



# education

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Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**CIVIL TECHNOLOGY**

**NOVEMBER 2009**

**MEMORANDUM**

**MARKS: 200**

**This memorandum consists of 17 pages.**

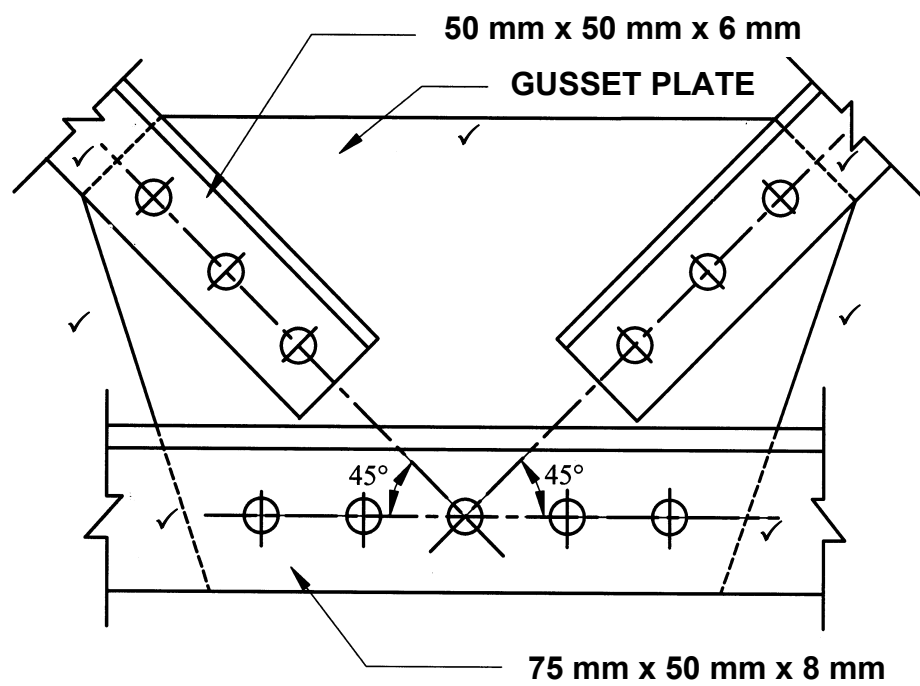
**QUESTION 1**

LO3 AS1,2,3,5,7,10

- |     |        |       |   |          |      |
|-----|--------|-------|---|----------|------|
| 1.1 | 1.1.1  | TRUE  | ✓ |          |      |
|     | 1.1.2  | TRUE  | ✓ |          |      |
|     | 1.1.3  | FALSE | ✓ |          |      |
|     | 1.1.4  | TRUE  | ✓ |          |      |
|     | 1.1.5  | FALSE | ✓ |          |      |
|     | 1.1.6  | FALSE | ✓ |          |      |
|     | 1.1.7  | TRUE  | ✓ |          |      |
|     | 1.1.8  | TRUE  | ✓ |          |      |
|     | 1.1.9  | FALSE | ✓ |          |      |
|     | 1.1.10 | FALSE | ✓ | (10 x 1) | (10) |

- |     |       |                 |   |  |     |
|-----|-------|-----------------|---|--|-----|
| 1.2 | 1.2.1 | A – Border seam | ✓ |  |     |
|     |       | B – Bolt pitch  | ✓ |  |     |
|     |       | C – Back mark   | ✓ |  | (3) |

1.2.2



**FIGURE 1.2.2** (7)

- 1.3
- Get the person away from the source of electricity.
  - Use a piece of timber or non-conductor to break the contact of electricity from the person.
  - Switch off the power source.
- (ANY TWO OF THE ABOVE OR ANY OTHER SUITABLE ANSWERS)** (2)
- 1.4
- Only use the tool for its intended purpose.
  - Wet hands can cause ferrous metals to rust, try to make contact with these parts as little as possible.
  - Remove rust from tools with steel wool only and thereafter apply a thin layer of oil or wax over it.
  - Check tools regularly for defects.
  - Avoid stacking tools on top of each other.
  - Tools must not be left lying around, they must be returned to its proper storage place.
  - Cutting tools must be sharp and its edges protected with a covering.
- (ANY FIVE OF THE ABOVE OR ANY OTHER SUITABLE ANSWERS)** (5)
- 1.5
- Take note of overhead electrical cables and avoid contact with it.
  - Place the ladder so that its feet are a quarter of its length away from the object it is resting against.
  - Unless the ladder is securely tied at the top, another person should hold it whilst in use.
  - Wherever possible, the ladder should protrude at least 900 mm above its support.
  - Do not use ladders horizontally as runways or scaffolding.
  - Never place ladders in front of a door without taking precautions.
  - Only one person at a time is to use a ladder.
- (ANY THREE OF THE ABOVE OR ANY OTHER SUITABLE ANSWERS)** (3)
- [30]**

