



# basic education

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Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**CIVIL TECHNOLOGY**

**FEBRUARY/MARCH 2015**

**MEMORANDUM**

**MARKS: 200**

**This memorandum consists of 16 pages.**

**QUESTION 1: CONSTRUCTION, SAFETY AND MATERIAL**

- 1.1
- He is not wearing earmuffs/ear protection. ✓
  - He is not wearing an overall. ✓
  - He did not remove loose clothing like the tie. ✓
  - He is not wearing a mask (dust, paint, gas, etc.). ✓
  - He is not wearing safety glasses.
- ANY FOUR OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (4)
- 1.2
- 1.2.1 A cornice is installed where the walls and ceiling meet. ✓  
A skirting is installed where the wall and floor meet. ✓ (2)
- 1.2.2 A cornice is used as a decorative finish between the ceiling and wall. ✓  
A skirting is used to seal the joint between the wall and floor. ✓  
**OR ANY OTHER ACCEPTABLE ANSWER** (2)
- 1.3
- 1.3.1 It prevents insects penetrating the wood. ✓  
Prevents rotting. ✓  
I would use treated timber because it makes the wood less susceptible to fungi attack.  
I would use treated timber because it is durable.  
Enhances appearance.  
**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)
- 1.3.2 Coal-tar creosote ✓  
Water-borne preservatives  
Light Organic Solvent Preservatives – LOSP  
Oil  
Varnish  
Paint  
**ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (1)
- 1.4 To hold, bind or join the main bars together. ✓  
To resist shear stress. ✓  
To prevent the bending of main bars.  
It prevents concrete from shearing  
It keeps the bars in place.  
**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)
- 1.5 Dampness will enter the wall. ✓  
Moisture will enter the building horizontal or vertically. ✓  
A damp musty (damp) smell will prevail in the building.  
Dampness will damage paint on the inside and outside of the wall.  
**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)

- 1.6 Clean the wall. ✓  
Repair cracks and blemishes. ✓  
Check for moisture. ✓  
Seal the wall.  
Apply a primer coat.  
Paint the wall with a suitable paint for concrete.  
Roll on concrete paint sealer.
- ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (3)**
- 1.7 1.7.1 Angle-iron ✓ (1)
- 1.7.2 Does not easily bend ✓  
Welds well  
Can easily be joined  
Malleable  
Ductile
- ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1)**
- 1.7.3 Steel roof trusses ✓  
Palisades/fences  
Runners for sliding barriers/gates  
Supports for fixing objects to walls
- ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1)**
- 1.8 Rungs ✓  
Stiles ✓  
Feet
- ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (2)**
- 1.9 1.9.1 Double casement window ✓ (1)
- 1.9.2 A – Window stile/stile ✓  
B – Mullion/Muntin ✓  
C – Window pane/glass ✓  
D – Bottom rail ✓  
E – Window sill ✓ (5)
- 1.10 Beam filling is the brickwork between the trusses/rafters from wall plate level to the underside of the roof covering. ✓ (1)
- [30]**



- 2.5 2.5.1 A- Cable/steel cable ✓  
B- Tube/steel casing ✓  
C- Undisturbed earth/unstable soil/soft soil/soil ✓  
D- Drop hammer ✓  
E- Plug ✓ (5)

2.5.2



CRITERIA	MARK ALLOCATION
Concrete Symbol	1
Extended/Enlarged base (toe)	1

(2)

- 2.5.3 To hammer in the concrete plug ✓ (1)

- 2.5.4 It should be removed ✓ (1)

- 2.5.5 When an ordinary foundation cannot be used ✓  
On loose soil/soft soil/unstable soil  
No bed rock/rock bed available

**ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (1)

- 2.5.6 Auger type pile/hammer-driven pile ✓ (1)

