



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2015

CIVIL TECHNOLOGY

MARKS: 200

TIME: 3 hours

This question paper consists of 12 pages, including 2 answer sheets and a formula sheet.

REQUIREMENTS

1. ANSWER BOOK
2. Drawing instruments
3. A non-programmable pocket 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 sub-questions.
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 to the length of your answers.
8. Drawings and sketches must be done in pencil, 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. Answer QUESTION 5.2 and QUESTION 6.1 on the ANSWER SHEETS provided.

QUESTION 1: CONSTRUCTION PROCESSES

- 1.1 What is the purpose of the following bars in a reinforced concrete beam?
- 1.1.1 Main bars (1)
 - 1.1.2 Anchor bars (Compression bars) (1)
 - 1.1.3 Shear bars (1)
 - 1.1.4 Stirrups (2 x 1) (2)
- 1.2 Briefly describe the purpose of the bar schedule which is sent to the steel fixing company. (2)
- 1.3 Describe FOUR aspects of mounted steel reinforcement which must be checked before the concrete is cast. (4 x 2) (8)
- 1.4 Which type of load causes lateral forces in a column? (1)
- 1.5 Name TWO advantages of using metal as formwork material. (2 x 1) (2)
- 1.6 Identify the parts 1.6.1 to 1.6.6 of the formwork in FIGURE 1.6. (6 x 1) (6)

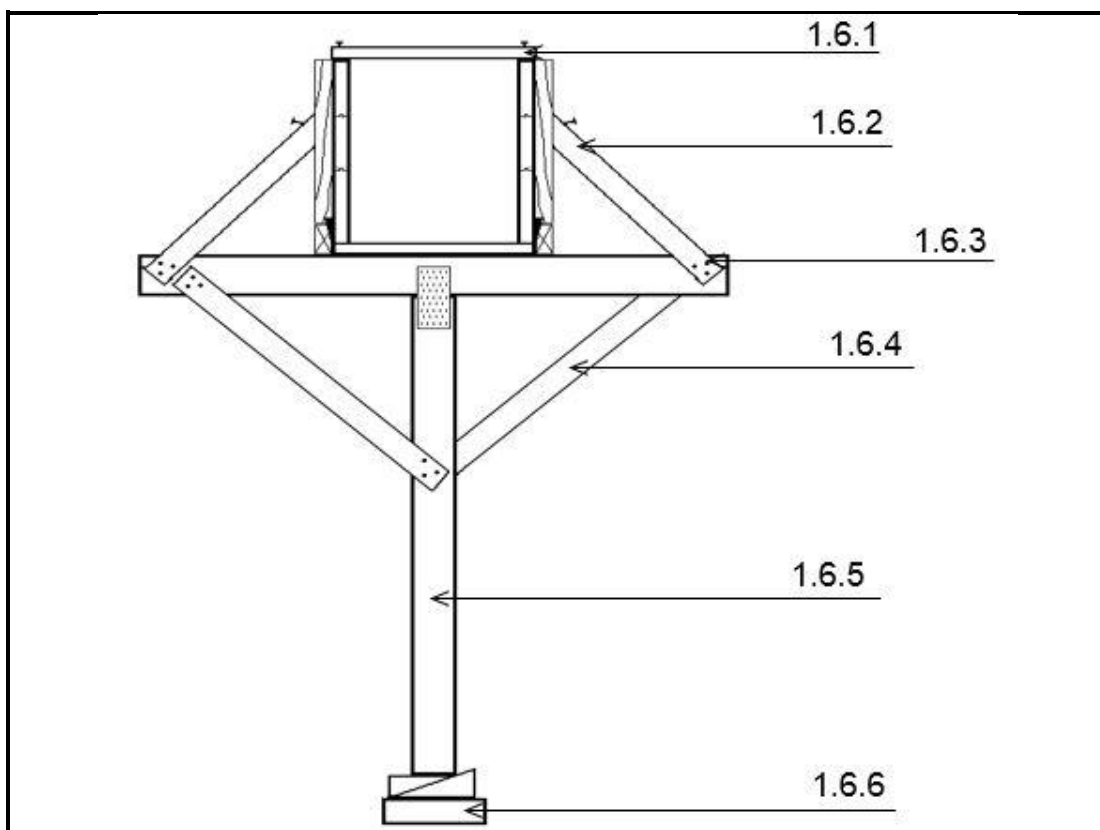


FIGURE 1.6

- 1.7 Briefly describe the manufacturing process of a prestressed concrete lintel. (3)
- 1.8 Name THREE advantages of prestressed concrete lintels. (3 x 1) (3)

