



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

SEPTEMBER 2016

**CIVIL TECHNOLOGY
MEMORANDUM**

MARKS: 200

This memorandum consists of 12 pages.

QUESTION 1: CONSTRUCTION PROCESSES

- 1.1 1.1.1 Raking shore ✓ (1)
- 1.1.2 1.1.A – Shoring planks / board / steel panel ✓
 1.1.B – Raking shore ✓
 1.1.C – Sole plate ✓ (3)
- 1.2 **Name the following tools and name ONE use of each:**
- 1.2.1 - **Claw hammer**
 Any ONE use:
 • Hammering in nails ✓✓
 • Claws are used to pull out nails ✓✓ (Any 1 x 2) (2)
- 1.2.2 - **Sliding bevel**
 Any ONE use:
 • Marking lines at any angle ✓✓
 • Test angles ✓✓ (Any 1 x 2) (2)
- 1.2.3 - **Short jointer**
 Any ONE use:
 • Finishing vertical mortar joints ✓✓ (2)
- 1.2.4 - **Bricklaying pins and lines**
 Any ONE use:
 • Setting building lines ✓✓ (2)
- 1.2.5 - **Portable jig saw**
 Any ONE use:
 • Cutting of curves ✓✓
 • Cutting straight cuts ✓✓ (Any 1 x 2) (2)
- 1.3 (1) The turning blade can (2) cause damage / injuries to the subject it is placed on. (2)
- 1.4 **FIGURE 1.4 shows the brickwork for an outer wall.**
- 1.4.1 Cavity wall (1)
- 1.4.2 **Any THREE advantages of this type of wall construction.**
 • Prevent damp to penetrate to the inner wall. ✓
 • Good thermal isolation ✓
 • No rendering / plastering required for outer walls ✓
 • Inner walls can be built with cheaper bricks ✓
 • Good sound isolation ✓ (Any 3 x 1) (3)
- 1.4.3 (1) So that damp / water that penetrate the wall, (2) can be discharged. (2)

- 1.5 **FIGURE 1.5 shows the uncompleted fixing of a roof truss on a wall. Answer the following questions with regard to the construction in FIGURE 1.5.**

