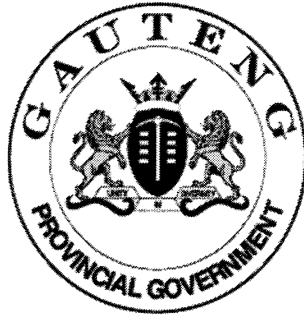


**SENIOR CERTIFICATE EXAMINATION  
SENIORSERTIFIKAAT-EKSAMEN**



**OCTOBER / NOVEMBER  
OKTOBER / NOVEMBER**

**2004**

**BUILDING CONSTRUCTION**

***BOUKONSTRUKSIE***

**SG**

**702-2/0**

**BUILDING CONSTRUCTION SG  
Question Paper & Answer Book**

**12 pages  
12 bladsye**



**702 2 0**

**SG**

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**GAUTENGSE DEPARTEMENT VAN ONDERWYS**  
**SENIORSERTIFIKAAT-EKSAMEN**

**BOUKONSTRUKSIE SG**

**TYD: 3 uur**

**PUNTE: 300**

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**BENODIGHEDE:**

- Antwoordboek
- Tekenantwoordboek 702-2/X
- Tekeninstrumente
- Sakrekenaar

**INSTRUKSIES:**

- Afdeling A is VERPLIGTEND.
  - Beantwoord enige DRIE vrae uit Afdeling B.
  - Alle berekeninge en skriftelike antwoorde moet in jou **antwoordboek** en op **antwoordvelle** SG 702-2/0(1) en 702-2/0(2) gedoen word wat agter aan hierdie vraestel aangeheg is. Maak asseblief hierdie antwoordvelle los en sit dit in jou antwoordboek as jy dit voltooi het.
  - Nommer jou antwoorde presies soos die vrae op die vraestel genommer is.
  - Toon duidelik op die tekeninge aan die vraagnommer wat jy beantwoord.
  - Tekeninge en sketse moet volledig gemaatskryf en met die nodige opskrifte en byskrifte afgewerk word in ooreenstemming met die SABS se Aanbevole Praktyk vir die Boutekene.
  - Skryf jou eksamennummer op alle los bladsye, tekenvelle en op jou antwoordboek.
  - Vir die doel van die eksamen moet die grootte van 'n baksteen as 220 mm x 110 mm x 75 mm geneem word.
- 
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GAUTENG DEPARTMENT OF EDUCATION  
SENIOR CERTIFICATE EXAMINATION

BUILDING CONSTRUCTION SG

TIME: 3 hours

MARKS: 300

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**REQUIREMENTS:**

- Answer book
- Drawing answer book 702-2/X
- Drawing instruments
- Pocket calculator

**INSTRUCTIONS:**

- Section A is **COMPULSORY**.
  - Answer any **THREE** questions from Section B.
  - All calculations and written answers must be done in your **answer book** and **answer sheets** SG 702-2/0(1) and 702-2/0(2) at the back of this question paper. Please detach these answer sheets and place them inside your answer book after completing them.
  - Number the questions as they appear in the examination question paper.
  - Clearly indicate on the drawings, the question number you are answering.
  - 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, drawing paper 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.
- 
-

**AFDELING A  
VERPLIGTEND****VRAAG 1**

Gebruik die **antwoordblad** SG 702-2/0(1) om hierdie vraag te beantwoord.

**Figuur 1** toon die grondplan van 'n gebou wat opgerig moet word.

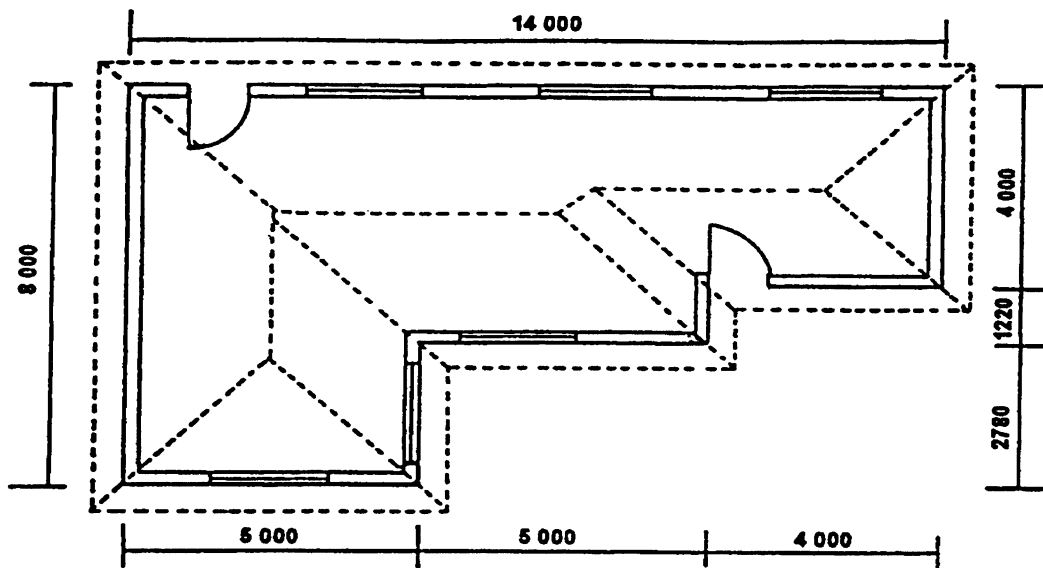
Bereken die hoeveelheid stene wat benodig word vir die \_\_\_\_\_ .