**QUESTION 2**

LO3 AS1,2,3,5,7,10

2.1 2.1.1

- Should be strong enough to support the load of wet concrete.
- It must not be able to deflect under the load of wet concrete.
- It must be accurately set out.
- It must have grout tight joints.
- The design of the formwork unit should be such that it can be easily erected and dismantled.
- Formwork material must be of such a nature that it can be easily handled by hand or mechanical lifting device.
- The material must be re-usable.

**(ANY FOUR OF THE ABOVE OR ANY OTHER SUITABLE ANSWERS)**

(4)

2.1.2

MARK ALLOCATION		
1	Joist / Bearer	✓
2	Cleats	✓
3	Stay / Strut	✓
4	Board shuttering	✓
5	Fixing plate / Kicker	✓
6	Head / Head tree	✓
7	Fish plate / Cleat	✓
8	Strut / Brace	✓
9	Wedges	✓
10	Post / Prop	✓
11	Folding wedges	✓
12	Sole plate / Sole piece	✓

(12)

- 2.2
- 1 – concrete or in-situ concrete ✓
- 2 – Reinforcing mesh/steel or weld mesh ✓
- 3 – Hollow blocks ✓
- 4 – Pre-stressed ribs or ribs ✓

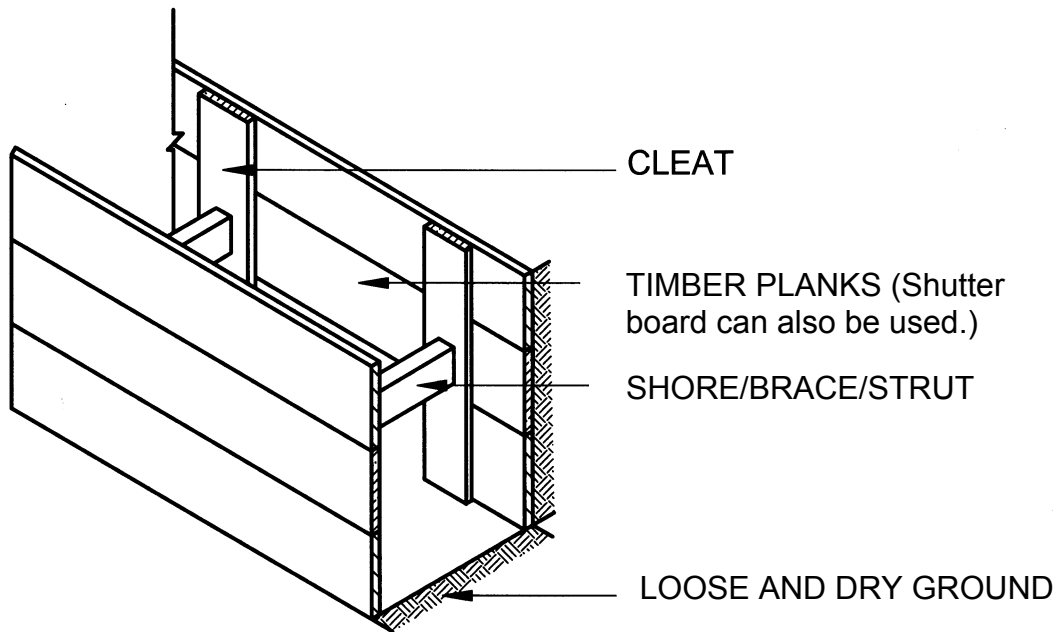
(4)

- 2.3
- Pre-stressed units
  - Maximum span
  - In-situ concrete layer
  - Unit weight
  - Reinforcement requirements
  - Insulation characteristic
  - Fire resistance
  - Volume reduction
  - Sound insulation
  - Nature of struts
  - Thickness of units
  - Speed of construction
  - Support and formwork needed
  - Weight reduction
  - Foundation reduction
  - Safety characteristics
  - Precast top layer