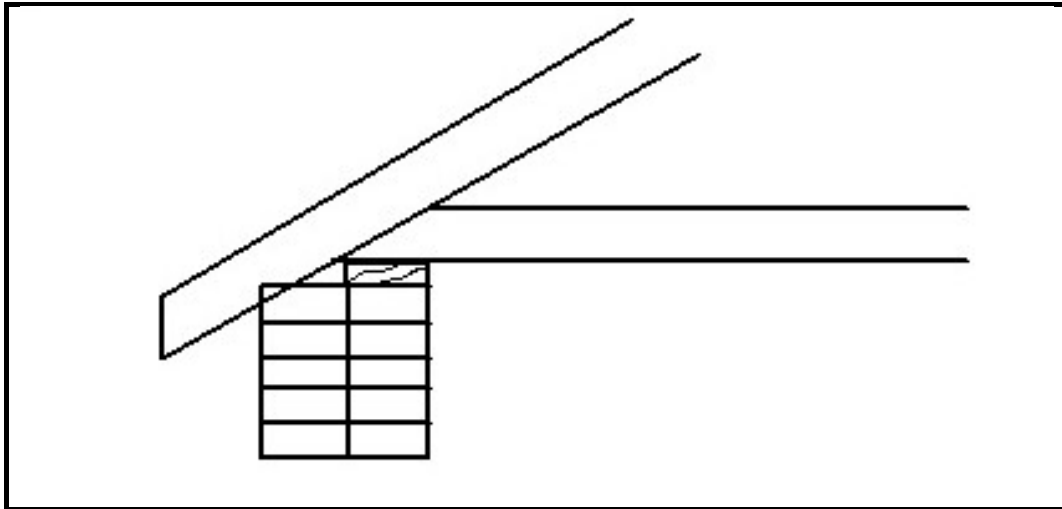


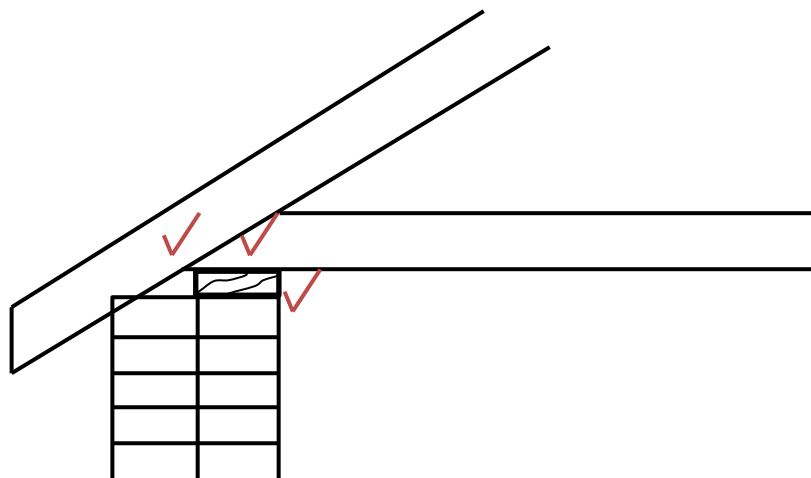
FIGURE 1.5

- 1.5.1 1.5.A – Rafter ✓
 1.5.B – Tie beam ✓
 1.5.C – Wall plate ✓ (3)
- 1.5.2 (1) Distribute the load (2) of the truss to the wall. (2)
- 1.5.4 Any similar answer:
 (1) Wall plate (2) pressure on the (3) bending part of the tie beam.

OR

(2) Wall plate (2) pressure on (3) intersection / corner of rafter and tie beam.

OR



(3)
[30]

QUESTION 2: ADVANCED CONSTRUCTION PROCESSES

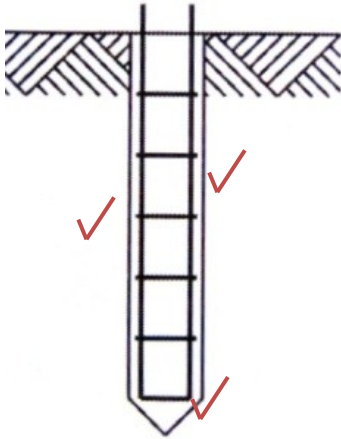
2.1 (1) Carry loads / brick work (2) over openings / windows / doors. (2)

2.2

- Soda ✓
- Silica ✓
- Chalk ✓

(3 x 1) (3)

2.3



(3)

2.4 (Any similar description.)
- (1) Soil below offers (2) better stability / hardness / firmness. (2)

2.5 **Any FOUR factors which will have an influence in the choice of the correct type of foundation:**

- Load bearing ability of the ground ✓
- Depth at which load bearing ground can be found ✓
- Level of water table ✓
- Distance from trees and other structures ✓
- Weight of the building ✓

(Any 4 x 1) (4)

2.6 (1) Prevents the damp proofing (2) from being punctured by (3) the hardcore filling. (3)

2.7 2.7.1 **THREE requirements to which steel reinforcement must comply.**

- Resist tensile stress. ✓✓
- Easily be bent into the required shape. ✓✓
- The surface must bond with the concrete. ✓✓

(3 x 1) (3)

2.7.1

- Gloves
- Overalls
- Safety shoes
- Hard hat
- Safety glasses

(Any 3 x 1) (3)

- 2.8 2.8.1 FALSE (1)
 2.8.2 FALSE (1)
 2.8.3 FALSE (1)
 2.8.4 FALSE (1)
 2.8.5 TRUE (1)
 2.8.6 TRUE (1)
 2.8.7 TRUE (1)
 2.8.8 TRUE (1)
- 2.9 2.8.1 Flat arch ✓ (1)
- 2.8.2 (Similar answer)
 (1) Prevents illusion (2) that the arch is bent downwards. (2)
- 2.8.3 2.8.A – Voussoirs ✓
 2.8.B – Abutment ✓ (2)
- 2.9 (1) Bind different (2) steel parts together. (2)
- 2.10 2.10.1 300 mm ✓ (1)
 2.10.2 600 mm ✓ (1)
- [40]**

QUESTION 3: CIVIL SERVICES

- 3.1 3.1.1 Water service point ✓ (1)
- 3.1.2 3.1.B – Stop cock ✓
 3.1.C – Water meter ✓
 3.1.D – Municipal water supply / Reticulating piping ✓
 3.1.E – User / consumer pipe ✓ (4)
- 3.1.3 Ø20 mm ✓ (1)
- 3.1.4 Local authority / Municipality ✓ (1)
- 3.2 (1) Catch water when (2) geyser is leaking / serviced / water not damaging the ceiling. (2)
- 3.3 (Any similar answer.)
 (1) Receiving most sun rays (2) from northern side. (2)
- 3.4 3.4.1 Ball valve ✓ (1)
- 3.4.1 Any TWO positions
 • Geyser ✓
 • Water storage tank of water closet (toilet) ✓ (2 x 1) (2)
- 3.5 3.5.1 **UNDERGROUND** ✓ (1)
 3.5.2 **TWO** ✓ (1)
 3.5.3 **SETTLE DOWN** ✓ (1)
 3.5.4 **ANAEROBIC BACTERIA** ✓ (1)