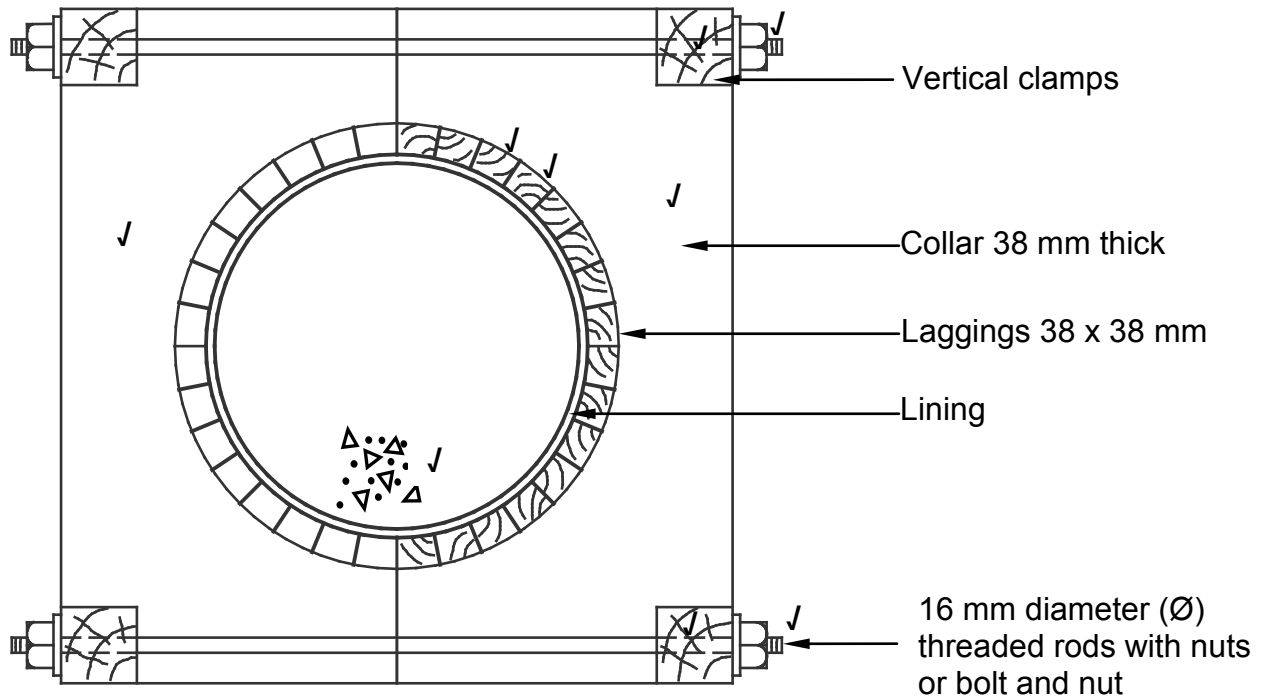
- 2.5.7 Can be used anywhere even in water ✓  
Good stability  
Easy to install  
Resists stress  
Can be used in any weather condition

**ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (1)

- 2.6 Tiling is more durable than paint ✓  
More cost effective over a period of time ✓  
Easy to maintain  
Enhance appearance

