Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2016

CIVIL TECHNOLOGY

MARKS: **200**

TIME: **3 hours**

* I C V L T E *

This question paper consists of 18 pages, including 4 answer sheets and a formula sheet.

REQUIREMENTS:

1. ANSWER BOOK
2. Drawing instruments
3. A non-programmable calculator

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX questions.
2. ALL questions are COMPULSORY.
3. Answer each question as a whole. DO NOT separate subsections.
4. Start each question on a NEW page.
5. Sketches may be used to illustrate your answers.
6. ALL calculations and written answers must be done in the ANSWER BOOK.
7. Use the mark allocation as a guide for the length of your answer.
8. Drawings and sketches in pencil, must be fully dimensioned and neatly finished off with titles and labels to conform to *SANS SABS Recommended Practice for Building Drawings.*
9. Use your discretion where dimensions and/or details have been omitted.
10. For the purposes of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
11. Answer QUESTION 1.1, 5.1, 5.2 and 6.1 on the ANSWER SHEETS provided.

QUESTION 1: CONSTRUCTION PROCESSES

1.1 FIGURE 1.1 A and FIGURE 1.1 B on Sheet A show wall constructions without dampproofing.

Draw on Sheet A the damp proofing underneath the floors and in the walls by means of clear lines. (8)

1.2 Name FOUR requirements to which wall constructions for buildings must comply. (4 x 1) (4)

1.3 Briefly describe the purpose of the beam filling at open eave constructions. (2)

1.4 Indicate whether the following statements are TRUE or FALSE.
Write only the word 'true' or 'false' next to the number in the answer book:

1.4.1 Cavity walls are wider than single brick walls. (1)

1.4.2 Cavity walls have better sound isolation than single brick walls. (1)

1.4.3 The cavity of a cavity wall is 75 mm. (1)

1.4.4 A closer brick is a brick which is cut in half. (1)

1.4.5 The English bond is mainly used for the building of cavity walls. (1)

1.5 Answer the following questions with regard to the structure in FIGURE 1.5:

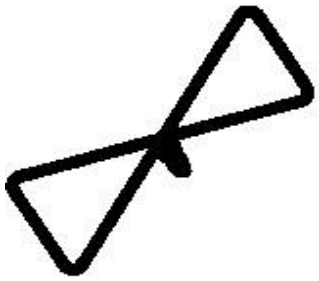


FIGURE 1.5

1.5.1 What is the structure in FIGURE 1.5 called? (1)

1.5.2 In which type of wall construction is this structure used? (1)

1.5.3 What is the purpose of this structure? (1)

1.6 What is the purpose of gusset plates in a steel roof truss construction? (1)

1.7 Name FOUR general safety measures for hand tools. (4 x 1) (4)

1.8 Identify the following tools:

1.8.1

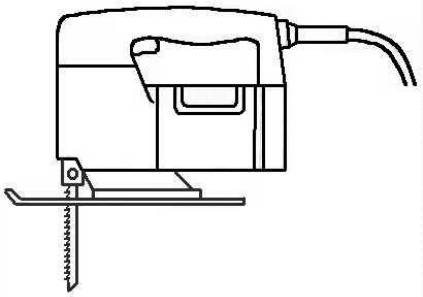


FIGURE 1.8.1

(1)

1.8.2

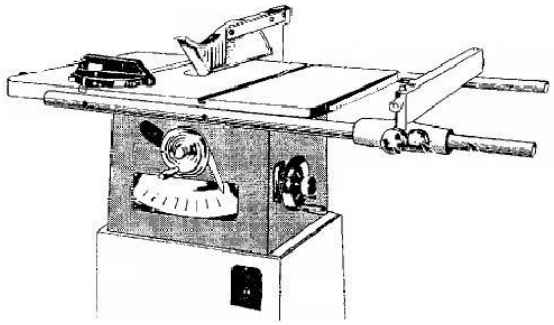


FIGURE 1.8.2

(1)