3.6 Test if drain pipe is clear of obstructions. ✓ (1)

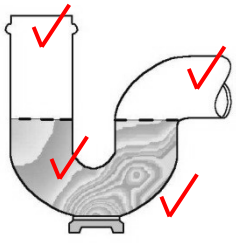
3.7 600 mm ✓ (1)

3.8 **Any THREE positions in a drain system where access openings must be installed.**

- Drain change in direction ✓
- Junction with other drain pipes ✓
- Every 45 m in system ✓
- Beginning of drain ✓
- Drain gradient change ✓

(3 x 1) (3)

3.9



(4)

3.10 Cleaning rods ✓ (1)

3.11 **Any TWO advantages of wind turbines for electricity supply.**

- Clean fuel ✓
- No pollution ✓
- Renewable ✓

(2 x 1) (2)

[30]

QUESTION 4: MATERIALS AND QUANTITIES

- 4.1 **Any THREE properties of coal tar creosote for wood preservation.**
- Outdoor use ✓
 - Use for wood that is in contact with the ground ✓
 - Resistant to maceration ✓
 - Dark colour ✓
 - Discolours the timber ✓
 - Cannot be painted ✓
 - Does not affect the dimensions ✓
 - Strong odour ✓
- (Any 3 x 1) (3)
- 4.2 1.6.1 Natural / air seasoning ✓ (1)
- 1.6.2 (1) Ensure proper air circulation and (2) not absorb moisture from the ground. (2)
- 1.6.3 **Any TWO requirement of the foundation for this seasoning method.**
- Sturdy ✓
 - Treated poles / Concrete / bricks ✓
 - Even ✓
- (Any 2 x 1) (2)
- 4.3 **Any FOUR advantages of PVC for the use drain pipes.**
- Light in weight ✓
 - Long lengths available ✓
 - Less jointing ✓
 - Tight joints ✓
 - Handle / install easy ✓
 - Good flow efficiency ✓
 - Resistance to chemicals / sewer ✓
- (Any 4 x 1) (4)
- 4.4 (1) Odd number of (2) layers of veneer (3) with the grain glued at right angles. (3)
- 4.5 4.5.1 FALSE (1)
- 4.5.2 FALSE (1)
- 4.5.3 TRUE (1)
- 4.5.4 FALSE (1)
- 4.5.5 TRUE (1)

- 4.6 **FIGURE 4.6 shows the foundation strips for a building. The foundations are 700 mm wide and 200 mm thick and a concrete mix of 1 : 3 : 4 is used. The centre line measurement of the building is 31,6 m and the total volume concrete needed for the foundation is 4,424 m³. Determine the following quantities for the concrete mix:**

- 4.6.1 Volume sand needed.

$$4,424 \text{ m}^3 \times \frac{3}{8} = 1,659 \text{ m}^3 \quad (3)$$

- 4.6.2 Volume stone needed.

$$4,424 \text{ m}^3 \times \frac{4}{8} = 2,212 \text{ m}^3 \quad (3)$$

- 4.6.3 Calculate the number bags of cement needed if the content of a bag cement is 0,033 m³.

$$4,424 \text{ m}^3 \times \frac{1}{8} = \frac{0,553 \text{ m}^3}{0,033} = 16,75 = 17 \text{ bags cement} \quad (4)$$

[30]

QUESTION 5: APPLIED MECHANICS

5.1 Calculate the centroid of the body in FIGURE 5.1 from point P.

$$X = \frac{b}{3} = \frac{3}{3} = 1$$

$$= 3 - 1 + 1 = 3$$

$$Y = \frac{h}{3} = \frac{6}{3} = 2$$

$$= 2 + 2 = 4$$

(4)

5.2 FIGURE 5.2, on ANSWER SHEET A, shows the space diagram for a roof truss. Determine graphically, on ANSWER SHEET A by drawing the force diagram and completing the table, the size and nature of the forces in the parts of the truss.

