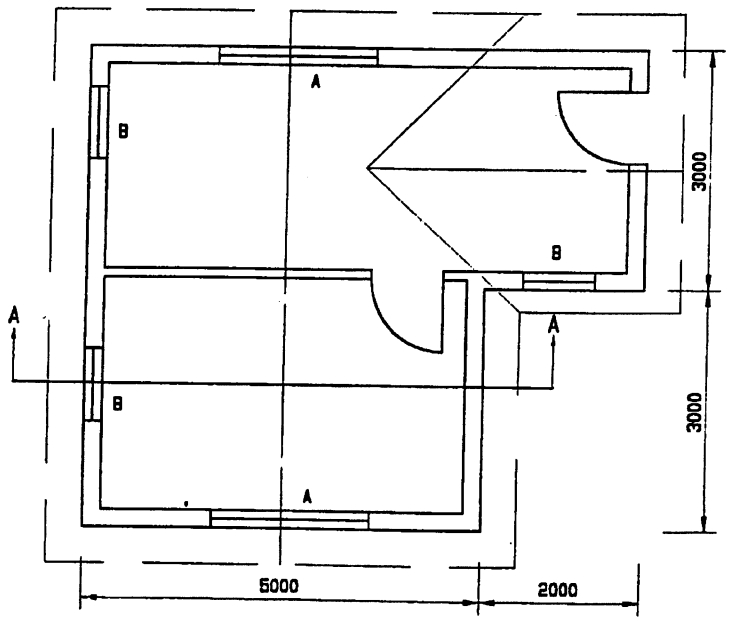
3.2 Die buitemure

3.3 Die binnemure

3.4 Die balkvulling

3.5 Die totale hoeveelheid stene vir die hele gebou

Slegs die hoeveelheid stene vir vensters en deure moet afgetrek word.



Figuur 2

Gebruik die volgende spesifikasies vir die berekeninge:

- Gebruik 50 stene per vierkante meter vir 'n halfsteenmuur.
- Hoogte van die onderbou is 300 mm.
- Hoogte van die bobou is 2 800 mm.
- Hoogte van die balkvulling is 3 steenlae.
- Deuropeninge is 2 000 mm x 800 mm.
- Venster A is 2 000 mm x 1 500 mm.
- Venster B is 1 500 mm x 900 mm.
- 'n 6% vermorsing van stene moet ook in berekening gebring word.

Gebruik die Antwoordblad SG 712/2/1(1) om hierdie vraag te beantwoord. **[60]**

TOTAAL VIR AFDELING A: **[180]**

QUESTION 3

Figure 2 below shows the ground plan of a building to be erected. Determine the number of bricks required for:

3.1 The foundation walls

3.2 The outer walls

3.3 The inner walls

3.4 The beam filling

3.5 The total number of bricks for the complete building

Only the number of bricks for the doors and windows must be deducted.

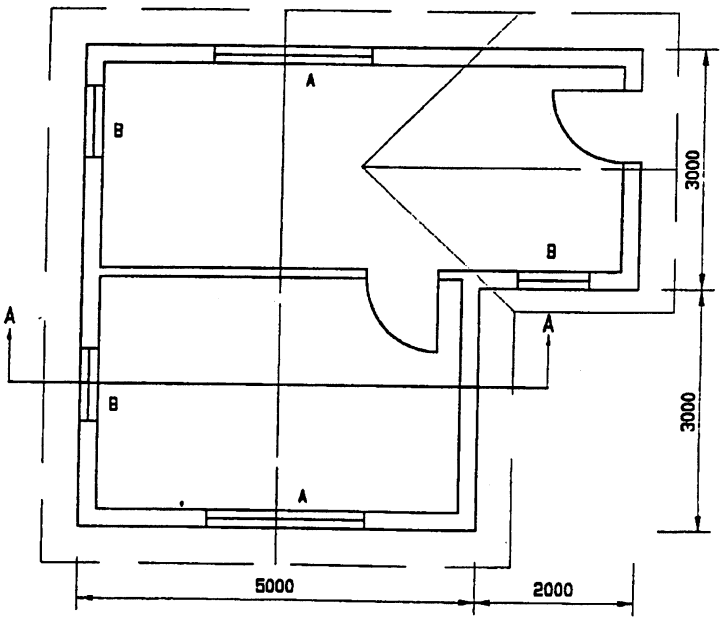


Figure 2

Use the following specifications for the calculations:

- Use 50 bricks per square metre for a half-brick wall.
- The substructure is 300 mm high.
- The superstructure is 2 800 mm high.
- The beam filling is 3 layers of bricks high.
- The door openings are 2 000 mm x 800 mm.
- Window A is 2 000 mm x 1 500 mm.
- Window B is 1 500 mm x 900 mm.
- A 6% wastage of bricks must also be calculated.