1.8.3

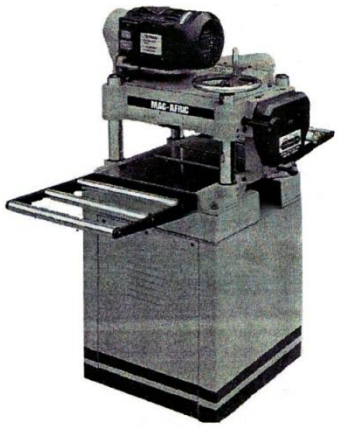


FIGURE 1.8.3

(1)

[30]

QUESTION 2: ADVANCED CONSTRUCTION PROCESSES

2.1 Name the THREE main forces which must be considered during the design process of reinforced concrete beams. (3 x 1) (3)

2.2 Answer the following questions with regard to the steel reinforcing of the reinforced concrete beam in FIGURE 2.2:

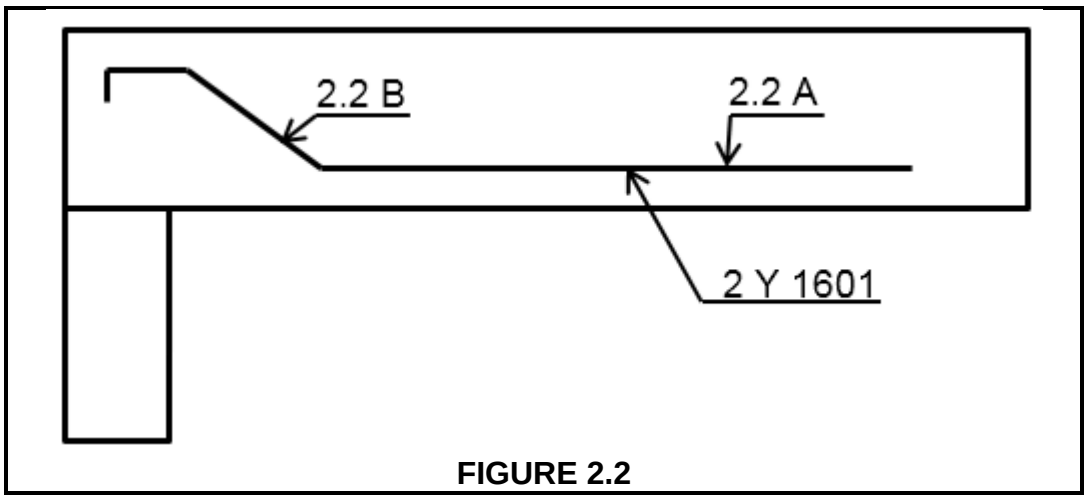


FIGURE 2.2

2.2.1 What is Bar 2.2 A called? (1)

2.2.2 Why is the bar bent upwards at 2.2 B? (1)

2.2.3 At which angle is the bar at 2.2 B bent upward? (1)

2.2.4 Which type of stress must Bar 2.2 A withstand? (1)

2.2.5 From which type of steel is the steel reinforcement manufactured? (1)

2.2.6 What is the sectional size of the steel bar? (1)

2.3 Briefly describe the reaction of a column when lateral loads are act upon it. (2)

2.4 Describe THREE erecting requirements for concrete formwork. (3 x 2) (6)

2.5 Name TWO factors which determine the cover depth of steel reinforcement. (2 x 1) (2)

2.6 Briefly describe the purpose of the pre-stressed steel reinforcement in concrete lintels. (2)

2.7 Make a neat side view sketch of a retaining wall with a buttress. Also indicate FOUR labels of the retaining wall parts. (12)

2.8 Name FOUR factors which must be considered when retaining walls are designed. (4 x 1) (4)

2.9 FIGURE 2.9 shows a concrete retaining structure.

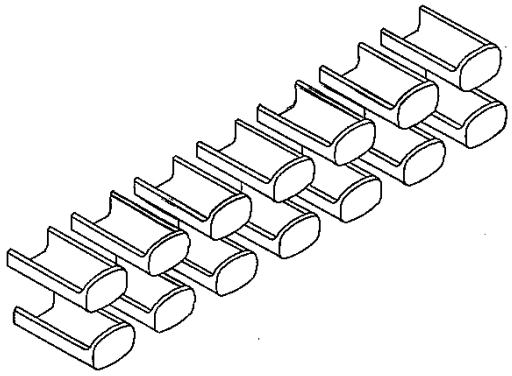


FIGURE 2.9

Name THREE principles which allow the structure to perform its retaining function. (3 x 1) (3)