**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)

2.7

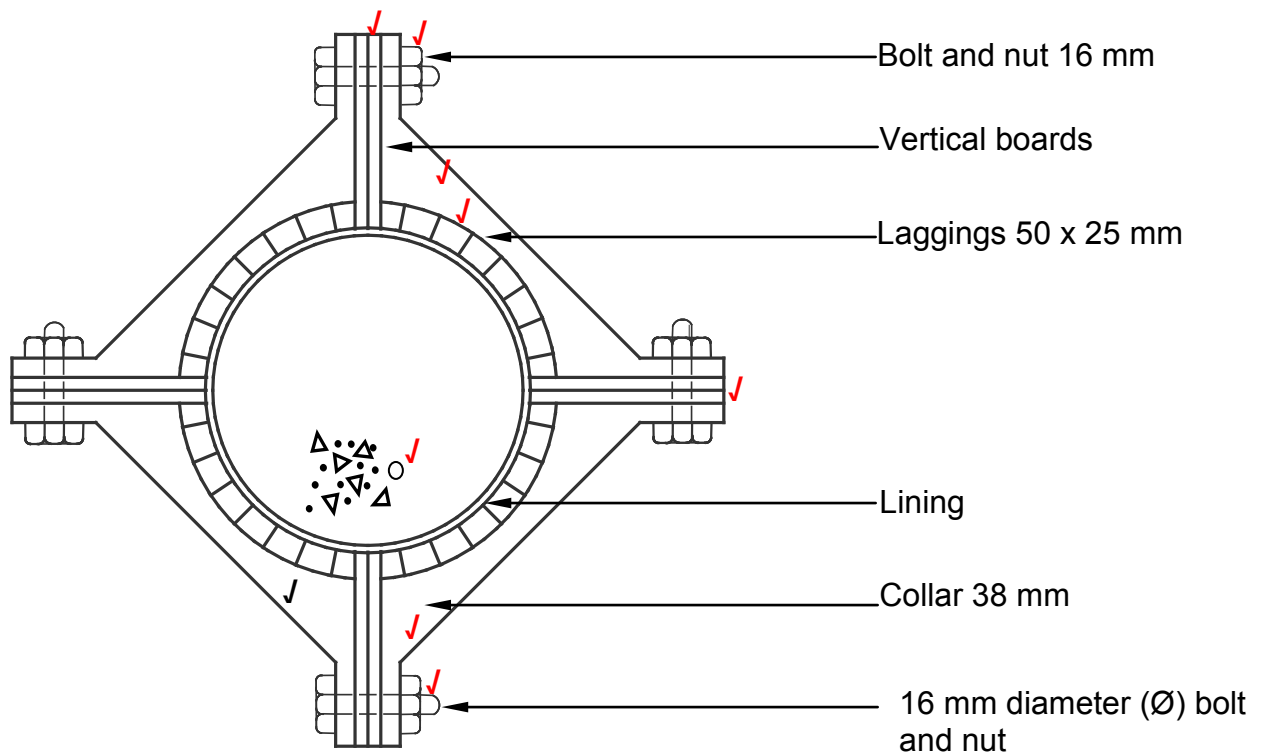


Formwork for round column ✓  
Application of scale ✓✓

**NOT TO SCALE: USE A MASK TO MARK THIS QUESTION**

Assessment Criteria	Marks	Learner mark
Laggings 38 x 38 mm	2	
Vertical clamp/vertical boards	2	
Collars	2	
16 mm bolts/threaded rods and nuts	2	
Symbol for concrete	1	
Application of scale	2	
Title	1	
<b>Total</b>	<b>12</b>	

**OR**



Formwork for round column ✓  
Application of scale ✓ ✓

**NOT TO SCALE: USE A MASK TO MARK THIS QUESTION**

Assessment Criteria	Marks	Learner mark
Laggings 38 x 38 mm	2	
Vertical clamp/vertical boards	2	
Collars	2	
16 mm bolts/threaded rods and nuts	2	
Symbol for concrete	1	
Application of scale	2	
Title	1	
<b>Total</b>	<b>12</b>	

[40]

**QUESTION 3: CIVIL SERVICES**

- 3.1 3.1.1 Rain/springs/dams/snow ✓  
**ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (1)
- 3.2.1 Copper ✓ (1)
- 3.2.2 Capillary joint ✓ (1)
- 3.3 Maintenance and repair work is very low. ✓  
It is easy to maintain. ✓  
It produces enough hot water for various households' purposes as long as there is electricity.  
**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)
- 3.4 Water inside the geyser is discharged through the drain cock into ✓ the drip tray when the geyser needs to be drained. ✓  
**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)
- 3.5 The season ✓  
Cloud cover/cloudy weather ✓  
The time of day  
The duration of the sunshine  
The angle at which the panel is mounted (an angle of 35° to the horizontal is ideal).  
The height of the panels on the roof for the effective operation of the other parts of the system.  
The position of the solar panel (facing north for the most sun)  
Shadow of adjacent double story building/trees  
The distance of the solar panel to the storage tank  
**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)
- 3.6 Solar panel must face north at ±35° ✓  
Circulation pipes must be insulated to avoid heat loss ✓  
Solar panels must be SANS approved  
Must not be installed in a shady area  
**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)



- 3.7 3.7.1 Sewage – refers to waste water and soiled water ✓ (1)
- 3.7.2 Soil water – water that carries human waste. (1)
- 3.8 3.8.1 Slope in millimetres from A to B  $\text{Slope } 1 : 40 = 1 \div 40 = 0,025$   
 $= 35 \text{ m} \times 0,025 \text{ m} \checkmark$   
 $= 0,875 \text{ m}$   
 $= 875 \text{ mm} \checkmark$  (2)