Use Answer Sheet SG 712/2/1(1) to complete this question. **[60]**

TOTAL FOR SECTION A: [180]

AFDELING B

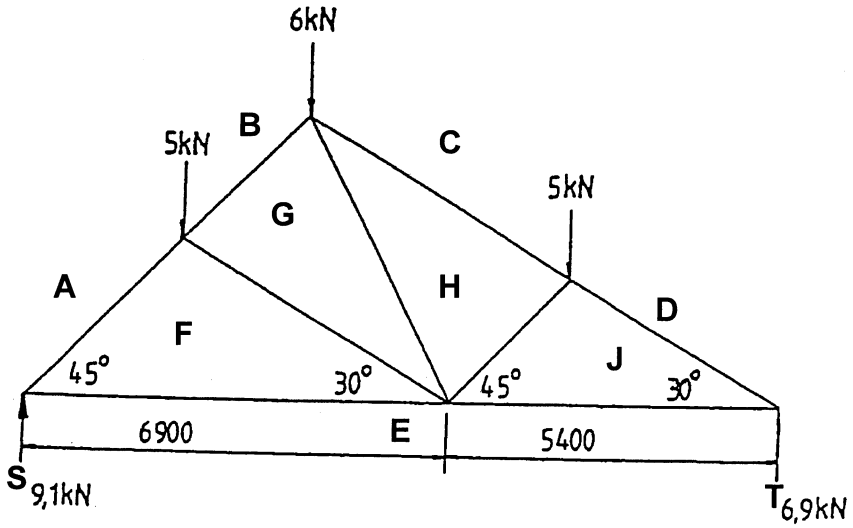
Beantwoord enige TWEE vrae uit hierdie afdeling.

VRAAG 4

Figuur 3 hieronder toon 'n lyndiagram van 'n raamwerk wat eenvoudig op sy ente ondersteun word.

4.1 Teken 'n volledige ruimtediagram deur gebruik te maak van 'n skaal van 1:100.

4.2 Teken 'n vektordiagram volgens 'n skaal van 10 mm = 1 kN.



Figuur 3

Teken die onderstaande tabel in jou antwoordboek oor en beantwoord Vraag 4.3 daarop.

4.3 Bepaal grafies die grootte en aard van die kragte wat op elke onderdeel van die raamwerk inwerk.

ONDERDEEL	AARD	GROOTTE
JE		
AF		
HJ		
BG		
GH		
CH		
DJ		
FE		
GF		

[60]

SECTION B

Answer any TWO questions from this section.

QUESTION 4

Figure 3 below shows a line diagram of a framework simply supported at its ends.

4.1 Draw a complete space diagram by using a scale of 1:100.

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

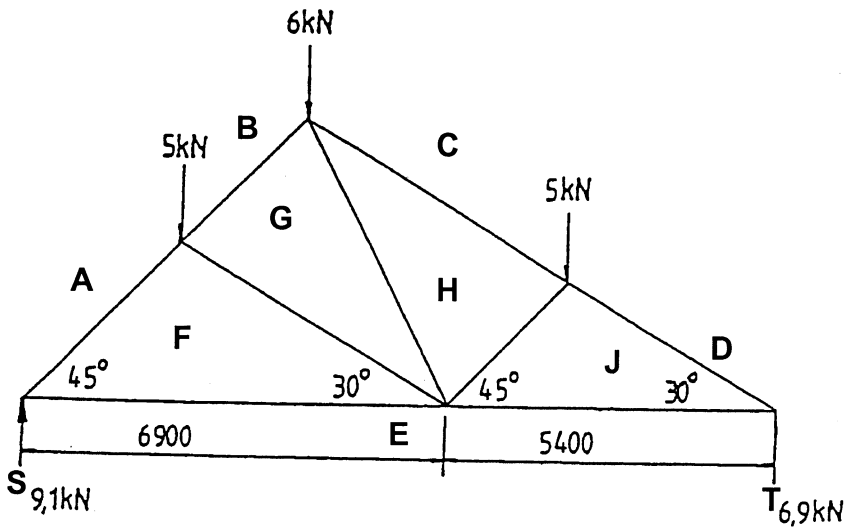


Figure 3

Draw the table below in your answer book and answer Question 4.3 within the table.