**(ANY FOUR OF THE ABOVE)** (4)

- 2.4      2.4.1      Red ✓      (1)
- 2.4.2      Yellow ✓      (1)
- 2.4.3      Green ✓      (1)

2.5



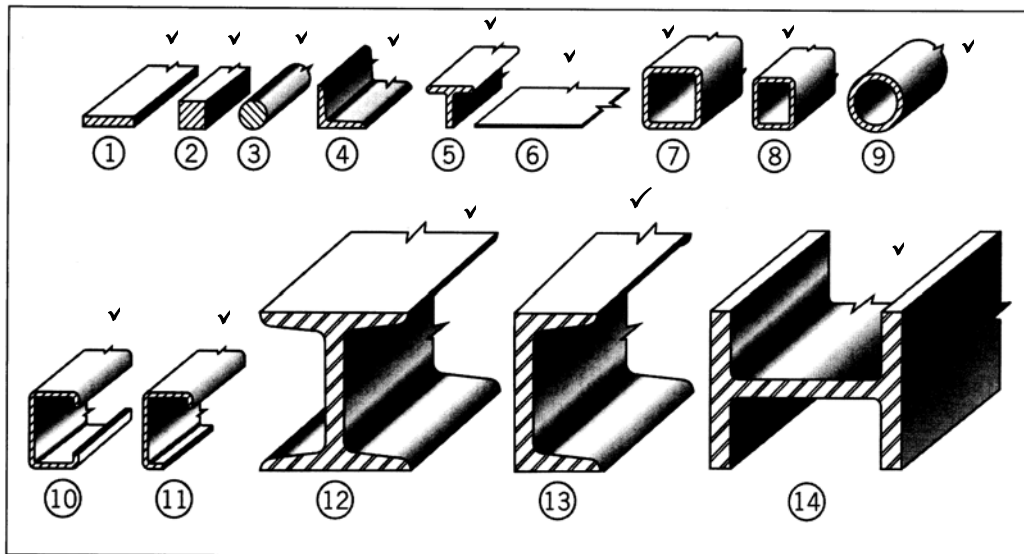
**FIGURE 2.5**

Basic members must be present, but the layout of the drawing can differ.

MARK ALLOCATION	
Cleat	1
Timber Planks/Shutter board	1
Shore	1
Loose and dry ground	1
Neatness	1
Correctness	2
<b>TOTAL</b>	<b>7</b>

(7)

2.6



- 1 – Flat bar
- 2 – Square bar
- 3 – Rod/round bar
- 4 – Angle iron
- 5 – T-beam
- 6 – Plate or sheet metal
- 7 – Square tube
- 8 – Rectangular tube
- 9 – Piping
- 10 – Lipped channel iron
- 11 – Lipped angle iron
- 12 – I-beam
- 13 – Channel or U-channel
- 14 – H-beam

**(ANY THREE OF THE ABOVE. ONE MARK FOR THE SKETCH AND ONE MARK FOR THE LABEL.)**

(6)  
[40]