**OR**

Slope in millimetres from A to B = Distance x Fall  
 $= 35 \text{ m} \times 1:40$   
 $= 35 \times 1 \div 40 \checkmark$   
 $= 0,875 \text{ m}$   
 $= 875 \text{ mm} \checkmark$

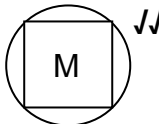
3.8.2 Invert level at A  $\begin{array}{l} \checkmark \quad \checkmark \\ = 1\ 385 - 875 \text{ mm} \\ \checkmark \\ = 510 \text{ mm} \end{array}$  (3)

- 3.9 A – Gully trap ✓  
 B – Junction 45° ✓ (2)

- 3.10 3.10.1 D ✓ (1)  
 3.10.2 C ✓ (1)  
 3.10.3 C ✓ (1)

- 3.11 It is much safer ✓  
 Bare cables cannot be seen ✓  
 Cables is not exposed to the weather and damage ✓  
 It also looks tidier than loose cables

**ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (3)

- 3.12  (2)

- 3.13 Channels ✓  
 Sloping hard surfaces ✓  
 Storm water pipes  
 Underground channels

**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)**[30]**

**QUESTION 4: QUANTITIES AND CALCULATIONS AND JOINING**

- 4.1 To attach roof structures to supporting walls ✓  
To build frames into walls

**ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1)**

- 4.2 4.2.1 Galvanized pipes ✓ (1)

4.2.2 PVC pipes ✓ (1)

- 4.3 4.3.1 It is used for rough carpentry work such as fixing fascia-boards,  
timber battens, metal and other materials to wood. ✓

**ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1)**

- 4.3.2 It is used to attach hinges to doors ✓  
When the head of the screw is required to be flush to the wood.

**ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1)**

- 4.4 Gang nails ✓  
Bolts and nuts ✓  
Nails

**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (2)**

**ANSWER SHEET 4.5**

A	B	C	D
			Centre line: Superstructure
			$2 / 10\ 500\ \text{mm} = 21\ 000\ \text{mm} \checkmark$
			$\underline{2} / 6\ 000\ \text{mm} = \underline{12\ 000\ \text{mm}} \checkmark$
			$= 33\ 000\ \text{mm} \checkmark$
			$\underline{\text{Minus } 4 / 220} = \underline{\quad 880} \checkmark$
			$= 32\ 120\ \text{mm}$
			Centre line = 32,12 m $\checkmark$ (5)
1/	32,12 $\checkmark$		Area of wall for superstructure
	$\underline{2,7} \checkmark$	86,72 m <sup>2</sup> $\checkmark$	(3)
1/	2,0 $\checkmark$		Area of Door: = 1,6 m <sup>2</sup>
	$\underline{0,8} \checkmark$	1,6 m <sup>2</sup> $\checkmark$	(3)
1/	1,0 $\checkmark$		Area of Window = 0,6 m <sup>2</sup>
	$\underline{0,6} \checkmark$	0,6 m <sup>2</sup> $\checkmark$	(3)
			Total area of wall after deductions
			$= 86,72\ \text{m}^2 - 1,6\ \text{m}^2 - 0,6\ \text{m}^2 \checkmark = 84,52\ \text{m}^2 \checkmark$ (2)
2/	84,52 $\checkmark$		
	$\underline{50} \checkmark$	8 452 $\checkmark$	8 452 bricks will be needed for the superstructure. (3)
			(19)
		<b>OR</b>	
1/	84,52		
	$\underline{100}$	8 452	

- 4.6
- Battens/brandering  $\checkmark$
  - Ceiling board/Rhino board/Knotty pine  $\checkmark$
  - Cornice  $\checkmark$
  - Cover strips/Half rounds  $\checkmark$
  - Wire nails/Panel Pins
  - Clout nails/Drywall screws

**ANY FOUR OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**

(4)  
[30]

**QUESTION 5: APPLIED MECHANICS****5.1 ANSWER SHEET 5.1**

$$\begin{aligned}
 \text{Position of centroid from A-A} &= \frac{(A_1 \times d) + (A_2 \times d) - (A_3 \times d)}{\text{Total area}} \\
 &= \frac{(2\,100 \times 65) + (2\,500 \times 25) - (450 \times 10)}{4\,150} \\
 &= \frac{136\,500 + 62\,500 - 4\,500}{4\,150} \\
 &= \frac{194\,500 \text{ mm}^3}{4\,150 \text{ mm}^2} \\
 &= 46,87 \text{ mm}
 \end{aligned}$$