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

MEMBER	MAGNITUDE	NATURE
JE		
AF		
HJ		
BG		
GH		
CH		
DJ		
FE		
GF		

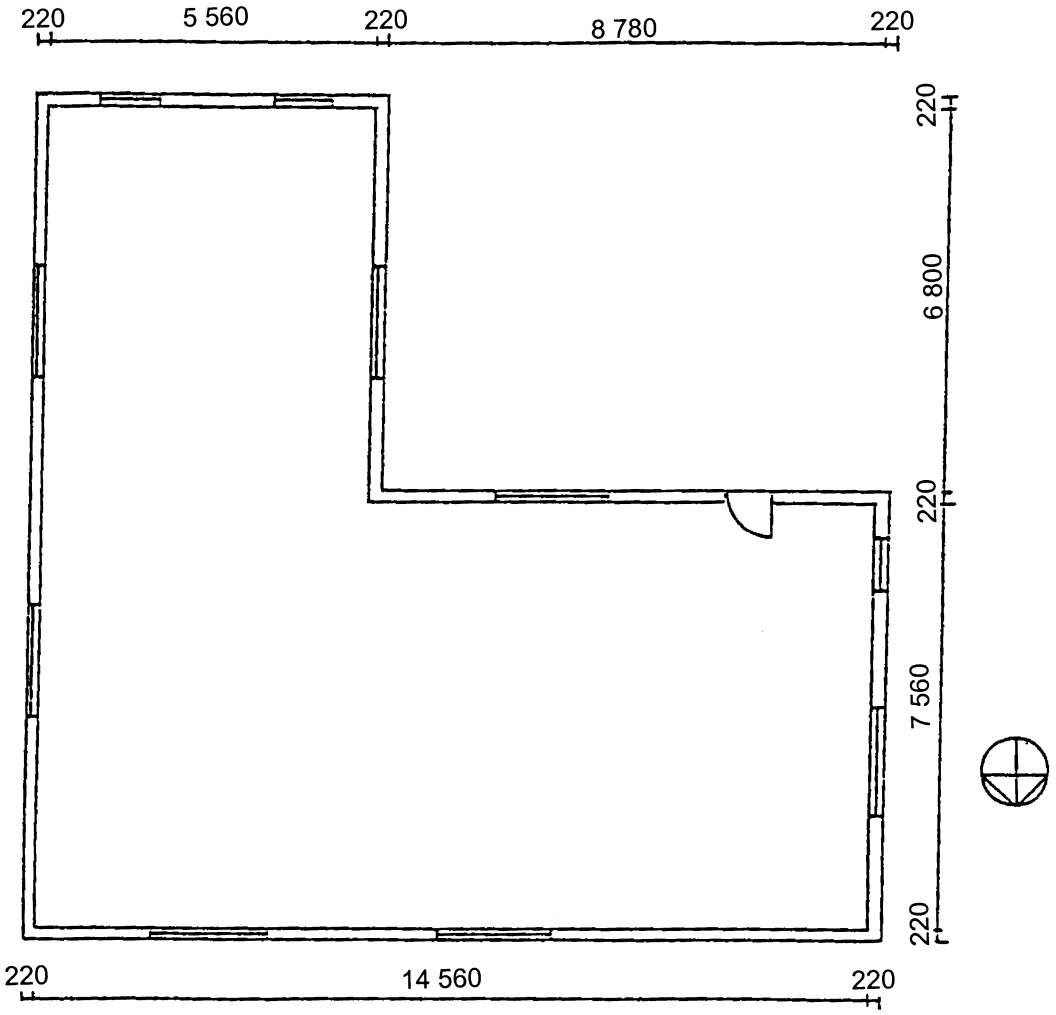
[60]