[40]

QUESTION 3: CIVIL SERVICES

3.1 Answer the following questions with regard to the drainage structure in FIGURE 3.1:

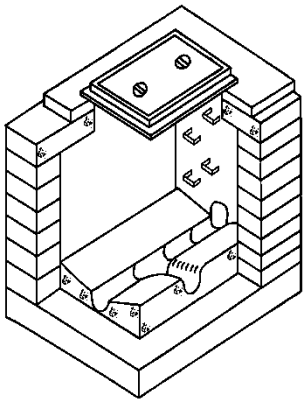


FIGURE 3.1

3.1.1 What is the drainage structure in FIGURE 3.1 called? (1)

3.1.2 Name TWO purposes of the structure in a drain system. (2 x 1) (2)

3.1.3 Name TWO factors which determine the size of the drainage system. (2 x 1) (2)

3.2 Briefly describe the mirror check to test if drains are straight. (2)

3.3 Name TWO test methods to test if drains are watertight. (2 x 1) (2)

3.4 FIGURE 3.4 shows the installation of a sink. Answer the following questions with regard to the installation:

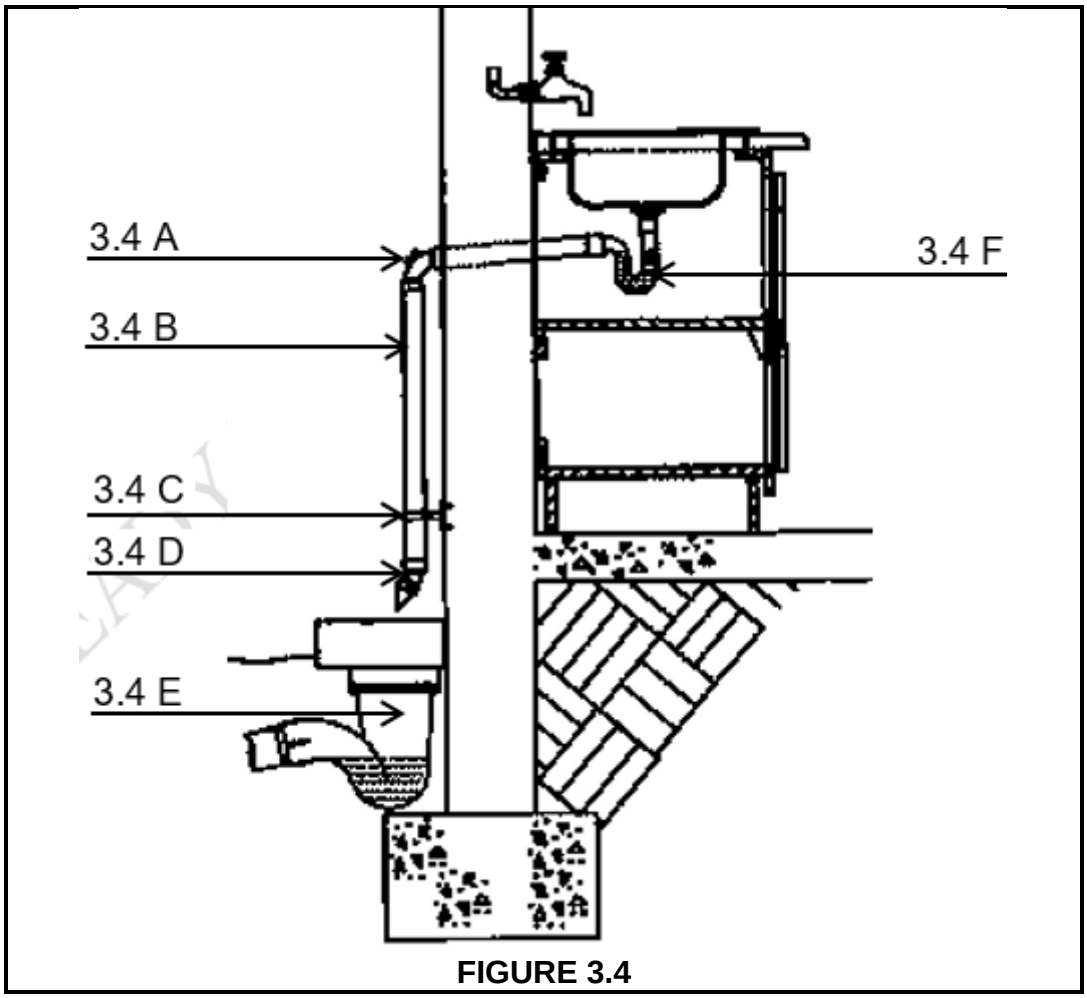


FIGURE 3.4

3.4.1 What is the opening at Bend 3.4 A called? (1)

3.4.2 What is the sectional size of Part 3.4 B? (1)

3.4.3 What is Structure 3.4 C called? (1)

3.4.4 At which angle is Bend 3.4 D bended? (1)

3.4.5 What is Structure 3.4 E called? (1)

3.4.6 What is Structure 3.4 F called? (1)

3.4.7 Briefly describe the purpose of the water lock in Structure 3.4 F. (2)

3.5 Indicate whether the following statements are TRUE or FALSE.
Write only the word 'true' or 'false' next to the number in the answer book:

3.5.1 Basins must be supplied with drain cocks. (1)

3.5.2 Cisterns must be supplied with stopcocks. (1)

3.5.3 Pillar taps are used to control the water supply to geysers. (1)

3.5.4 Copper pipes rust easily. (1)

3.5.5 Copper pipes are mainly used for cold water supply. (1)

3.5.6 PVC pipes are light of weight. (1)

3.5.7 The maximum distance between the electrical connection of the geyser and the isolator switch is 1 meter. (1)

3.5.8 Galvanised pipes can be used for cold and hot water. (1)

3.6 Name THREE advantages of the kick pipe in an electrical system. (3 x 1) (3)

3.7 What is the minimum height of the electrical distribution board above the floor? (1)

3.8 Who is responsible for the installation of electricity from the meter box to the dwelling? (1)

[30]