(18)

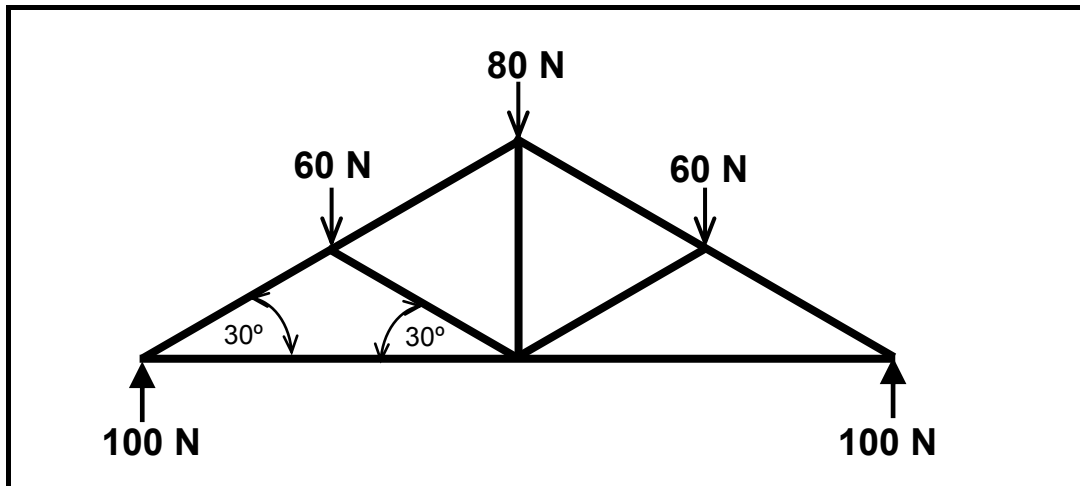
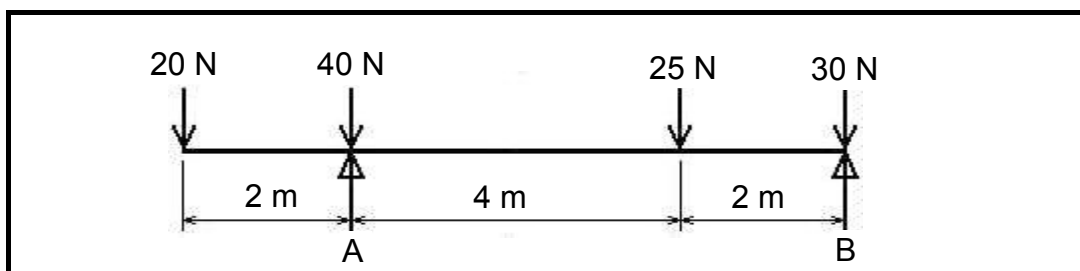


FIGURE 5.2

(18)

5.3 FIGURE 5.3 shows a beam with point loads. Calculate the reaction forces of the supports A and B.



<p>Around A M.L</p> $(B \times 6) + (20 \times 2) = (25 \times 4) + (30 \times 6)$ $B6 + 40 = 100 + 180$ $B6 = 280 - 40$ $B = \frac{240}{6}$ $= 40 \text{ N}$	<p>Around B M.R</p> $(A \times 6) = (25 \times 2) + (40 \times 6) + (20 \times 8)$ $A6 = 50 + 240 + 160$ $A = \frac{450}{6}$ $= 75 \text{ N}$
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(8)

[30]

QUESTION 6: GRAPHICS AND COMMUNICATION

6.1 **FIGURE 6.1 on ANSWER SHEET B shows the outer lines of a structure which must be built on a site. Draw the site plan on scale 1 : 200 on ANSWER SHEET B so that the structure is in the middle of the site. The site plan must comply too the following requirements:**

- 6.1.1 Site size is (1) 20 m wide from east to west and (2) 30 m long from south to north (2)
- 6.1.2 Pavement of (1) 2 m and the street of (2) 6 m at the (3) south side (4)
- 6.1.3 Building boundaries are (1) 2 m at the (2) east, north and west sides and (3) 4 m at the south side (4)
- 6.1.4 (1) 3 m Wide entrance to (2) the site (2)
- 6.1.5 (1) Datum level in the (2) north-western corner of the site (2)







Draw also the roof plan on the structure and indicate the following:

- 6.1.6 Overhang of 400 mm (2)
- 6.1.7 Hipped end at the north end (2)
- 6.1.8 American cable end at the south end (3)
- 6.1.9 Ridge (1)

Indicate the following measurements:

- 6.1.10 Length and width of the site (4)
- 6.1.11 Southern and western building boundaries (2)