VRAAG 5

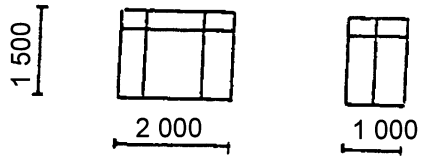
Figuur 4 hieronder toon 'n grondplan van 'n woonhuis. Die woonhuis is van 'n 30° geweldak met 'n 500 mm oop oorhang voorsien en met 'n 200 mm fassiebord, waaraan die 100 mm x 100 mm vierkantige geute met 75 mm afleipype geheg is, afgewerk. Die vloer is 300 mm bokant die grondvlak en die bobou hoogte is 2 900 mm. Die voordeur is 'n geraamde, geklampte verspande bo- en onderdeur wat in 'n 75 mm houtkosyn pas, en die vensterbanke is afgewerk met 30 mm kleiteëls.

Teken, volgens 'n skaal van 1:100, 'n suid- en oosaansig van hierdie woonhuis. Toon ook deur van 'n skaaltekening gebruik te maak, hoe die dakhoogtes bepaal word.

Gebruik die vensterskedule vir die venstergroottes.



Figuur 4



[60]

QUESTION 5

Figure 4 below shows a ground plan of a dwelling. The dwelling has a gabled roof with a 30° pitch, a 500 mm open eave overhang, and is finished off with a 200 mm fascia board to which the 100 mm x 100 mm square gutter and 75 mm downpipes are attached. The floor is 300 mm above ground level and the superstructure is 2 900 mm high. The front door is a framed, ledged and braced Dutch door fitting in a 75 mm wooden frame and the window sills are finished with 30 mm clay tiles.

Draw, to a scale of 1:100, a south and east elevation of this dwelling.
Show by means of a scale drawing how the roof heights are determined.

Use the window schedule for window sizes.

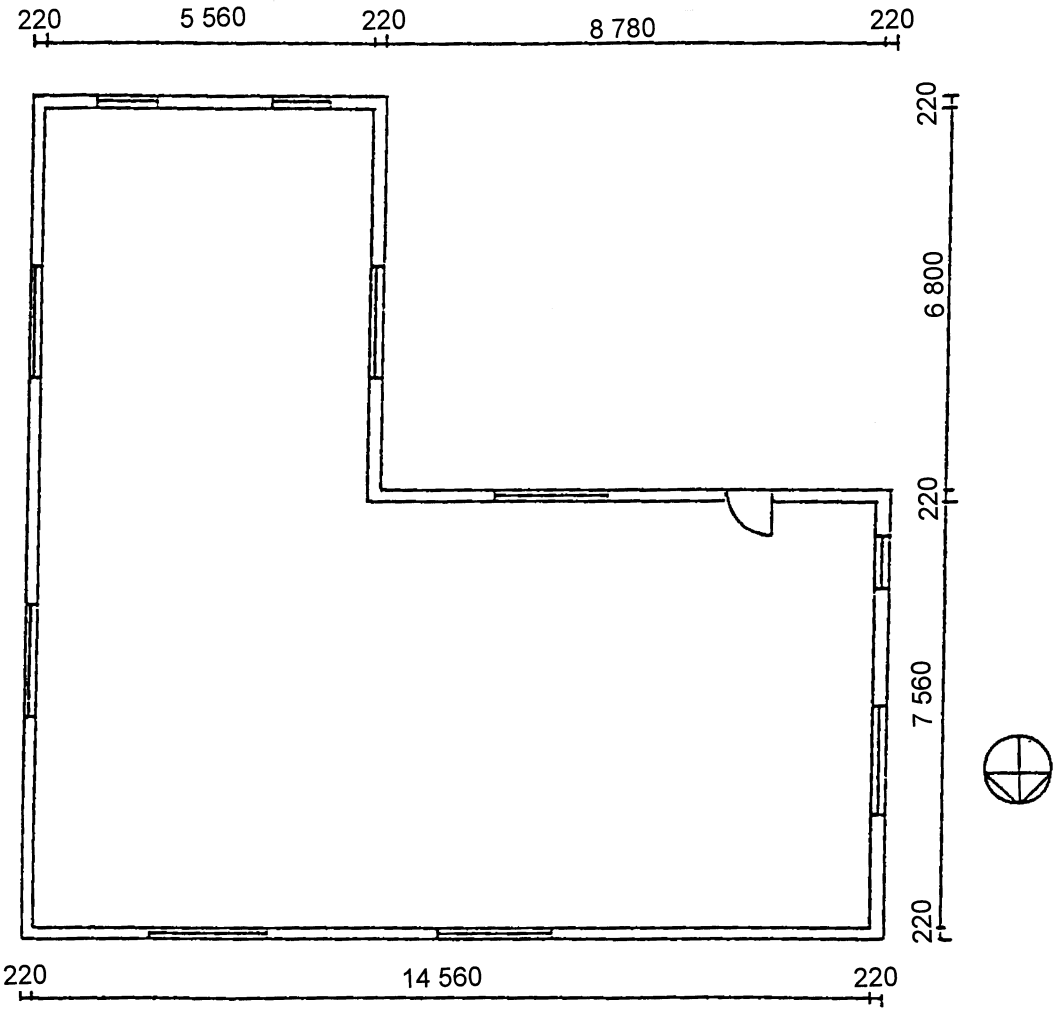
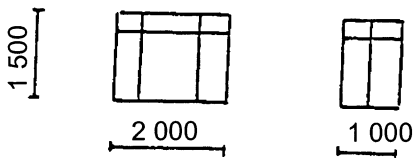