[30]

QUESTION 2: ADVANCED CONSTRUCTION PROCESSES

- 2.1 Make a neat sketch in good proportion of a half brick wall and indicate the following:
- 2.1.1 FIVE brick layers (1)
 - 2.1.2 Stretcher bond (1)
 - 2.1.3 Dead end at the left hand-side (1)
 - 2.1.4 Raking back at the right hand-side (2)
- 2.2 Briefly describe the purpose of the line blocks in the construction of brick walls. (2)
- 2.3 Briefly describe the purpose of the wall plate in a roof construction. (2)
- 2.4 Indicate whether the following statements are TRUE or FALSE.
- Write only the word TRUE or FALSE next to the number in the ANSWER BOOK.
- 2.4.1 Horizontal dagha joints are called bed joints. (1)
 - 2.4.2 Brick force is a wire net of galvanised steel. (1)
 - 2.3.3 Beam filling is a wooden beam to which roof tiles are fixed. (1)
 - 2.4.4 Lugs are used to bind the leaves of cavity walls. (1)
 - 2.4.5 Damp proofing in outer walls must be at least 50 mm from the ground level. (1)
- 2.5 Briefly motivate why a cavity wall must have a weep-hole opening. (2)
- 2.6 Briefly describe the principles responsible for the retaining function of the precast concrete retaining structures. (2)