**QUESTION 3**

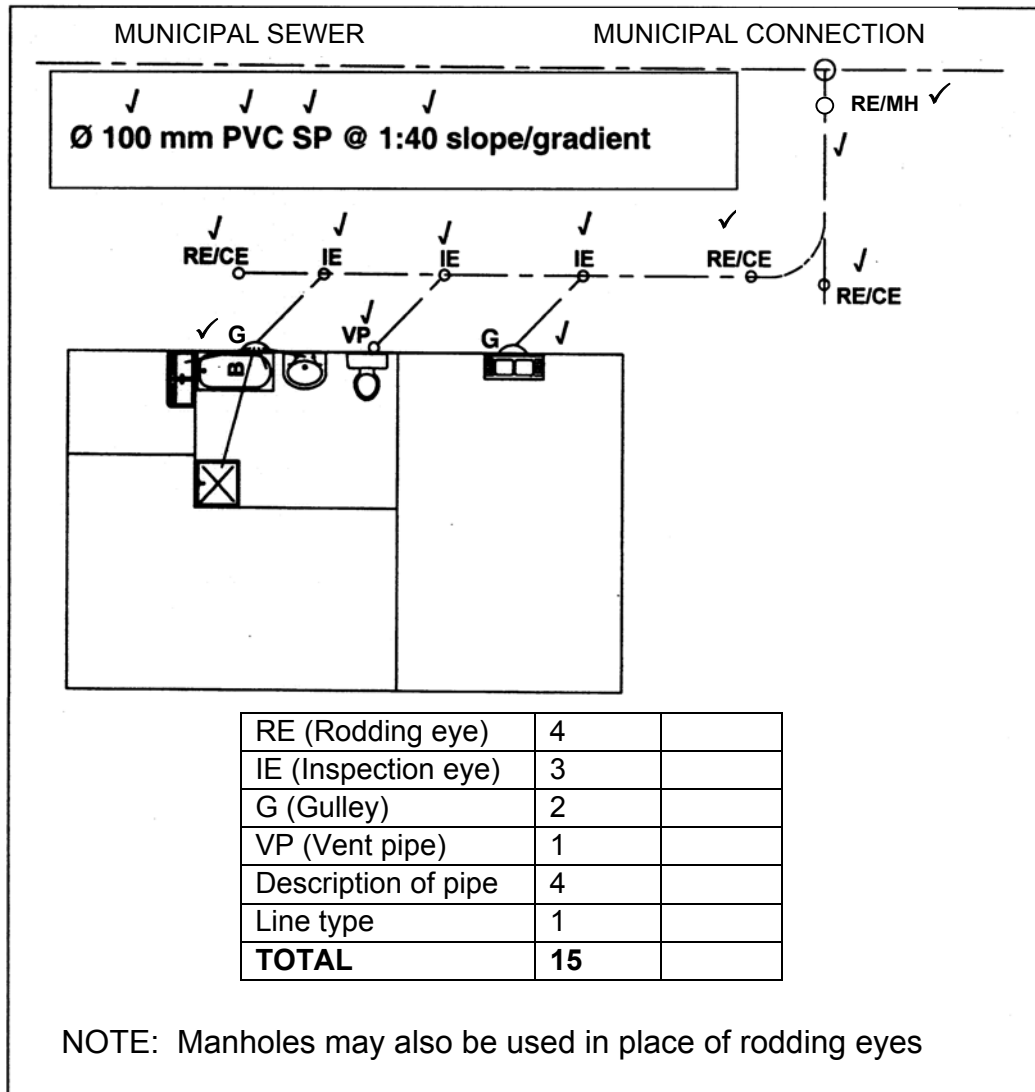
LO3 AS5,8,10

3.1 3.1.1

1	Bath or B✓
2	Wash hand basin or WHB✓
3	Sink or S✓
4	Water closet or WC✓
5	Shower or S✓
6	Gulley or G✓

(6)

3.1.2



**FIGURE 3.1.2**

(15)

3.1.3 45° ✓

(1)

3.1.4 Waste-water pipe ✓

(1)

- 3.2
- Pipe must be encased with concrete.
  - Pipe must be laid on a fixed concrete base.
  - Inspection eyes must be provided on both sides of building.
  - There must be no change in direction under the building.
  - There must be no connection under the building.
  - It is preferable to use heavy cast-iron pipes under the building.
  - The sewer should be laid at least 50 mm clear of any foundation
- (ANY TWO OF THE ABOVE)** (2)
- 3.3
- Do not use strong or harsh chemical agents to wash toilet pans.
  - Do not dispose of cigarette ashes and cigarette stubs into the toilet pan.
  - If sewer line is blocked, do not use chemicals to clear the blockage but rather use cleaning rods.
- (ANY ONE OF THE ABOVE)** (1)
- 3.4
- Breaks the siphon that could empty the hot-water cylinder to inlet level.
  - Prevents back-flow of hot water to cold-water taps.
  - Prevents contamination of fresh water supply.
  - Allow air into the cylinder to ensure good flow of water when the cylinder must be drained.
- (ANY ONE OF THE ABOVE)** (1)
- 3.5
- Solar
  - Hydro
  - Nuclear
  - Wind
- (ANY THREE OF THE ABOVE)** (3)  
**[30]**

**QUESTION 4**

LO3 AS2,5,9

- 4.1 Visual grading is done visually ✓ whilst mechanical grading is done with testing equipment (machines). ✓ (2)
- 4.2
- 4.2.1 In mechanical grading the strength and stiffness of timber is tested. ✓ (1)
- 4.2.2 In visual grading – The size of the knots, the arrangements of the grain and the number of the annual rings are noted. ✓ (1)
- 4.3
- Cement should be stored on a raised platform covered with waterproof material.
  - Should not be exposed to moisture.
  - Should be used as soon as possible.
  - Must be used in a cycle of first in first out.
  - Must be stacked away from the walls.
  - Do not store more than 12 bags on top of one another.
  - Do not stack more than two pallets on top of each other.
- (ANY THREE OF THE ABOVE)** (3)