QUESTION 4: MATERIALS AND QUANTITIES

4.1 Briefly describe the manufacturing process of laminated glass. (4)

4.2 Name THREE properties of stainless steel. (3 x 1) (3)

4.3 Name FOUR properties of aluminium. (4 x 1) (4)

4.4 Name the TWO methods of connecting steel pipes. (2 x 1) (2)

4.5 Answer the following questions with regard to the corrugated cladding in FIGURE 4.5.

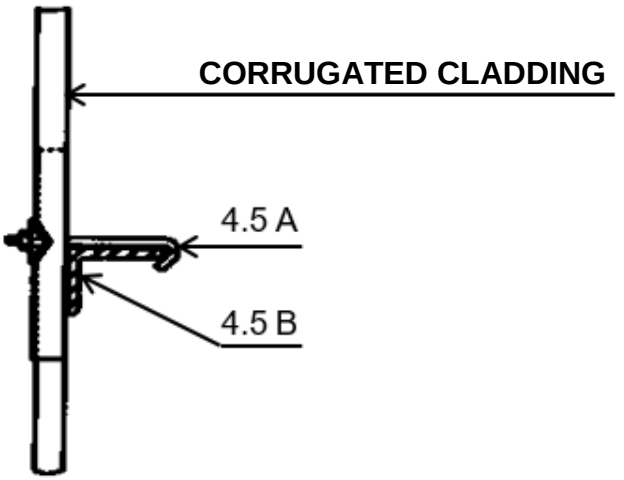


FIGURE 4.5

4.5.1 Identify Part 4.5 A and Part 4.5 B. (2)

4.5.2 Briefly motivate why thin cladding material must be avoided. (2)

4.5.3 Name THREE advantages of the use of steel-cladding in the construction of structures. (3 x 1) (3)

4.5.4 Briefly describe the term THERMAL MOVEMENT in steel-cladding constructions. (2)

4.6 Determine the centre line of the strip foundation in FIGURE 4.6.