- 1.1 330 mm onderbou
- 1.2 220 mm bobou
- 1.3 110 mm balkvulling
- 1.4 totale aantal stene vir die hele gebou

Slegs die aantal stene vir die deure en vensteropeninge moet afgetrek word.

Gebruik die volgende spesifikasies vir berekening:

- Gebruik 50 stene per vierkante meter vir 'n halfsteenmuur.
- Die onderbouhoogte is 375 mm.
- Die hoogte van die bobou is 2 900 mm.
- Die balkvulling is drie steenlae hoog.
- Alle vensteropeninge is 2 000 mm x 1 500 mm.
- Alle deuropeninge is 2 000 mm x 1 000 mm.
- 'n Ses persent steenvermorsing moet ook in die berekeninge ingesluit word.



**Figuur 1**

[60]

b.o.

**SECTION A  
COMPULSORY**

**QUESTION 1**

Use answer sheet SG 702-2/0(1) to answer this question.

Figure 1 shows the plan of a building to be erected.

Calculate the number of bricks required for the \_\_\_\_\_ .

- 1.1 330 mm substructure
- 1.2 220 mm superstructure
- 1.3 110 mm beam filling
- 1.4 total number of bricks for the complete building

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

Use the following specifications for the calculations:

- Use 50 bricks per square metre for a half-brick wall.
- The height of the substructure is 375 mm.
- The height of the superstructure is 2 900 mm.
- The beam filling is three layers of bricks high.
- All window openings are 2 000 mm x 1 500 mm.
- All door openings are 2 000 mm x 1 000 mm.
- A six percent brick wastage should also be included in the calculations.

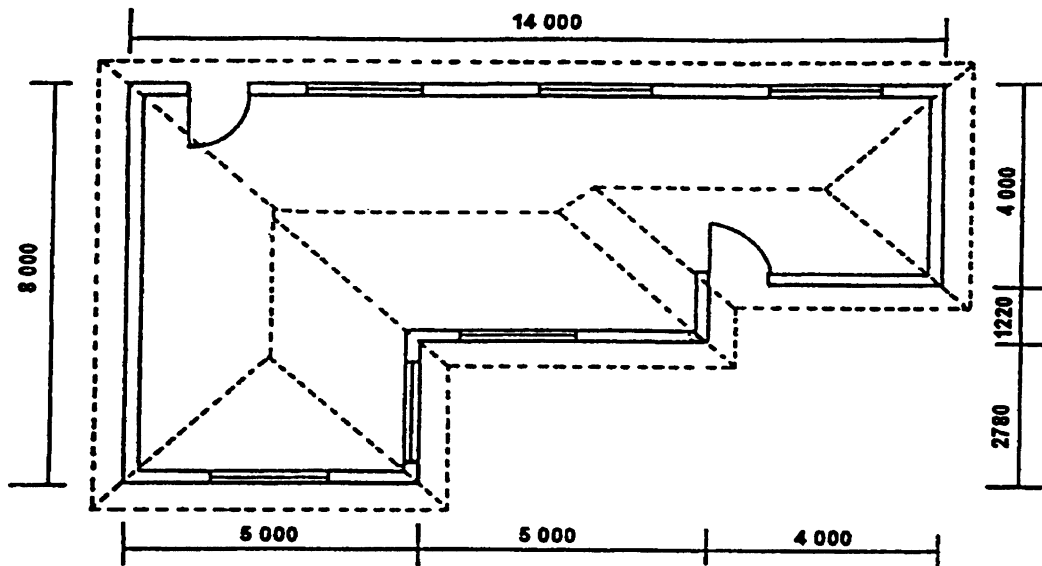


Figure 1

[60]

P.T.O.

**VRAAG 2**

- 2.1 Noem enige VYF vereistes van die bouregulasies wanneer 'n riool onder deur 'n gebou gelê moet word. (10)
- 2.2 Noem VYF aspekte waarna 'n inspekteur moet oplet wanneer die inspeksie op 'n rioolstelsel gedoen word. (10)
- 2.3 Noem enige VYF aspekte wat in ag geneem moet word by die installering van 'n sonwaterverwarmingsstelsel met die oog op maksimum doeltreffendheid. (10)
- 2.4 Toon, deur middel van 'n netjiese skets, die konstruksie van 'n vensterbank vir 'n metaalvensterraam in die buitemuur van 'n woonhuis.
- Die volgende besonderhede moet duidelik op jou skets aangetoon word:
- Eensteenmuur
  - Pleisterafwerking aan die binnekant van die muur
  - Vogweerlaag
  - Vensterbankteëls aan die binnekant
  - Kleiteëls aan die buitekant
  - Sierstene
  - Metaalvensterraam (20)
- 2.5 Noem VYF vereistes waaraan materiaal vir **bekisting** moet voldoen. (10)  
[60]

**TOTAAL VIR AFDELING A: [120]****AFDELING B**

Beantwoord enige DRIE vrae uit hierdie afdeling.