6.2 **Sketches to illustrate the following symbols on a floor plan:**

- 6.2.1 Water meter  (2)
- 6.2.2 Vent pipe  (2)
- 6.2.3 Bath  (2)
- 6.2.4 Water closet  (2)
- 6.2.5 Sink  (2)
- 6.2.6 Power point  (2)

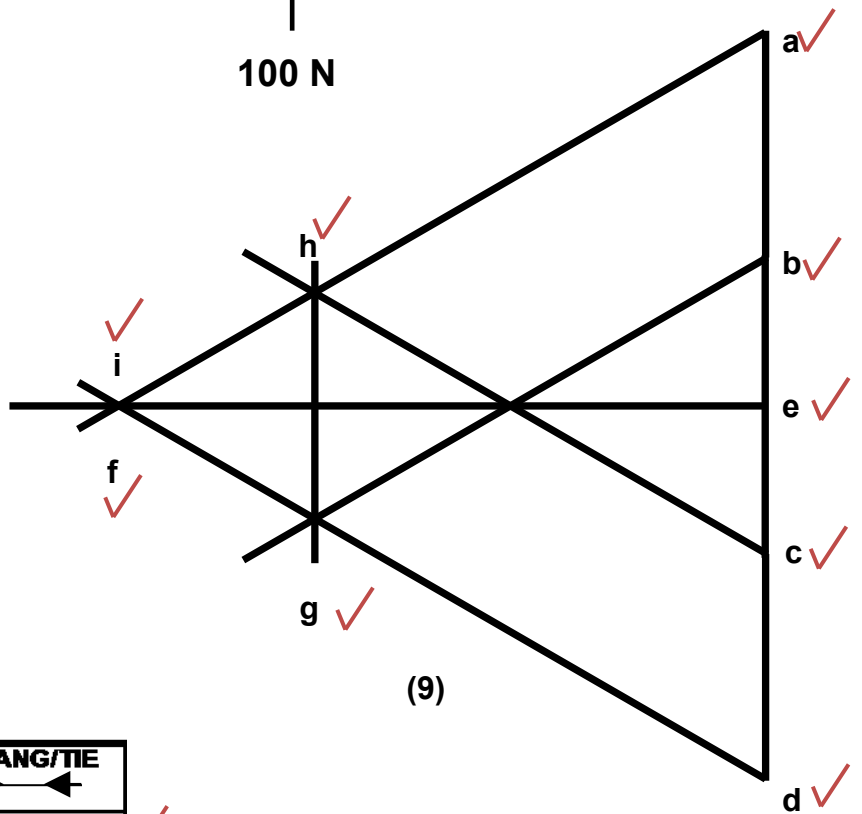
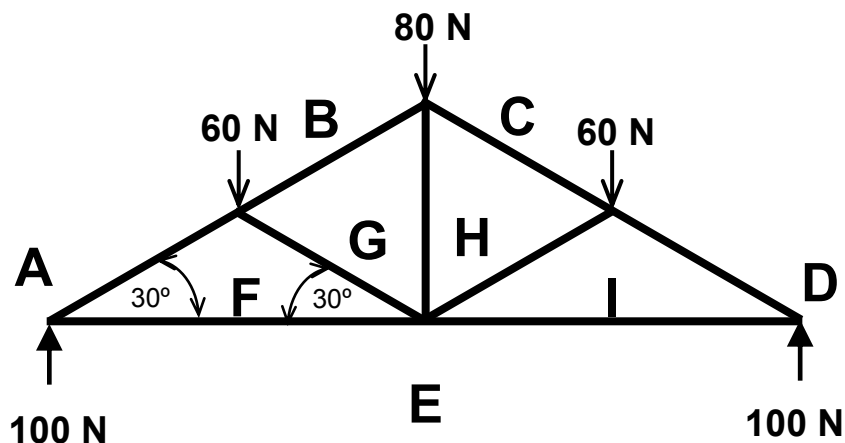
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TOTAL: 200

ANTWOORDBLAD ANSWER SHEET	SIVIELE TEGNOLOGIE CIVIL TECHNOLOGY	NAAM: _____ NAME: _____
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VRAAG/QUESTION 5.2

(18)

RUIMTEDIAGRAM:SPACE DIAGRAM:SKAAL/SCALE: 2 mm = 1 N

DEEL/PART	STUT/STRUT ↔	STANG/TIE →←
AF	100 N	
BG	70 N	
CH	70 N	
DI	100 N	
EI		85 N
EF		85 N
FG	30 N	
GH		30 N
HI	30 N	

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ANSWER SHEET		CIVIL TECHNOLOGY	NAME:

VRAAG/QUESTION 6.1

(28)