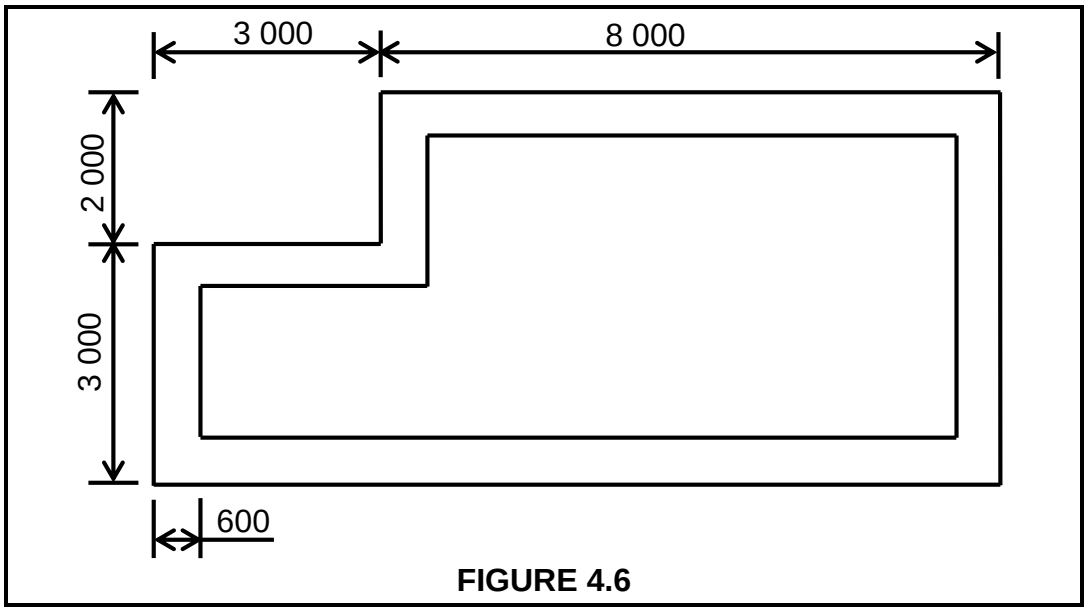


FIGURE 4.6

(8)
[30]

QUESTION 5: APPLIED MECHANICS

5.1 FIGURE 5.1 on Sheet B shows a frame structure with pointed loads. Complete the following on Sheet B:

5.1.1 The force diagram on scale 1 N = 2 mm (7)

5.1.2 The table by indicating the size and nature of the forces in the parts (9)

5.2 FIGURE 5.2 shows a beam with point loads. Use the information on Sheet C and calculate on Sheet C the shear force values from point ***a*** to ***c*** and draw the shear force diagram on scale 1 mm = 1 N.

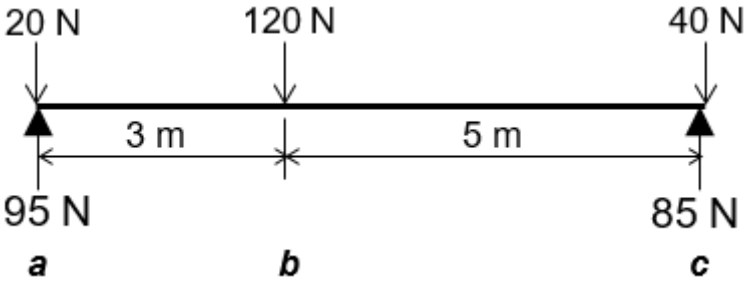


FIGURE 5.2 (9)

5.3 FIGURE 5.3 shows a beam with point loads. Calculate the reaction force of Support B.

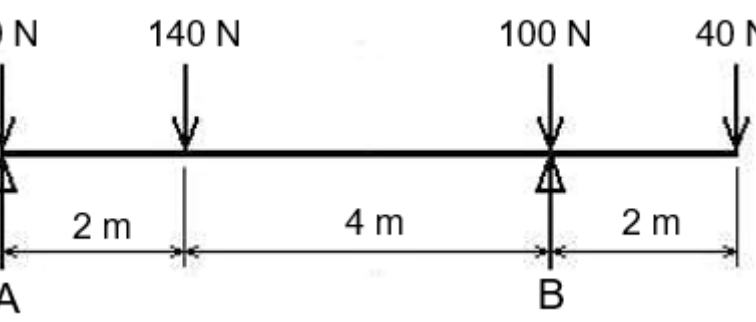


FIGURE 5.3 (5)

[30]