**VRAAG 3**

**Figuur 2** toon die grondplan van 'n woonhuis aan. Die huis het 'n skilddak wat bedek is met gegolfde sinkplaat. Die dakhelling is 30 grade en het 'n 500 mm oopdakrant wat oorhang. Die dak is afgewerk met 'n 200 mm asbesfassiebord, 100 mm x 100 mm vierkantige geute en 75 mm deursneë afleipype. Die bobou is 2 700 mm en die onderbou 300 mm hoog. Die buitedeur is geraam, geklamp en verspan. Die vensterbanke is aan die buitekant afgewerk met 30 mm sementkleiteëls.

Gebruik die gegewe vensterskema vir die venstergroottes.

Teken volgens 'n skaal van 1:100 die suid- en oosaansigte van hierdie woonhuis. Toon ook deur middel van 'n skaaltekening hoe die dakhoogte bepaal word.

### QUESTION 2

- 2.1 Name FIVE requirements of the building regulations when a drain is to be laid underneath a building. (10)
- 2.2 State FIVE aspects to which an inspector must pay attention during the inspection of a sewerage system. (10)
- 2.3 Name any FIVE aspects which must be taken into consideration when installing a solar heating system to ensure maximum efficiency. (10)
- 2.4 Draw a neat sketch to show the construction of a window sill for a metal frame window in the outer wall of a dwelling. (20)
- The following detail must be shown clearly on your sketch:
- One brick wall
  - Plaster finish on the inside of the wall
  - Damp proof course
  - Window sill tiles on the inside
  - Clay tiles on the outside
  - Face bricks
  - Metal window frame
- 2.5 Name FIVE requirements with which materials used for **form-work** must comply. (10)
- [60]**

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

### SECTION B

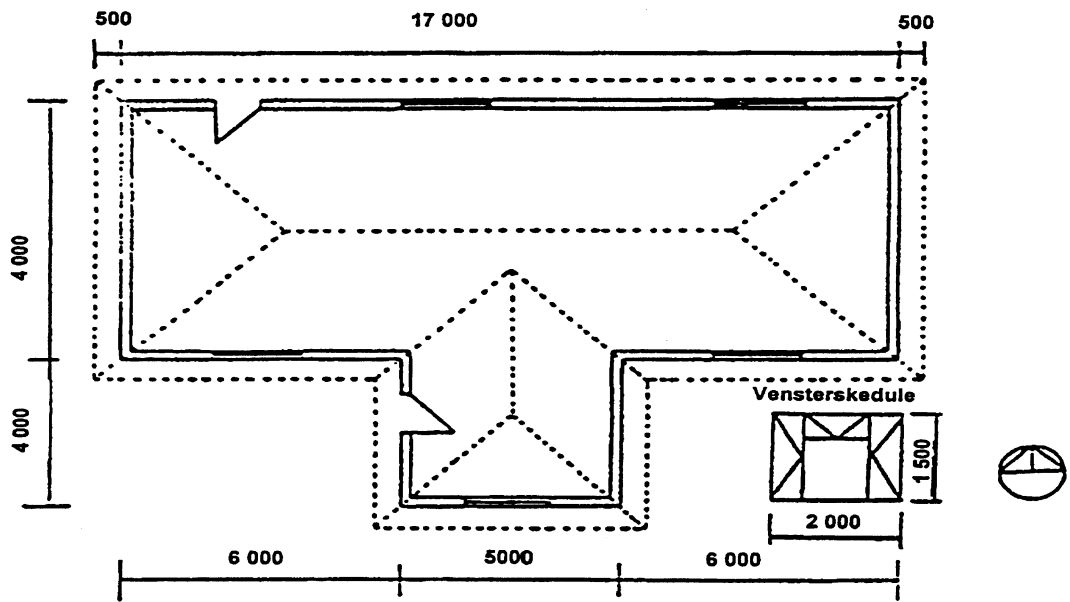
Answer any THREE questions from this section.

### QUESTION 3

**Figure 2** shows the ground plan of a house. The dwelling has a corrugated iron hipped roof. The slope is 30 degrees with a 500 mm open eaves overhang. The roof is finished off with a 200 mm asbestos fascia board, 100 mm x 100 mm square gutters with 75 mm downpipes. The superstructure is 2 700 mm high and the substructure is 300 mm high. The outer door is framed, ledged and braced. The window sills on the outside are finished off with 30 mm cement clay tiles.

Use the given window schedule for the window sizes.

Draw to a scale of 1:100 the south and east elevations of this dwelling. Also show, by means of a sketch, how the height of the roof is determined.