**OR**

Take moments around A on Y-axis

$$\begin{aligned}
 4\,150 \text{ mm}^2 \times Y &= (2\,100 \times 65) + (2\,500 \times 25) - (450 \times 10) \\
 4\,150 \text{ mm}^2 \times Y &= \frac{199\,000 - 4\,500}{4\,150} \\
 &= \frac{194\,500 \text{ mm}^3}{4\,150 \text{ mm}} \\
 &= 46,867 \text{ mm}
 \end{aligned}$$

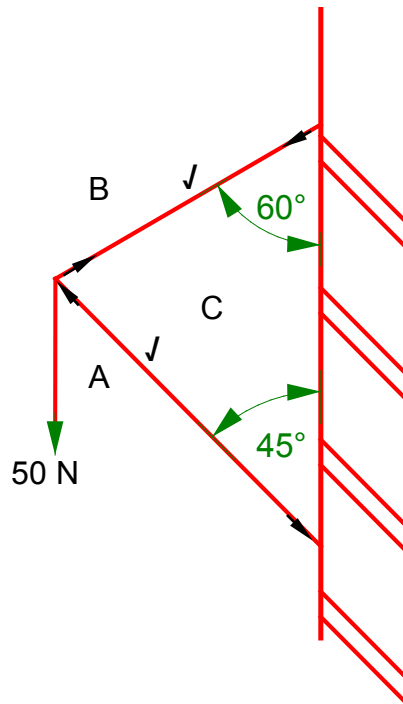
**OR**

PART	AREA (A)	Y	AREA OF Y (AY)
Rectangle	2 100 mm <sup>2</sup>	$\frac{h}{2} = \frac{30}{2} = 15 \text{ mm}$ $c = 50 + 15$ $= 65 \text{ mm}$	136 500 mm <sup>3</sup>
Square	2 500 mm <sup>2</sup>	$\frac{s}{2} = \frac{50}{2} = 25 \text{ mm}$	62 500 mm <sup>3</sup>
Right-angled triangle	- 450 mm <sup>2</sup>	$\frac{h}{3} = \frac{30}{3} = 10 \text{ mm}$	- 4 500 mm <sup>3</sup>
$\Sigma$	4 150 mm <sup>2</sup>		194 500 mm <sup>3</sup>

$$\begin{aligned}
 &\frac{\Sigma AY}{\Sigma A} \\
 &= \frac{194\,500 \text{ mm}^3}{4\,150 \text{ mm}^2} \\
 &= 46,87 \text{ mm}
 \end{aligned}$$

(8)

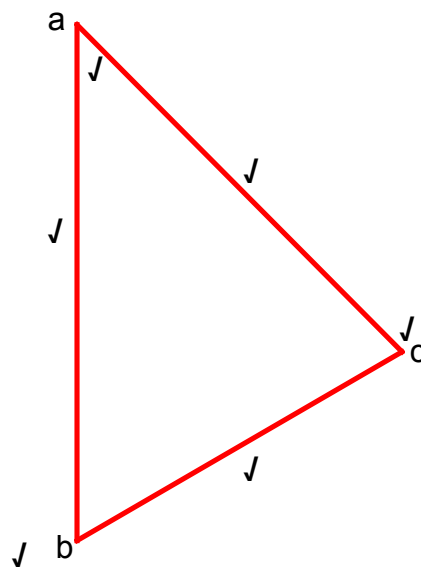
5.2  
5.2.1



(2)

SPACE DIAGRAM  
Nature of forces BC and CA = 2 marks

5.2.2



(6)