QUESTION 6: GRAPHICS AND COMMUNICATION

6.1 Sheet D shows an incomplete floor plan of a flat. The measurements of the rooms are indicated on the floor plan and the outer wall thickness is 280 mm and the inner wall thickness is 120 mm.
Use the information on Sheet D and complete the following missing parts according to standard building drawing practice:

6.1.1	Outer door at D1	(2)
6.1.2	Window at W1	(2)
6.1.3	Inner door at D2	(1)
6.1.4	Water closet at WC	(2)
6.1.5	Shower at SH	(2)
6.1.6	Sink at S	(2)
6.1.7	Stove at STV	(2)
6.1.8	Light switch at the outer door	(2)
6.1.9	Single fluorescent light in the middle of the living area	(2)
6.1.10	Joining line between the light switch and the fluorescent light	(1)
6.1.11	Complete measurements for the West elevation	(12)

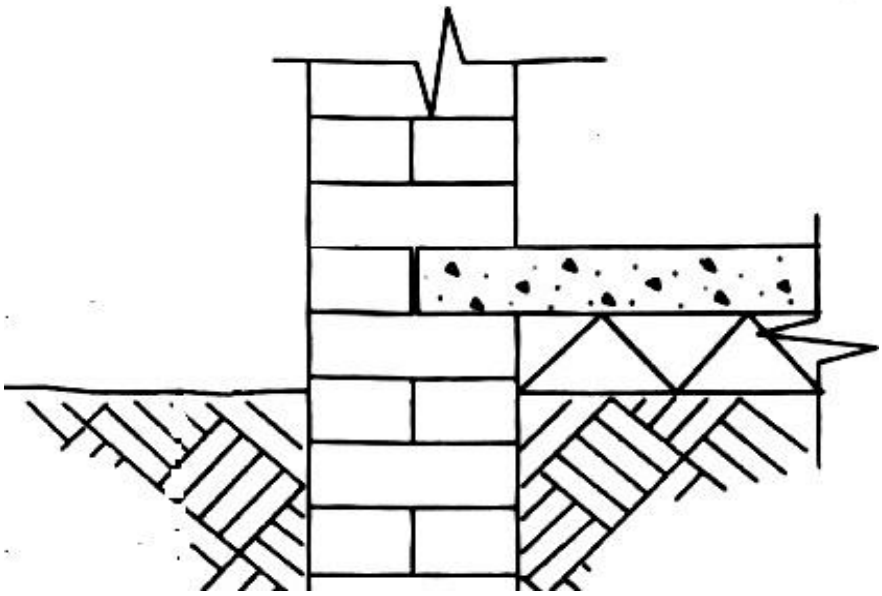
6.2 Make neat sketches to illustrate each of the following symbols:

6.2.1	Concrete	(2)
6.2.2	Hardcore filling	(2)
6.2.3	Power point	(2)
6.2.4	Distribution board	(2)
6.2.5	Vent pipe	(2)
		[40]

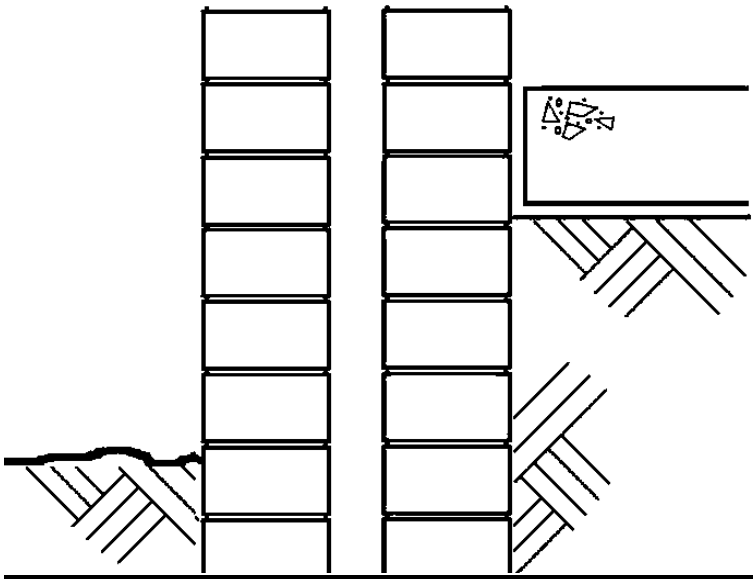
TOTAL: 200

ANSWER SHEET **ANTWOORDBLAD**	**A**	**CIVIL TECHNOLOGY** **SIVIELE TEGNOLOGIE**	**NAME:** **NAAM:**

QUESTION/VRAAG 1.1 A (3)