Figuur 2

[60]

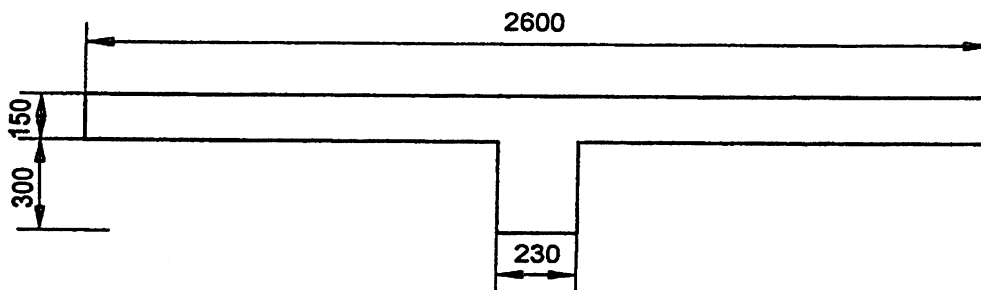
VRAAG 4

**Figuur 3** toon 'n 150 mm dik betonvloer wat ondersteun word deur 'n 300 mm x 230 mm betonbalk. Gebruik die volgende spesifikasies en teken volgens 'n skaal van 1:10 'n vertikale snit deur die betonbalk en betonvloer om die nodige bekisting en betonbewapening te toon.

Spesifikasies:

Betonbalk : Hoofstawe met 'n diameter van 20 mm  
Beuels met 'n diameter van 6 mm

Betonvloer : Hoofstawe met 'n diameter van 16 mm  
Verspreidingstawe met 'n diameter van 12 mm en 'n hartafstand van 240 mm



Figuur 3

[60]

b.o.



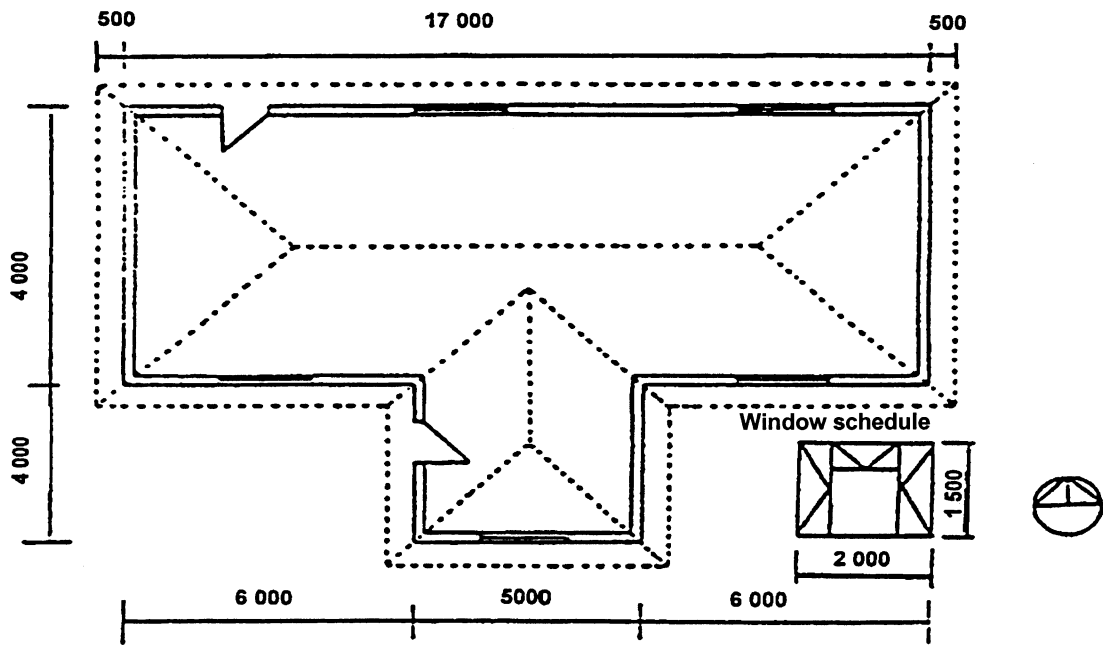


Figure 2

[60]

**QUESTION 4**

**Figure 3** shows a 150 mm thick concrete floor which is supported by a 300 mm x 230 mm concrete beam. Use the following specifications and draw to a scale of 1:10 a vertical section through the concrete beam and floor to show the necessary shuttering and concrete reinforcement.