2.7 Answer the following questions with regard to the shoring construction in FIGURE 2.7:

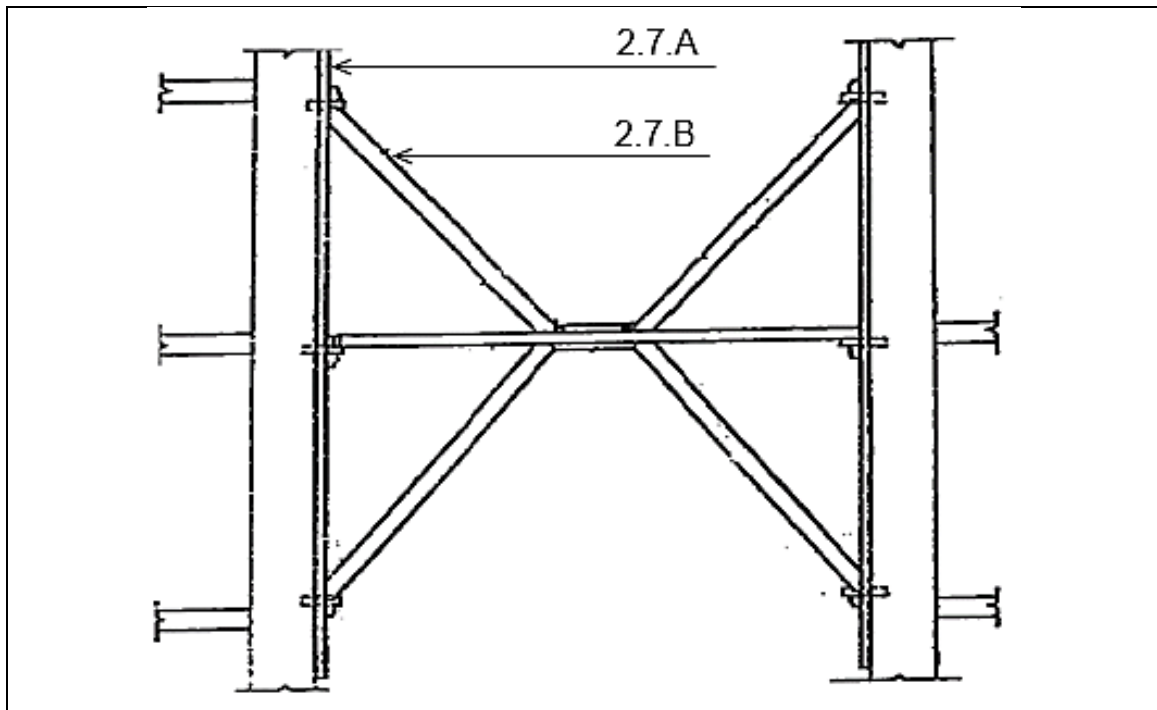


FIGURE 2.7

- 2.7.1 What is the advantage of this type of shoring? (1)
- 2.7.2 Name FIVE factors which will influence the type of design for the shoring. (5 x 1) (5)
- 2.7.3 Name the parts 2.7.A and 2.7.B. (2)
- 2.8 Which type of tool will be used for the following type of work?
- 2.8.1 To test whether floors have been horizontally casted (1)
- 2.8.2 To hold plaster up for plaster work (1)
- 2.8.3 To run multiple grooves next to each other in concrete floors (1)
- 2.8.4 To wet the plastering during the floating process (1)
- 2.8.5 To cut various profiles in wood for edge cutting work (1)
- 2.9 Describe THREE safety measures which are applicable when working with the thicknesser. (3 x 2) (6)
- 2.1 Name THREE measures which must be applied when a worker sustains a neck injury. (3 x 1) (3)

[40]

QUESTION 3: CIVIL SERVICES

- 3.1 Briefly motivate why a pressure control valve must be installed in a geyser by referring to purposes of the pressure control valve. (3)
- 3.2 Which valve protects the geyser against vacuum collapse? (1)
- 3.3 Briefly motivate why each geyser must be supplied with a safety tray. (2)
- 3.4 Indicate whether the following statements are TRUE or FALSE.

Write only the word TRUE or FALSE next to the number in the ANSWER BOOK.

- 3.4.1 Soil water is discharged in a gully. (1)
- 3.4.2 The section size of sink discharge pipes is 50 mm. (1)
- 3.4.3 The angle of drain bends is 90°. (1)
- 3.4.4 Traps are used at the outlet of geysers. (1)
- 3.4.5 A water closet is connected to a 110 mm drain pipe. (1)
- 3.4.6 The purpose of a water lock is to prevent the waste water from pushing up into the wall fittings. (1)
- 3.5 What is the purpose of a ball valve and where will it be found? (2)
- 3.6 Name FOUR places where manholes are installed in a drain system. (4 x 1) (4)
- 3.7 What is the purpose of rodding eyes in a drain system? (1)
- 3.8 Briefly motivate why drains must be laid in a straight line. (2)
- 3.9 Make a neat sketch to illustrate the construction of a backdrop system. Also indicate the position of the rodding eye. (4)
- 3.10 What is the maximum pitch of a drain pipeline? (1)
- 3.11 Make neat sketches and indicate the abbreviations of the following drain symbols:
- 3.11.1 Vent pipe (2)
- 3.11.2 Gully (2)

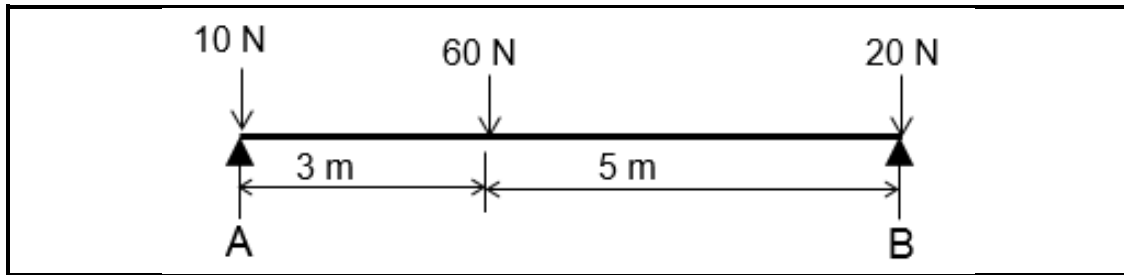
[30]

QUESTION 4: MATERIALS AND QUANTITIES

- 4.1 Make neat sketches to illustrate the following steel profiles:
- 4.1.1 Angle iron (2)
 - 4.1.2 Channel iron (2)
 - 4.1.3 H-beam (2)
- 4.2 Name FIVE properties of coal tar creosote for wood preservation. (5 x 1) (5)
- 4.3 Describe the purpose of wood preservation. (2)
- 4.4 Briefly motivate why aluminium window frames will be used in constructions near the coast. (1)
- 4.5 What is the disadvantage of ferrous metals? (1)
- 4.6 Briefly motivate why a designer must know the properties of metals when designing structures. (2)
- 4.7 Name FIVE properties of glass. (5 x 1) (5)
- 4.8 Briefly describe the manufacturing process of mirrors. (4)
- 4.9 A quantity list consists of four columns.
- Name the columns **A**, **B**, **C** and **D**. (4)
- [30]**

QUESTION 5: APPLIED MECHANICS

- 5.1 FIGURE 5.1 shows a beam which is supported by supports A and B. Calculate the reaction force of support A and B.