Figure 4



[60]

VRAAG 6

'n Betonbalk van 300 mm wyd breed en 400 mm diep word enkelvoudig ondersteun deur twee reghoekige 400 mm x 300 mm betonkolomme. Die spanwydte tussen die kolomme is 3 600 mm.

Gebruik die volgende spesifikasies om die tekening te voltooi:

BALK

TWEE hoofstawe van 25 mm in deursnee
EEN skuifbewapeningstaaf van 25 mm in deursnee
TWEE ankerstawe van 20 mm in deursnee
Gebruik 6 mm beuels soos nodig

KOLOMME

Moet 1 meter hoog geteken word
VIER hoofstawe van 20 mm in deursnee
Gebruik 6 mm beuels soos nodig

6.1 Teken, volgens 'n skaal van 1:20, 'n lengtesnit deur die lengte van die balk en 'n gedeelte van die kolomme om die posisie van die staalbewapening duidelik aan te toon.

6.2 Gebruik 'n skaal van 1:5 en teken 'n vertikale snit deur die middel van die balk en toon die bewapening duidelik in posisie.

6.3 Teken volgens 'n skaal van 1:5, 'n snit deur die balk, 100 mm vanaf die regterkantse kolom om die bewapening duidelik in posisie aan te toon. **[60]**

QUESTION 6

A concrete beam 300 mm wide and 400 mm deep is simply supported by two rectangular 400 mm x 300 mm concrete columns. The span between the columns is 3 600 mm.

Use the following specifications to complete the drawing :

BEAM

TWO main bars of 25 mm diameter
ONE shear force rod of 25 mm diameter
TWO anchor bars of 20 mm diameter
Use 6 mm stirrups as required

COLUMNS

To be drawn 1 meter high
FOUR main bars of 20 mm diameter
Use 6 mm stirrups as required

6.1 Draw, to a scale of 1:20, a vertical section through the length of the beam and part of the columns to clearly show the positioning of the reinforcing.

6.2 To a scale of 1:5, draw a vertical section through the centre of the beam and show the reinforcing in position.

6.3 Draw, by using a scale of 1:5, a section through the beam, 100 mm from the right-hand column to clearly show the reinforcing in position. **[60]**

VRAAG 7

Figuur 5 hieronder toon 'n diagram van 'n enkelvoudig ondersteunde balk by **P** en **Q**.

7.1 Bereken die reaksies by **P** en **Q**.

7.2 Bereken al die buigmomente van die balk.

7.3 Bereken al die skuifkragte van hierdie balk.

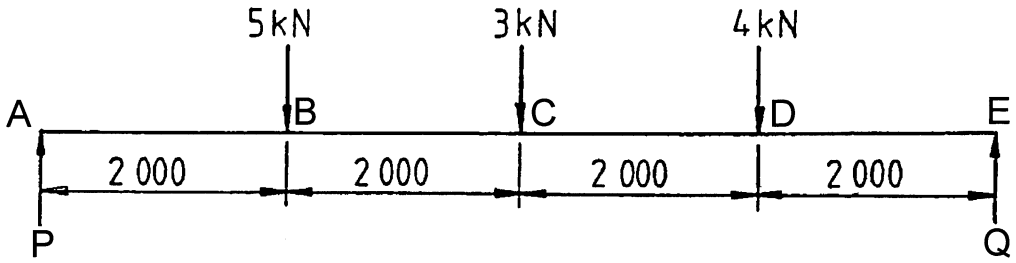
7.4 Teken die ruimte-, buigmoment- en skuifkragtediagramme van die balk.