Specifications:

Concrete beam:      Main bars with a diameter of 20 mm  
                               Stirrups with a diameter of 6 mm

Concrete floor:      Main bars with a diameter of 16 mm  
                               Distribution bars with a diameter of 12 mm and a centre distance of 240 mm

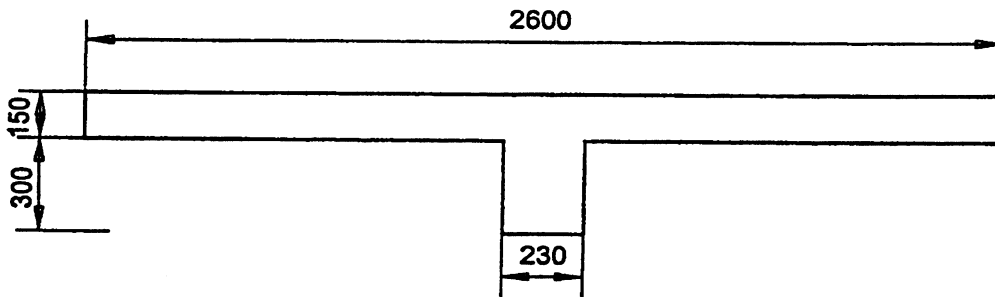


Figure 3

[60]

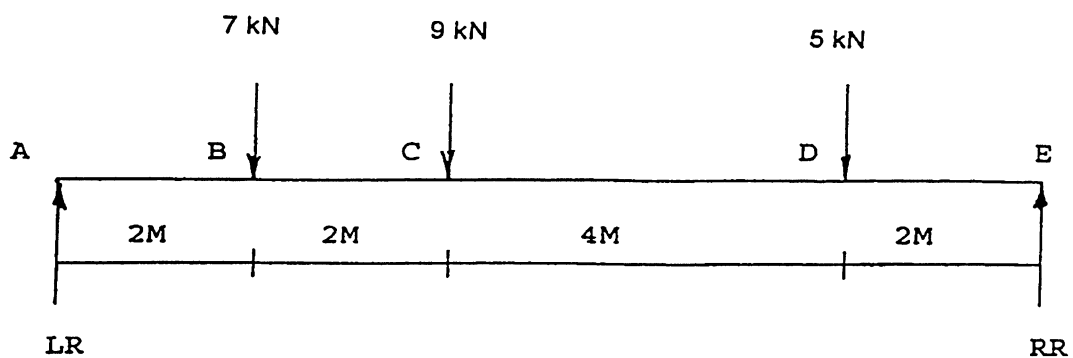
P.T.O.

**VRAAG 5**

**Figuur 4** toon 'n eenvoudig belaste balk met drie puntbelastings, wat op sy ente ondersteun word.

- 5.1 Bereken die reaksies by die steunpunte LR en RR.
- 5.2 Bereken die skuifkragte en buigmomente by punte **A, B, C, D** en **E**.
- 5.3 Teken die ruimtediagram, skuifkrag- en buigmomentdiagramme.  
Gebruik die volgende skale vir die diagramme:

Ruimtediagram: 1:100  
 Skuifkragdiagram: 1 kN = 4 mm  
 Buigmomentdiagram: 1 kN = 2 mm



**Figuur 4**

[60]

**VRAAG 6**

**Figuur 5** toon 'n ruimtediagram van 'n raamwerk wat eenvoudig op sy ente ondersteun word.

- 6.1 Teken die ruimtediagram volgens 'n skaal van 1:100.
- 6.2 Teken die kragtediagram volgens 'n skaal van 1 kN = 6 mm.
- 6.3 Teken die onderstaande tabel in jou antwoordboek oor en gebruik dit om die aard en omvang van die kragte wat op elke onderdeel inwerk, grafies te bepaal.

Onderdeel	Krag	Aard
AE		
BG		
CH		
DH		
DF		
DE		
EF		
FG		
GH		

b.o.

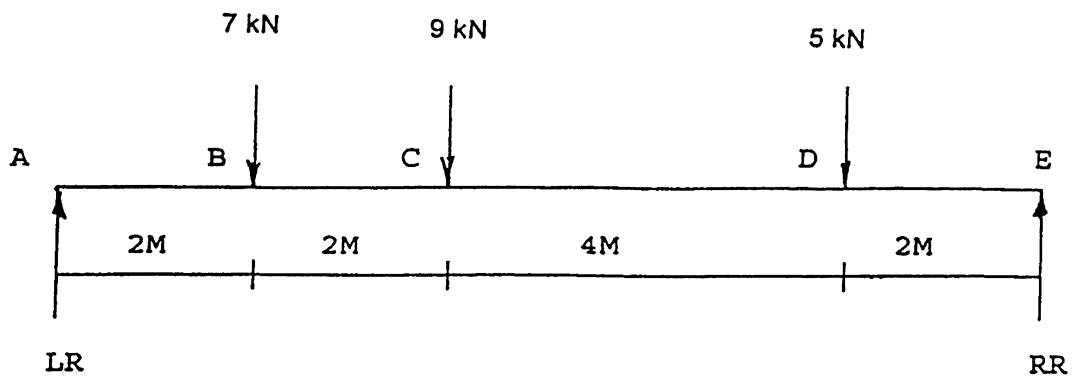
**QUESTION 5**

**Figure 4** shows a simply loaded beam with three point loads, supported at the ends.

- 5.1 Calculate the reactions at the supports LR and RR.
- 5.2 Calculate the shear forces and bending moments at points **A, B, C, D** and **E**.
- 5.3 Draw the space diagram as well as the shear force and bending moments diagrams.