(10)

FIGURE 5.1

- 5.2 FIGURE 5.2 on sheet A shows a frame structure with pointed loads. Complete the following on sheet A:

5.2.1 The force diagram on scale 1 N = 1 mm (8)

5.2.2 The table by indicating the size and nature of the forces (8)

- 5.3 FIGURE 5.3 shows a beam with pointed loads. Calculate the bending moment values of point a to d. (4)

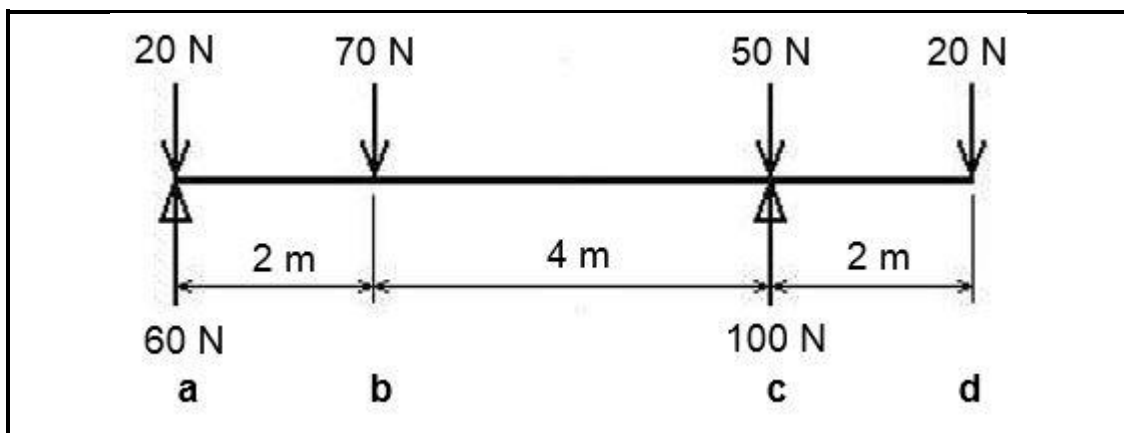


FIGURE 5.3

[30]

QUESTION 6: GRAPHICS AND COMMUNICATION

- 6.1 SHEET C indicates the natural ground level for a section view through a wall construction with a window. Use SHEET C and draw to scale 1 : 50 the section drawing of one wall construction of a dwelling.
The following information must be indicated:

- | | | |
|--------|--|-----|
| 6.1.1 | Scale 1 : 50 | (2) |
| 6.1.2 | 600 mm x 200 mm concrete foundation with the concrete symbol | (3) |
| 6.1.3 | Undisturbed ground symbol | (1) |
| 6.1.4 | Foundation wall | (1) |
| 6.1.5 | 100 mm Ground filling with the symbol | (2) |
| 6.1.6 | 100 mm Concrete floor with the symbol | (2) |
| 6.1.7 | Damp-proof layer under the floor | (1) |
| 6.1.8 | Cavity wall with hatching | (3) |
| 6.1.9 | Damp proof layer in the cavity wall | (2) |
| 6.1.10 | 2,6 m Wall height from floor level to the ceiling | (1) |
| 6.1.11 | Window sill | (1) |
| 6.1.12 | 900 mm window | (1) |
| 6.1.13 | Window lintel | (1) |
| 6.1.14 | Window damp-proof layer | (1) |
| 6.1.15 | Beam filling | (1) |
| 6.1.16 | 114 x 38 mm Wall plate | (1) |
| 6.1.17 | 114 mm Tie beam and rafter with a 30° roof pitch | (2) |
| 6.1.18 | Bottom two 38 x 38 mm purlines with tiles | (2) |
| 6.1.19 | Line work and neatness | (2) |