4.4.1

A	B	C	D
			FOUNDATION
			Centre line: $2 / 6\ 000 = 12\ 000 \checkmark$
			$2 / 3\ 000 = 6\ 000 \checkmark$
			$= 18\ 000 \checkmark$
			Less $4 / 600 = 2\ 400 \checkmark$
			$= 15\ 600 \checkmark$
1/	15.6 $\checkmark$		
	0.60 $\checkmark$		Volume of concrete required for foundation
	0.25 $\checkmark$	2,34 m <sup>3</sup> $\checkmark$	2,34 m <sup>3</sup>

(9)

4.4.2

			FLOOR SLAB
			<b>(Floor is cast up to the middle of one-brick wall)</b>
			$6\ 000 - 2(190 + 110) = 6\ 000 - 600 = 5\ 400 \checkmark$
			$3\ 000 - 2(190 + 110) = 3\ 000 - 600 = 2\ 400 \checkmark$
1/	5.4 $\checkmark$		
	2.4 $\checkmark$		Volume of concrete required for floor slab
	0.075 $\checkmark$	0,972 m <sup>3</sup> $\checkmark$	0,972 m <sup>3</sup>
			<b>OR</b>
			<b>(Floor is cast up to the middle of one-brick wall)</b>
			$6\ 000 - 380 = 5\ 620$ (External measurements of wall)
			$5\ 620 - (2 \times 110) = 5\ 400 \checkmark$
			$3\ 000 - 380 = 2\ 620$ (Short wall)
			$2\ 620 - (2 \times 110) = 2\ 400 \checkmark$
1/	5.4 $\checkmark$		
	2.4 $\checkmark$		
	0.075 $\checkmark$	0,972 m <sup>3</sup> $\checkmark$	
			<b>OR (Floor is cast between external walls)</b>
			$6\ 000 - 380 = 5\ 620$ (External measurements of wall)
			$5\ 620 - (2 \times 220) = 5\ 180 \checkmark$
			$3\ 000 - 380 = 2\ 620$ (External measurements of wall)
			$2\ 620 - (2 \times 220) = 2\ 180 \checkmark$
1/	5.18 $\checkmark$		
	2.18 $\checkmark$		
	0.075 $\checkmark$	0,847 m <sup>3</sup> $\checkmark$	

			<b>OR (Floor is cast over external walls)</b>
			6 000 – 380 = 5 620 ✓ (External measurements of wall)
			3 000 – 380 = 2 620 ✓ (External measurements of wall)
	1/	5.62 ✓	
		2.62 ✓	
		0.075 ✓	1,104 m <sup>3</sup> ✓

(6)

4.5

<b>TYPE OF GLASS</b>	<b>WHERE USED</b>
Rolled glass/Sheet glass	Windows/Mirrors
Patterned glass	Windows
Safety glass/Reinforced glass	Shower doors Sliding doors Safety doors Windows
Glass bricks	Transparent walls

**(ANY TWO OF THE ABOVE AND ONE MARK EACH)**

(4)

4.6

- It is available in long lengths.
- Lighter to handle.
- Easier to join.
- Does not rust.
- Less maintenance.
- It is cheaper than copper pipe.

**(ANY FOUR OF THE ABOVE OR ANY OTHER SUITABLE ANSWERS)**

(4)

**[30]**

**QUESTION 5**

LO3 AS5,6
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5.1      5.1.1      **SHEAR FORCES**

$$\text{SF A} = 25 \text{ N} \quad \checkmark \checkmark$$

$$\begin{aligned} \text{SF B} &= 25 - 40 \quad \checkmark \\ &= -15 \text{ N} \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{SF C} &= 25 - 40 - 20 \quad \checkmark \\ &= -35 \text{ N} \quad \checkmark \end{aligned}$$