Use the following scales for the diagrams:

- Space diagram: 1:100
- Shear force diagram: 1 kN = 4 mm
- Bending moment diagram: 1 kN = 2 mm



**Figure 4**

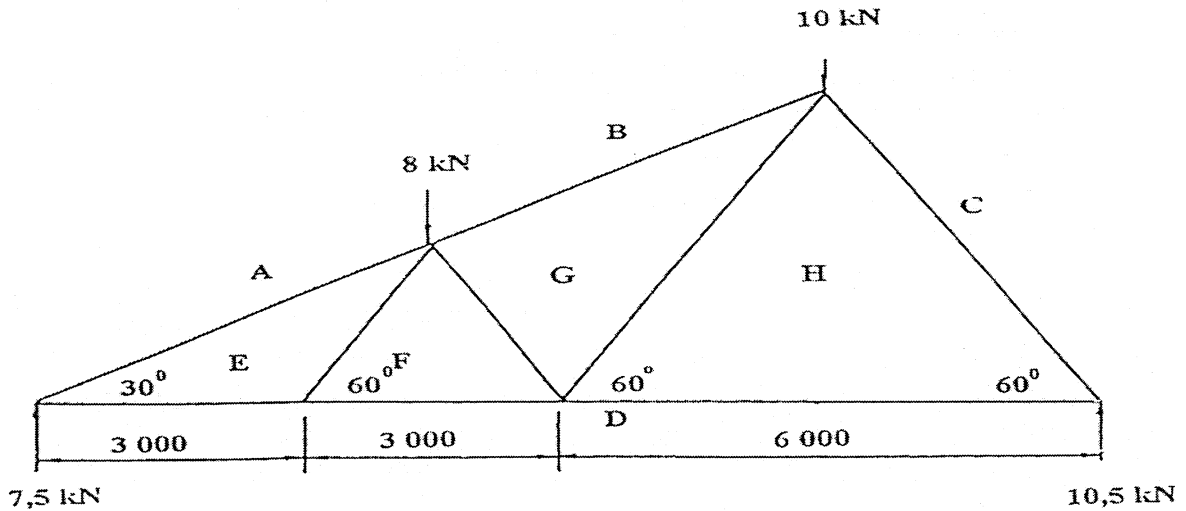
[60]

**QUESTION 6**

**Figure 5** shows a space diagram of a framework that is simply supported at the ends.

- 6.1 Draw the space diagram to a scale of 1:100.
- 6.2 Draw the force diagram according to a scale of 1 kN = 6 mm.
- 6.3 Copy the table below in your answer book and use it to determine graphically the size and extent of the forces affecting each member.

Member	Force	Nature
AE		
BG		
CH		
DH		
DF		
DE		
EF		
FG		
GH		



Figuur 5

[60]

VRAAG 7

- 7.1 Definieer die begrip **opmeting**. (6)
- 7.2 Noem VIER aspekte wat in gedagte gehou moet word wanneer daar hout vir 'n nuwe dak aangekoop word. (4)
- 7.3 Die **antwoordblad SG 702-2/0(1)** toon die gedeeltelike plan van 'n woonhuis met 'n buitegebou. Die sanitêre muurmeublement word deur standaard afkortings aangedui.
- Gebruik die **antwoordblad** en teken 'n geskikte rioleringsstelsel vir die gebou en dui alle rioleringsbesonderhede met standaardafkortings aan. (20)
- 7.4 Teken volgens 'n skaal van 1:10 'n vertikale snitaansig deur die lengte van 'n reguit betontrap en toon die bekisting, stutte en bewapening wat vir die oprigting van so 'n trap nodig is. Die traparm bestaan uit ses trappe, waarby 'n 900 mm bordes, wat 100 mm dik is, ingesluit is. Die bordes word deur 'n ongepleisterde buitemuur van een steendikte ondersteun. Die trappe het 'n optree van 150 mm en 'n aantree van 280 mm. (30)

[60]

TOTAAL VIR AFDELING B: [180]

TOTAAL: 300

(Antwoordblaaie volg)