Gebruik die volgende skale:

Ruimtediagram : 1:100

Skuifkragdiagram : 5 mm = 1 kN

Buigmomentdiagram : 2 mm = 1 kNm



Figuur 5 **[60]**

TOTAAL VIR AFDELING B: [120]

TOTAAL: 300

QUESTION 7

Figure 5 below shows a diagram of a simply supported beam at **P** and **Q**.

7.1 Calculate the reactions at **P** and **Q**.

7.2 Calculate all the bending moments of the beam.

7.3 Calculate all the shear forces in the beam.

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

Use the following scales:

Space diagram : 1:100

Shear force diagram : 5 mm = 1 kN

Bending moment diagram : 2 mm = 1 kNm

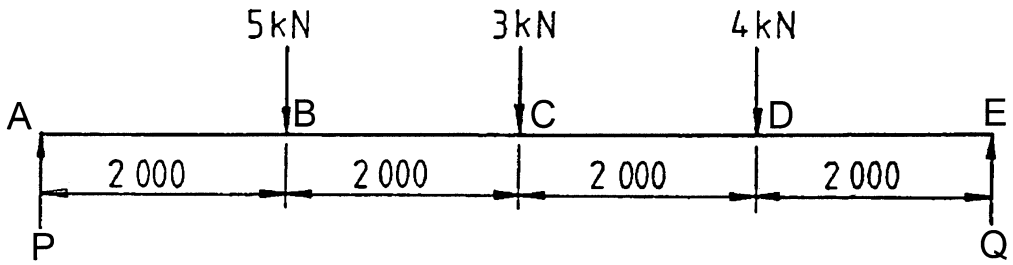


Figure 5 **[60]**

TOTAL FOR SECTION B: [120]

TOTAL: 300

ANSWER SHEET / *ANTWOORDBLAD* SG 712-2/1(1)

EXAMINATION NUMBER / *EKSAMENNOMMER*: | | | | | | | | | | | | |

CENTRE NUMBER / *SENTRUMNOMMER*: | | | | | | | | | | | | |

- Please detach the answer sheet (pages 10-14) on completion and place it **inside** your answer book. / *Maak asseblief die antwoordblad (bladsy 10-14) los en plaas dit **binne-in** jou antwoordboek wanneer jy dit voltooi het.*

- Write your examination number in the spaces provided. / *Skryf jou eksamennommer in die spasies wat daarvoor voorsien is.*

NOTE / *NOTA*

Fill in the missing answer in the block [ ]. / *Voltooi deur die ontbrekende antwoord in die blok [ ] in te vul.*

e.g. / *bv.*

Minus 4 x [ ] = [ ]

Minus 4 x [**110**] = [**440**]

A	B	C	D
			Substructure centre line / *Onderbou hartlyn*
			2 x [ ] = [ ] mm
			2 x [ ] = [ ] mm
			[ ] mm
			Minus 4 x [ ] = [ ] mm
			[ ] mm
			The centre line is / *Die hartlyn is* [ ] m
			Height of the substructure is [ ] mm
			Hoogte van die onderbou is [ ] mm
			50 bricks per square metre for a half-brick wall
			50 stene per vierkante meter vir 'n halfsteenmuur
			There are [ ] half-brick walls.
			Daar is [ ] halfsteenmure.
1/	[ ] [ ] [ ]	[ ] m	
[ ]/	[ ] 50 [ ]	[ ]	[ ] bricks are required. *Daar is [ ] stene nodig.*
			Superstructure centre line / *Bobou hartlyn*
			2 x [ ] = [ ] mm
			2 x [ ] = [ ] mm
			[ ] mm
			Minus 4 x [ ] = [ ] mm [ ] mm
			The centre line is / *Die hartlyn is* [ ] m
			Height of the superstructure is [ ] mm.
			Hoogte van die bobou is [ ] mm.
			50 bricks per square metre for a half-brick wall
			50 stene per vierkante meter vir 'n halfsteenmuur
			There are [ ] half-brick walls.
			Daar is [ ] halfsteenmure.
1/	[ ] [ ] [ ]	[ ]	
[ ]/	[ ] 50 [ ]	[ ]	[ ] bricks are required. *Daar is [ ] stene nodig.*