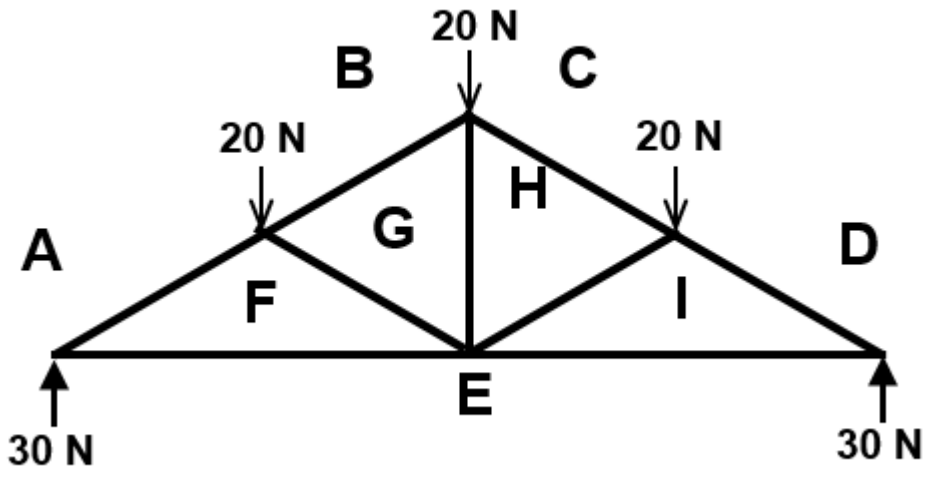


QUESTION/VRAAG 1.1 B (5)



ANSWER SHEET ANTWOORDBLAD	B	CIVIL TECHNOLOGY SIVIELE TEGNOLOGIE	NAME: NAAM:

QUESTION/VRAAG 5.1 (PITCH OF TRUSS SSIS 30°) (16)



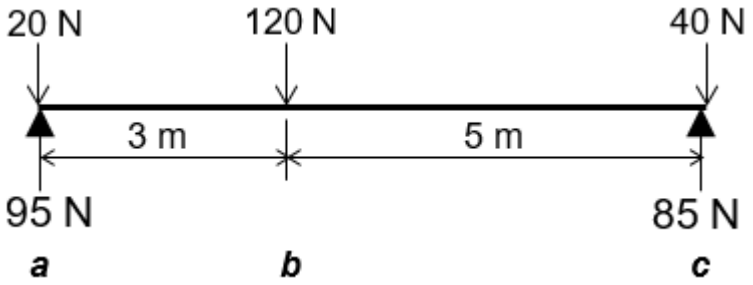
a

SKAAL/SCALE: 1 N = 2 mm

DEEL/PART	STUT/STRUT	STANG/TIE
AF		
BG		
CH		
DI		
EI		
EF		
FG		
GH		
HI		

ANSWER SHEET **ANTWOORDBLAD**	**C**	**CIVIL TECHNOLOGY** **SIVIELE TEGNOLOGIE**	**NAME:** **NAAM:**

QUESTION/VRAAG 5.2 (9)