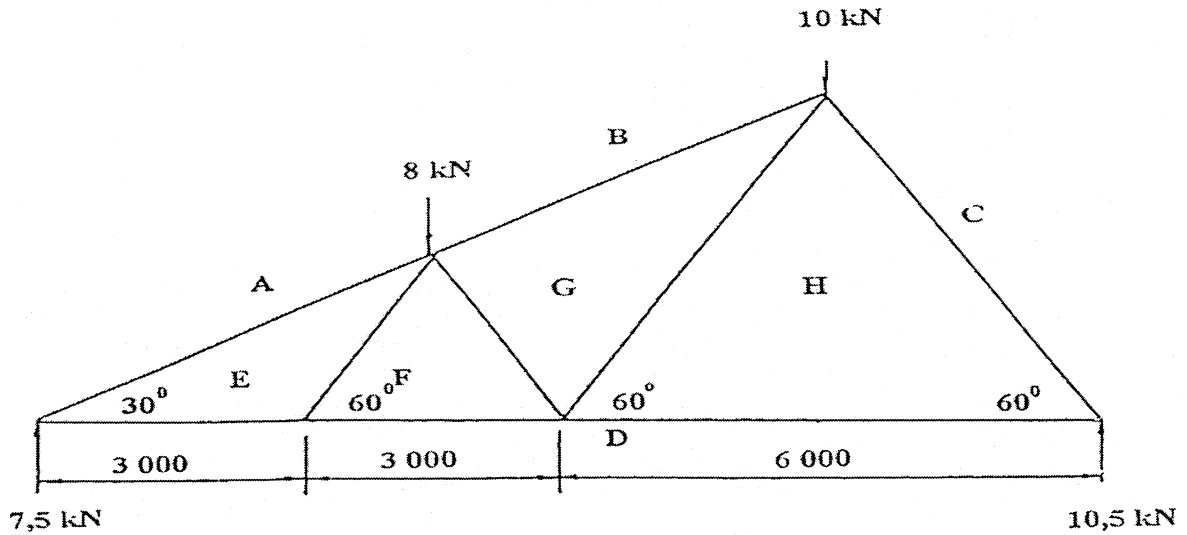


Figure 5

[60]

QUESTION 7

- 7.1 Define the term **surveying**. (6)
- 7.2 Name FOUR aspects that have to be kept in mind when buying wood for a new roof. (4)
- 7.3 The **answer sheet SG 702-2/0(1)** shows part of a plan of a dwelling with an outbuilding. Standard abbreviations are used to show the sanitary fitments. On the **answer sheet**, draw a suitable and effective drainage system for the building showing all drainage details by means of standard abbreviations. (20)
- 7.4 Draw to a scale of 1:10 a vertical section through the length of a straight flight of concrete stairs and show the framework, supports and reinforcements necessary for the erection of the stairs. The flight of stairs consists of six steps, including a landing of 900 mm which is 100 mm thick. An unplastered external wall supports the landing, which is one-brick thick. The steps have a rise of 150 mm and a tread of 280 mm. (30)

[60]

TOTAL FOR SECTION B: [180]

TOTAL: 300



**ANSWER SHEET / ANTWOORDBLAD SG 702-2/0(1)**

**EXAMINATION NUMBER /  
EKSAMENNOMMER**

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- Please detach this answer sheet on completion and place it inside your Answer book. / *Maak asseblief hierdie antwoordblad los en plaas dit 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**

Complete by adding an answer in the block [ ] /  
*Vul die ontbrekende antwoorde tussen die blokke [ ] in.*

E.g. / *Bv.*

Minus 4 x [ ] = [ ]

**ANSWER / ANTWOORD**

Minus 4 x [110] = [440]





A	B	C	D
			<b>Substructure centre line / Onderbou hartlyn</b>
			[ x ] = [ ] mm
			[ x ] = [ ] mm
			[ ] mm
			Minus [ x ] = [ ] mm = [ ] mm
			The centre line is / Die hartlyn is [ ] mm
			Height of superstructure is 375 mm / Hoogte van bobou is 375 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 [ ] stene word benodig
			<b>Superstructure centre line / Bobou hartlyn</b>
			2 x 14 000 = 28 000 mm
			2 x 8 000 = 16 000 mm
			44 000 mm
			Minus [ x ] = [ ] mm = [ ] mm
			The centre line is / Die hartlyn is [ ] mm
			Height of substructure is [ ] mm Hoogte van 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/	[ ]	[ ]	
[ / ]	[ ]		[ ] bricks are required [ ] stene word benodig



			<b>Beam filling centre line/ Balkvulling hartlyn</b>
			2 x 14 000 = 28 000 mm
			2 x 8 000 = 16 000 mm
			44 000 mm
			Minus [ x ] = [ ] mm = [ ] mm
			The centre line is / Die hartlyn is [ ] mm
			Height of beam filling is 225 mm <i>Hoogte van die balkvulling is 225 mm</i>
			50 bricks per square metre for a half-brick wall / <i>50 stene per vierkante meter vir 'n halfsteenmuur</i>
			There are [ ] half-brick walls <i>Daar is [ ] halfsteenmure</i>
1/	[ ] [ ] [ ]		
1/	[ ] [ ] [ ]		[ ] bricks are required <i>[ ] stene word benodig</i>
			<b>Total for structure without deductions / Totaal vir struktuur sonder aftrekkings</b>
			Substructure / Onderbou [ ]
			Superstructure / Bobou [ ]
			Beam filling / Balkvulling [ ]
			[ ] Bricks / Stene
			<b>Deductions / Aftrekkings</b>
			<b>Doors / Deure</b>
			[ ] x 2 x 1
			50 bricks per square metre for a half-brick wall / <i>50 stene per vierkante meter vir 'n halfsteenmuur</i>
			There are [ ] half-brick walls <i>Daar is [ ] halfsteenmure</i>
2/	[ ] [ ] [ ]		
[ / ]	[ ] [ ] [ ]		There are [ ] bricks <i>Daar is [ ] stene</i>