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

- | | | |
|-------|--------------------------|-----|
| 6.2.1 | Inner door | (2) |
| 6.2.2 | Stairs | (2) |
| 6.2.3 | Wall light | (2) |
| 6.2.4 | Fluorescent light single | (2) |
| 6.2.5 | Manhole | (2) |

[40]**TOTAL: 200**

ANSWER SHEET
ANTWOORDBLAD

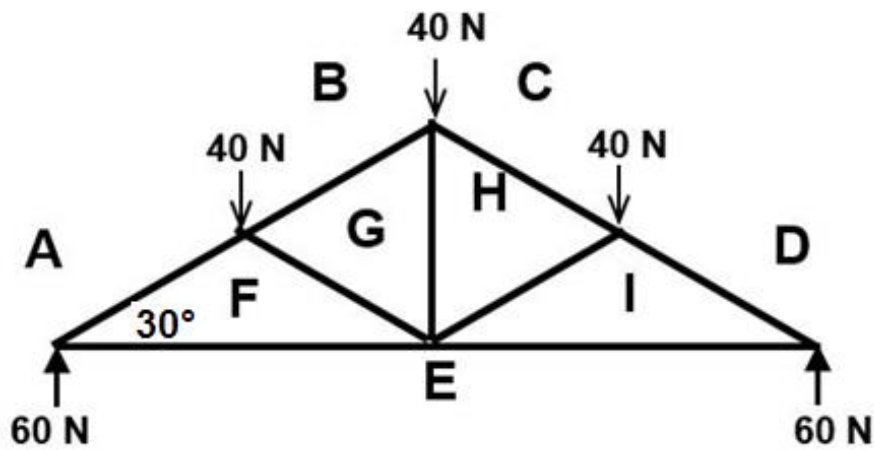
A

CIVIL TECHNOLOGY
SIVIELE TEGNOLOGIE

NAME:
NAAM:

QUESTION/VRAAG 5.2

(16)



a

SCALE/SKAAL: 1 N = 1 mm

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

(4)

**ANSWER SHEET
ANTWOORDBLAD**

B

**CIVIL TECHNOLOGY
SIVIELE TEGNOLOGIE**

**NAME:
NAAM:**

QUESTION/VRAAG 6.1

(30)

Correct scale	2	
Foundation + Symbol	3	
Undisturbed ground symbol	1	
Foundation wall	1	
Ground filling symbol	2	
Concrete floor + Symbol	2	
Floor DPC	1	
Cavity wall + Hatching	3	
Wall DPC	2	
Wall height	1	
Window sill	1	
Window	1	
Window lintel	1	
Window DPC	1	
Beam filling	1	
Wall plate	1	
Tie beam + Rafter	2	
Purlines	2	
Line work/Neatness	2	
TOTAL	30	

NATURAL GROUND LEVEL



SECTION ELEVATION

SCALE 1:50

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	$\text{Pi} = \frac{22}{7} = 3,142$	\emptyset	Diameter	V	Volume

FORMULAS

AREA OF	FORMULA (in words)	FORMULA (in symbols)	FORMULA FOR THE POSITION OF CENTROIDS	
			X-axis	Y-axis
Square	Length x Breadth	$l \times b$	$\frac{b}{2}$	$\frac{b}{2}$
Rectangle	Length x Breadth	$l \times b$	$\frac{l}{2}$	$\frac{b}{2}$
Right-angled triangle	$\frac{1}{2} \times \text{base} \times \text{height}$	$\frac{1}{2}b \times h$	$\frac{b}{3}$	$\frac{h}{3}$
Equilateral triangle/ Pyramid	$\frac{1}{2} \times \text{base} \times \text{height}$	$\frac{1}{2}b \times h$	$\frac{b}{2}$	$\frac{h}{3}$
Circle	$\pi \times \text{radius} \times \text{radius}$	πr^2	Centroid is in the centre	
Circle	$\pi \times \text{diameter} \times \text{diameter}$ divided by 4	$\frac{\pi d^2}{4}$		
Semi-circle	$\pi \times \text{radius} \times \text{radius}$ divided by 2	$\frac{\pi r^2}{2}$	Centroid is 0,424r on the centre line	

$$\text{Position of centroid} = \frac{(A_1 \times d) + (A_2 \times d)}{\text{Total area}}$$