VECTOR DIAGRAM  
**NOT TO SCALE: USE A MASK TO MARK THIS QUESTION**

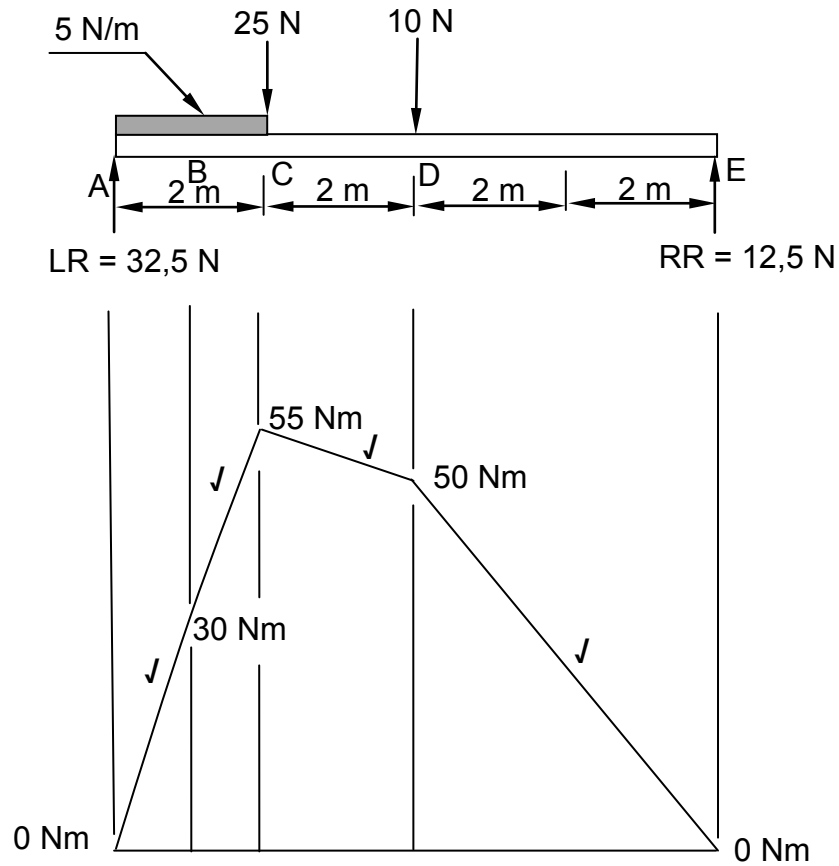
5.2.3

MEMBER	NATURE	FORCE
BC	Tie ✓	37 N ✓
CA	Strut ✓	45 N ✓

Tolerance of 1 N to either side

(4)

- 5.3 5.3.1 10 N ✓ (1)
- 5.3.2 1 m ✓ (1)
- 5.3.3  $SF_e (8 \text{ m from A}) = 32,5 \text{ N} - 10 \text{ N} - 25 \text{ N} - 10 \text{ N} + 12,5 \text{ N} \quad \checkmark\checkmark\checkmark$   
= 0 N (4)
- 5.3.4




**NOT TO SCALE: USE A MASK TO MARK THIS QUESTION  
-1 MARK IF THE WRONG SCALE IS USED**

(4)  
[30]