**OR**

$$\begin{aligned} \text{SF C} &= -15 - 20 \\ &= -35 \text{ N} \end{aligned}$$

$$\text{SF D} = 0 \text{ N} \quad \checkmark$$

**OR**

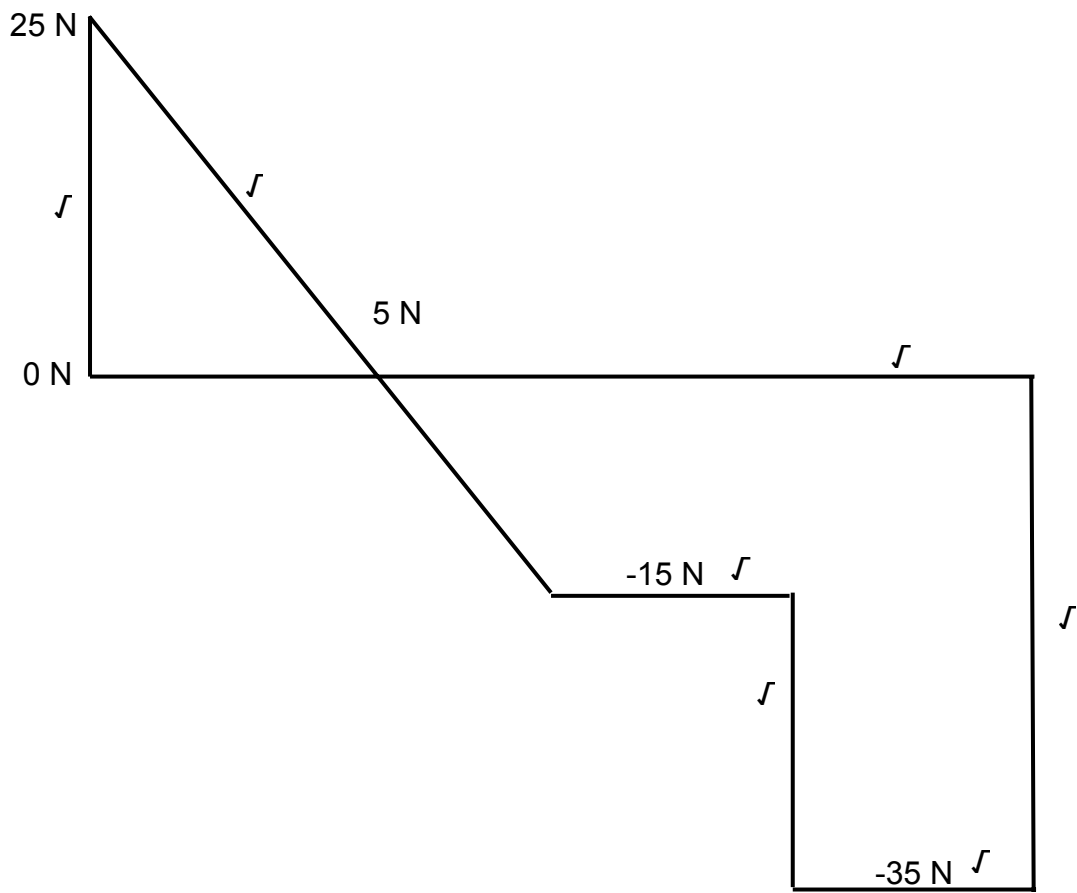
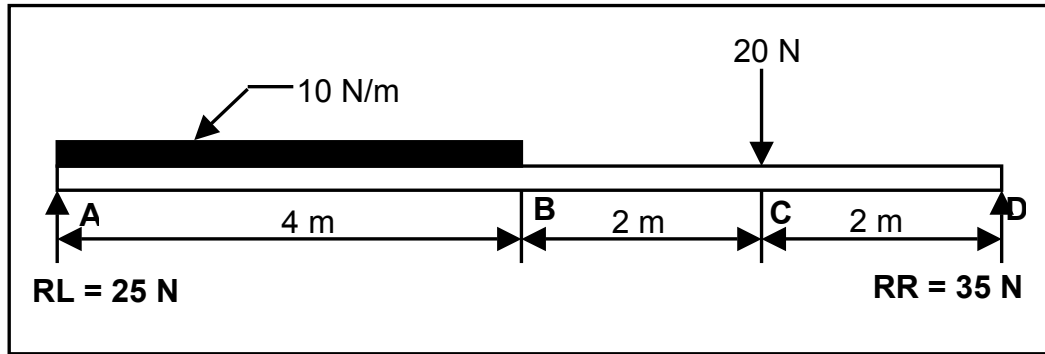
$$\begin{aligned} \text{SF D} &= 25 - 40 - 20 + 35 \\ &= 0 \text{ N} \end{aligned}$$