			Beam filling centre line / *Balkvulling hartlyn*
			2 x 6 000 = 12 000 mm
			2 x 6 000 = 14 000 mm
			26 000 mm
			Minus 4 x [ ] = [ ] mm
			[ ] mm
			The centre line is / *Die hartlyn is* [ ] m
			Height of the beam filling is [ ] mm.
			Hoogte van die balkvulling is [ ] mm.
			50 bricks per square metre for a half-brick wall
			50 stene per vierkante meter vir 'n halfsteenmuur
			There are [ ] half-brick wall(s).
			Daar is [ ] halfsteenmure.
1/	[ ] [ ] [ ]	[ ] m	
[ ]/	[ ] 50 [ ]	[ ]	[ ] bricks are required *Daar is [ ] stene nodig*
			Inner wall centre line / *Binnemuur hartlyn*
			1 x [ ] = [ ]
			The centre line is / *Die hartlyn is* [ ] m
			Height of the superstructure is [ ] mm.
			Hoogte van die bobou is [ ] mm.
			50 bricks per square metre for a half-brick wall
			50 stene per vierkante meter vir 'n halfsteenmuur
			There are [ ] half-brick walls.
			Daar is [ ] halfsteenmure
1/	[ ] [ ] [ ]	[ ]	
[ ]/	[ ]		[ ] bricks are required.
	50	[ ]	Daar is [ ] stene nodig.
	[ ]		
			Total for structure without deductions
			Totaal vir struktuur sonder aftrekkings
			Substructure/ *Onderbou* [ ]
			Superstructure / *Bobou* [ ]
			Beam filling / *Balkvulling* [ ]
			Inner wall / *Binnemuur* [ ]
			[ ] Bricks / *Stene*

			Deductions / *Aftrekkings*
			Doors / *Deure*
			[ ] x 2 x 0,9
			50 bricks per square metre for a half-brick wall
			50 stene per vierkante meter vir 'n halfsteenmuur
			There are [ ] half-brick walls.
			Daar is [ ] halfsteenmure.
[ ] /	2 0,9 [ ]	[ ] m	
[ ] /	[ ] 50 [ ]	[ ]	There are [ ] bricks. *Daar is [ ] stene.*
			Windows / *Vensters*
			Window / *Venster* A
			[ ] x 2 x 1.5
			50 bricks per square metre for a half-brick wall
			50 stene per vierkante meter vir 'n halfsteenmuur
			There are [ ] half-brick walls.
			Daar is [ ] halfsteenmure.
[ ]/	2		
	1,5	[ ]m	
	[ ]		
[ ]/	[ ]		There are [ ] bricks.
	50	[ ]	*Daar is [ ] stene.*
	[ ]		
			Window / *Venster* B
			[ ] x 0.900 x 1.5
			50 bricks per square metre for a half-brick wall
			50 stene per vierkante meter vir 'n halfsteenmuur
			There are [ ] half-brick walls.
			Daar is [ ] halfsteenmure.
[ ]/	0.9		
	1.5	[ ] m	
	1.35		
[ ]/	[ ]		There are [ ] bricks.
	50	[ ]	*Daar is [ ] stene.*
	[ ]		

			Total Deductions / *Totale aftrekkings*
			Doors / *Deure* [ ]
			Windows / *Vensters* [ ]
			[ ] Bricks / *Stene*
			Total bricks for the structure
			Totale stene vir die struktuur
			Structure / *Struktuur* [ ]
			Deductions / *Aftrekkings* [ ]
			[ ]
			Plus [ ] % Wastage / *Vermorsing*
			[ ]
			x [ ]
			[ ]
			[ ]
			plus [ ]
			[ ]
			[ ] bricks will be required for the structure.
			Daar sal [ ] stene nodig wees vir die struktuur.

END / *EINDE*