Skuifkragwaardes/Shearforce values

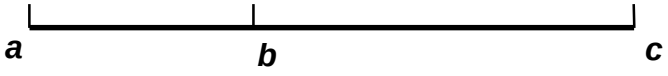
a =

b =

c =

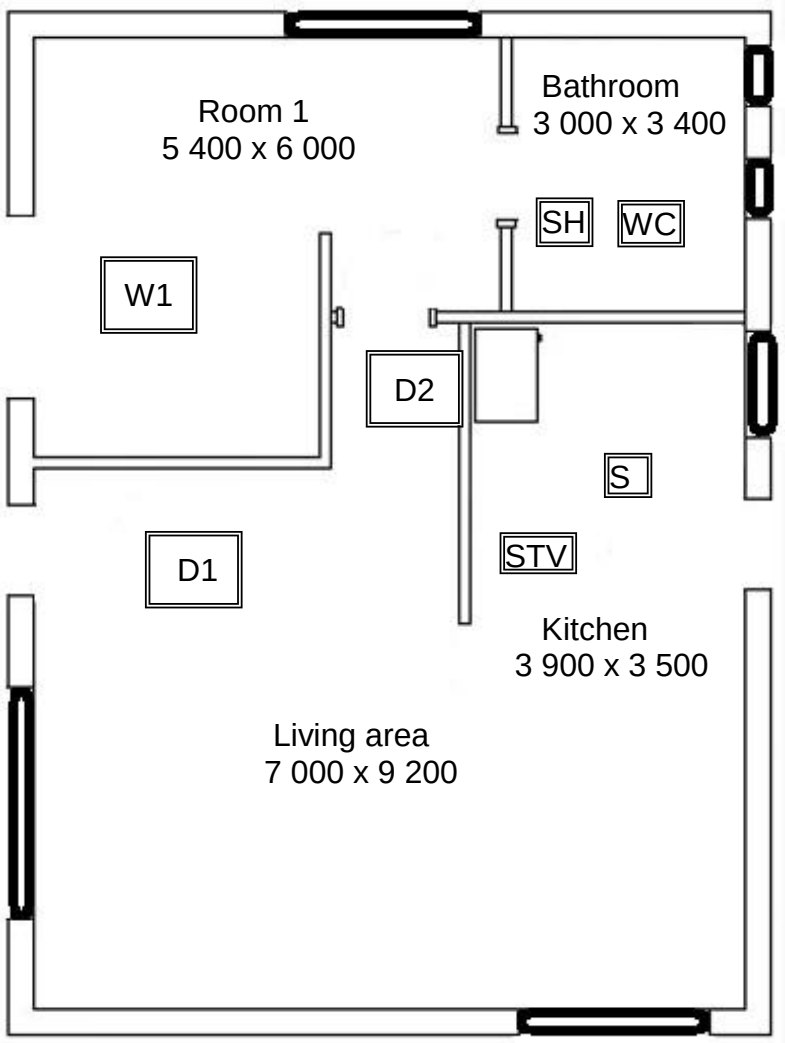
Skuifkragdiagram / Shearforce diagram

Skaal/Scale: 1 mm = 1 N



ANTWOORDBLAD ANSWER SHEET **D**	SIVIELE TEGNOLOGIE CIVIL TECHNOLOGY	NAAM: NAME:

QUESTION/VRAAG 6.1 (30)



FLOORPLAN

Outer door	2	
Window	2	
Inner door	1	
Water closet	2	
Shower	2	
Sink	2	
Stove	2	
Measurements	12	
Light switch and light	5	
TOTAL	**30**	

FORMULA SHEET

IMPORTANT ABBREVIATIONS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
G	Centre of gravity	h	Height	d	Diameter
C	Centroid	b	Breadth/Width	r	Radius
L	Length	s	Side	A	Area
π	Pi = $\frac{22}{7}$ = 3,142	ø	Diameter	V	Volume

FORMULAE

AREA OF	FORMULA (in words)	FORMULA (in symbols)	FORMULA FOR THE POSITION OF CENTROIDS	
			X-axis	Y-axis
Square	Length x Breadth	l x b	$\frac{b}{2}$	$\frac{b}{2}$
Rectangle	Length x Breadth	l x b	$\frac{l}{2}$	$\frac{b}{2}$
Right-angled triangle	½ x base x height	½b x h	$\frac{b}{3}$	$\frac{h}{3}$
Equilateral triangle/ Pyramid	½ x base x height	½b x h	$\frac{b}{2}$	$\frac{h}{3}$
Circle	π x radius x radius	πr^2	Centroid is in the centre	
Circle	π x diameter x diameter divided by 4	$\frac{\pi d^2}{4}$		
Semi-circle	π x radius r x radius divided by 2	$\frac{\pi r^2}{2}$	Centroid is 0,424r on the centre line	

$$\text{Position of centroid} = \frac{(A1 \times d) \pm (A2 \times d)}{\text{Total area}}$$