**QUESTION 6.1****ANSWER SHEET 6.1**

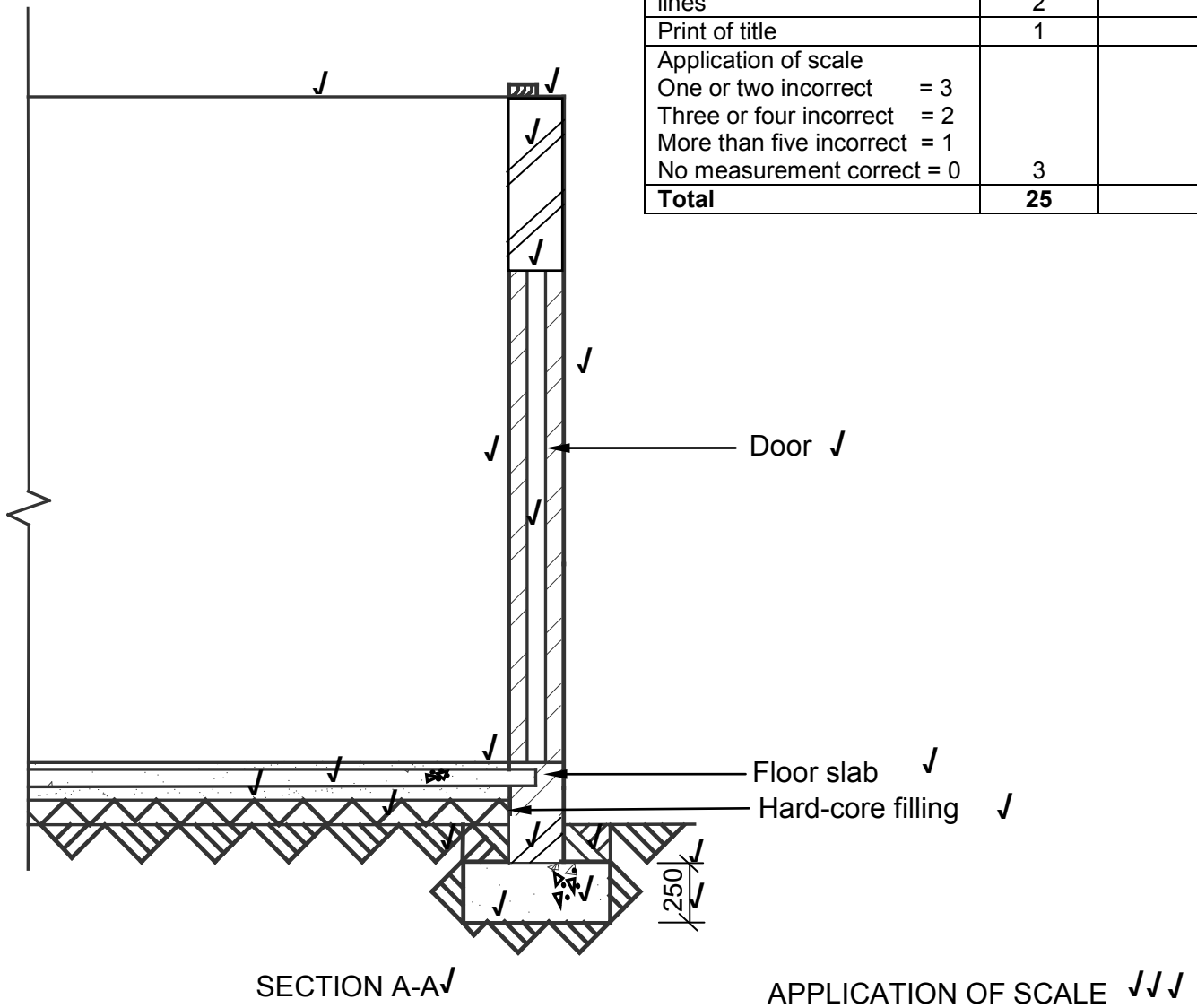
<b>NO.</b>	<b>QUESTIONS</b>	<b>ANSWERS</b>	<b>MARKS</b>
1	Identify number 1.	Bath	1
2	Calculate the perimeter of the building	29 600 mm/29,6 m	1
3	Identify number 2.	Wash basin	1
4	Identify number 3.	Water closet	1
5	Calculate the area of the floor of the bathroom in m <sup>2</sup> ?	9 m <sup>2</sup>	1
6	Identify number 4.	Wash tub	1
7	Identify number 5.	Built-in cupboard	1
8	Name the type of roof of the building	Hipped roof	1
9	Identify the electrical symbol at 6.	Fluorescent light	1
10	Identify the electrical symbol at number 7.	Double pole one way light switch	1
11	Draw the symbol to indicate a sectional view of a face-brick wall.		2
12	Identify number 8.	Light – wall mounted	1
13	Which elevation of the house must be drawn if you want to see the front of the bedroom?	North elevation	1
14	How many doors are indicated on the drawing?	4 doors	1
		<b>Total</b>	<b>15</b>



**QUESTION 6.2**

**ANSWER SHEET 6.2**

ASPECT	MARKS	LEARNER MARK
Correctness of substructure	6	
Correctness of superstructure	7	
Correctness of any three drawing symbols	3	
Printing any three labels	3	
Dimension and dimension lines	2	
Print of title	1	
Application of scale		
One or two incorrect = 3		
Three or four incorrect = 2		
More than five incorrect = 1		
No measurement correct = 0	3	
<b>Total</b>	<b>25</b>	



**NOT TO SCALE: USE A MASK TO MARK THIS QUESTION**

[40]

**TOTAL: 200**