**OR**

$$\begin{aligned} \text{SF D} &= -35 + 35 \\ &= 0 \text{ N} \end{aligned}$$

(7)

5.1.2



(7)

NOT TO SCALE



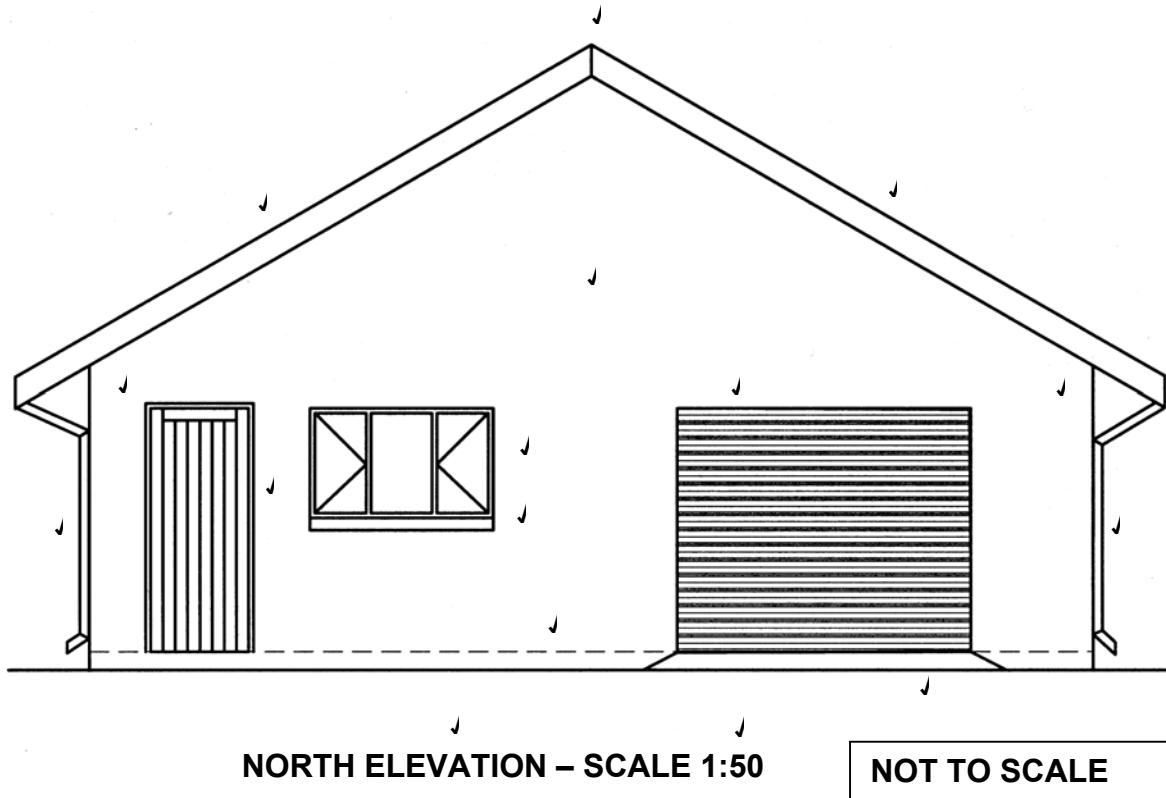
$$\begin{aligned}\text{Position of centroid} &= \frac{(A_1 \times d) + (A_2 \times d) + (A_3 \times d)}{\text{Total area}} \\ &= \frac{(1\,500 \times 180) + (4\,800 \times 160) + (10\,000 \times 50)}{73\,000} \\ &= \frac{2\,700\,000 + 7\,680\,000 + 500\,000}{73\,000} \\ &= \frac{10\,880\,000}{73\,000} \\ &= 149,04 \text{ mm OR } 149 \text{ mm}\end{aligned}$$

(9)  
[30]