			<b>Windows / Vensters</b>
			[ ] 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 2 half-brick walls / Daar is 2 halfsteenmure
[ / ]	[ ]		
2/	[ ]		There are [ ] bricks Daar is [ ] stene
			<b>Total deductions / Totale aftrekkings</b>
			Doors / Deure [ ]
			Windows / Vensters [ ]
			[ ] Bricks / Stene
			<b>Total bricks for structure / Totale hoeveelheid stene vir die struktuur</b>
			Structure / Struktuur [ ]
			Deductions / Aftrekkings [ ]
			[ ]
			Plus 6% wastage / vermorsing
			[ ] [ ] x [ ]
			[ ] [ ] + [ ]

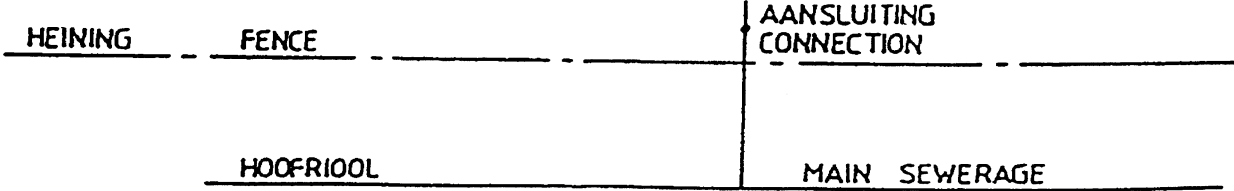
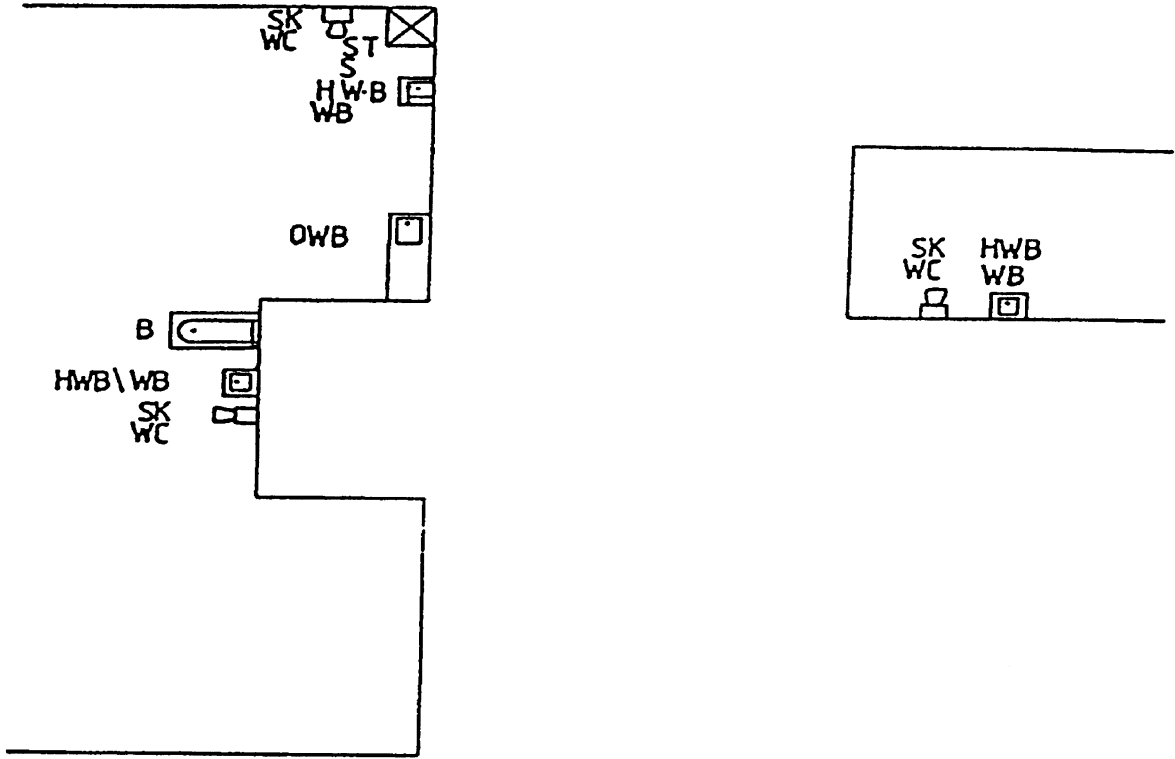
[ ] bricks will be required for the structure. /  
stene sal benodig word vir die struktuur.



**ANSWER SHEET / ANTWOORDBLAD SG 702-2/0(2)**

**EXAMINATION NUMBER /  
EKSAMENNOMMER**

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**Partial part of a plan of a dwelling with an outbuilding**  
*'n Gedeelte van 'n plan van 'n woonhuis met 'n buitegebou*