**QUESTION 6**

LO3 AS4,5

6.1

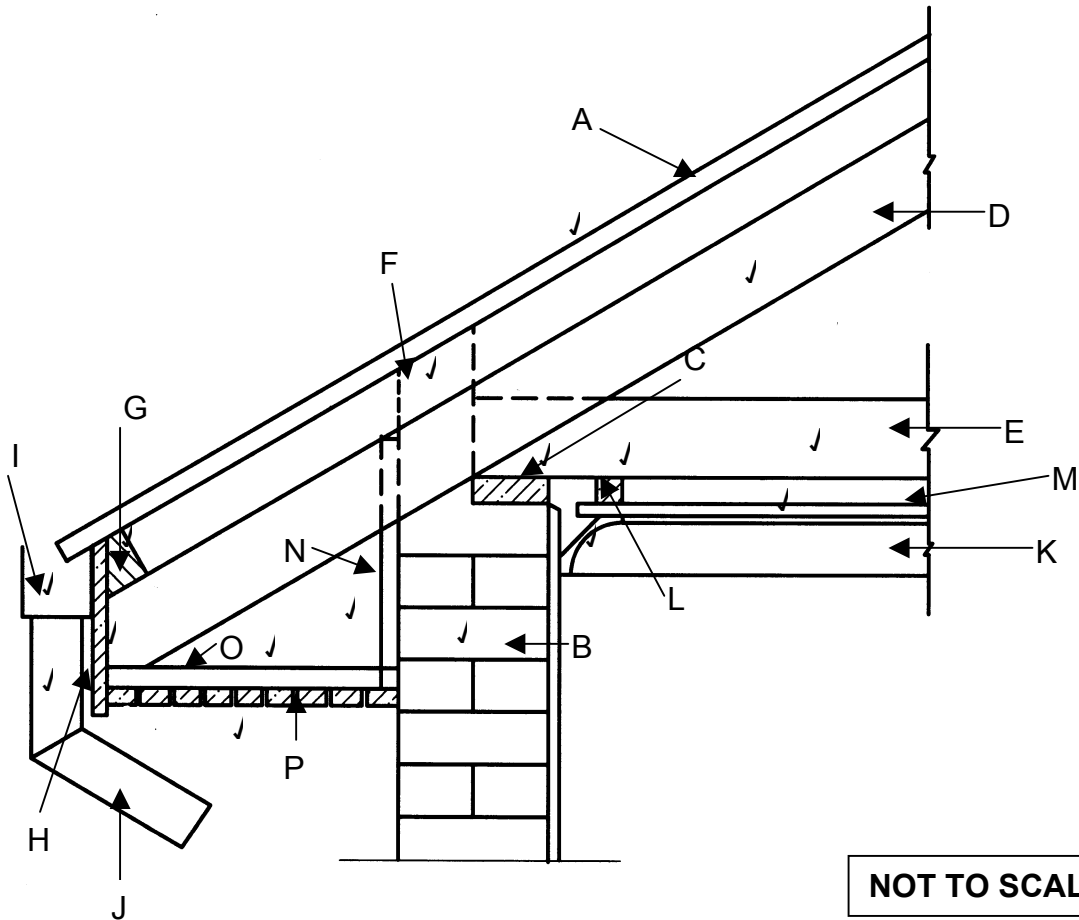


ITEM	MARK ALLOCATION
Floor slab height	1
Entrance door	1
Window	1
Window sill	1
Ramp	1
Roll-up door	1
Down pipes	2
Barge boards	2
Gable wall	1
Wall plate height	2
Roof pitch	1
North elevation	1
Scale	1
Accuracy	4
<b>TOTAL</b>	<b>20</b>

**NOTE: Use a mask to mark the accuracy of this question.**

(20)

6.2



MARK ALLOCATION		
A	Galvanised roof sheet	1
B	Wall 220 mm	1
C	Wall plate 114 mm x 38 mm	1
D	Rafter 114 mm x 38 mm	1
E	Tie beam 114 mm x 38 mm	1
F	Beam filling	1
G	Purlin 76 mm x 50 mm	1
H	Fascia board 225 mm x 30 mm	1
I	Square gutter 100 mm x 100 mm	1
J	Down pipe 75 mm diameter	1
K	Cornice 75 mm	1
L	Branding (ceiling batten) 38 mm x 38 mm	1
M	Ceiling board 6 mm thick	1
N	Hanger 38 mm x 38 mm	1
O	Bearer 38 mm x 38 mm	1
P	Covering material	1
	Accuracy	4
	<b>TOTAL</b>	<b>20</b>

(20)  
[40]



**NOTE: Provincial moderators and chief markers may accept alternative answers provided they can verify that such answers are indicated in reference material relevant to Civil Technology used in the province.**

**TOTAL: 200**