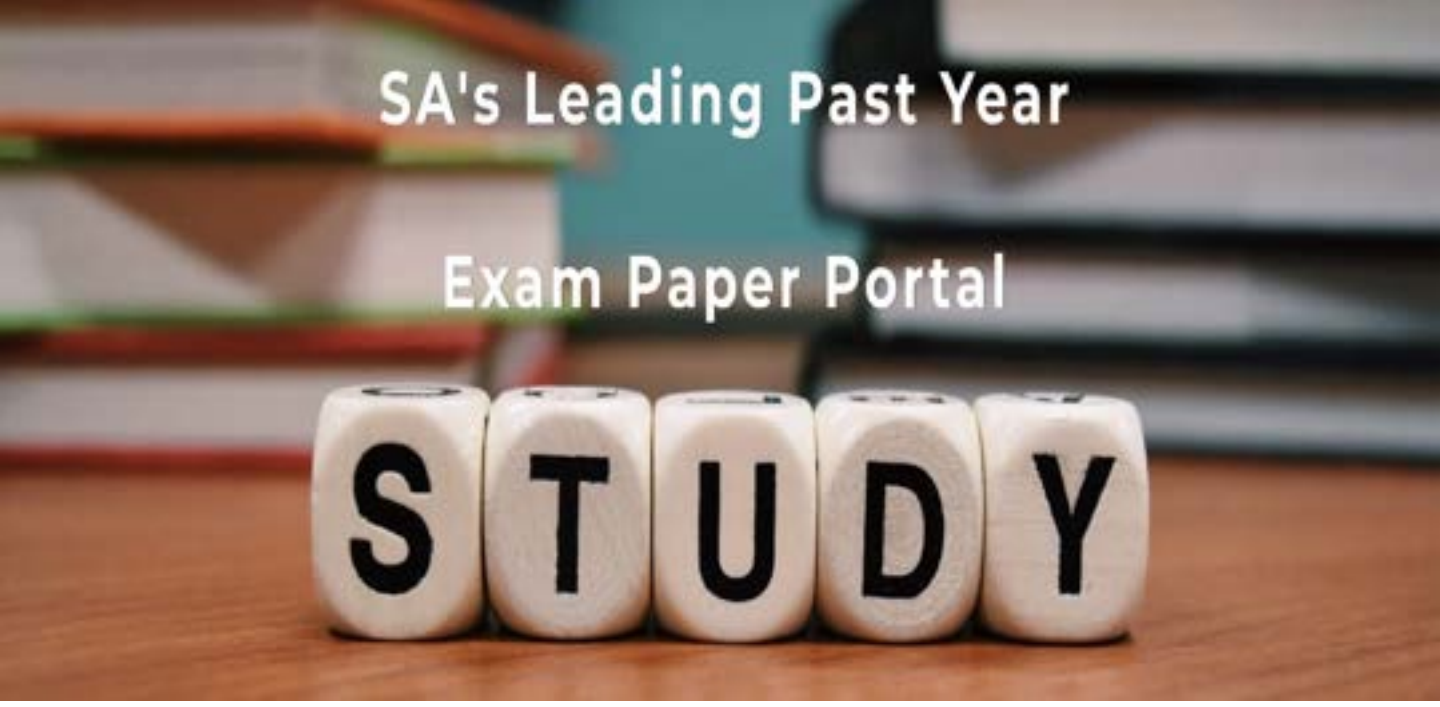

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GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2009

MEMORANDUM

MARKS: 200

This memorandum consists of 16 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 or FALSE ✓
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 ✓ **(**e.g. Centre Line) (3)
NB: Description of correct term is acceptable

1.2.2

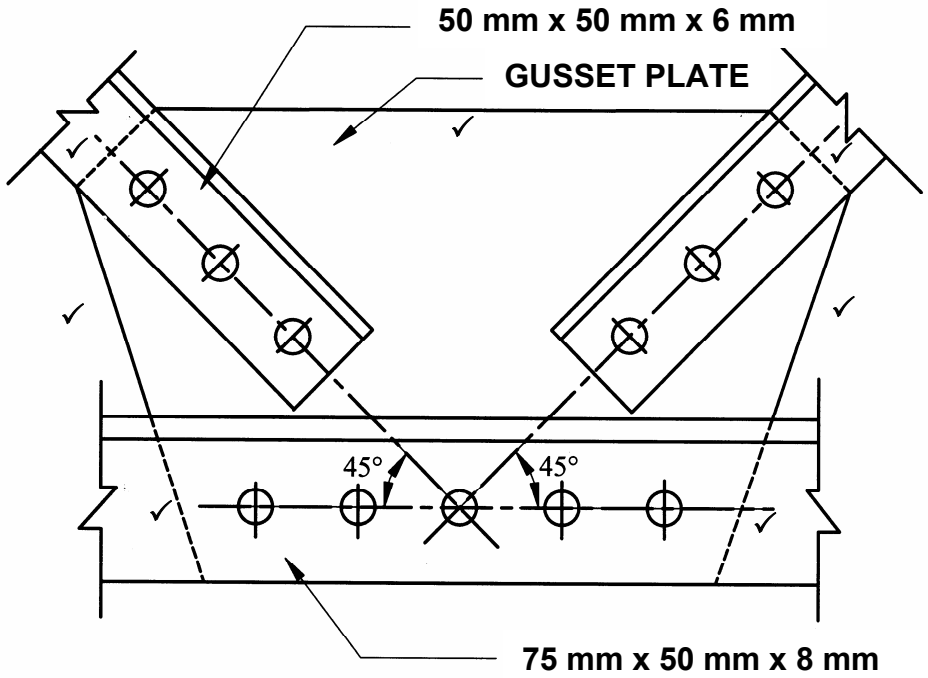


FIGURE 1.2.2 (7)

NB: Different options of the cutting of the gusset plate may also be accepted.
See examples in Grade 12 text books.

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 ✓ or Red on white (1)

2.4.2 Yellow ✓ Yellow on black (1)

2.4.3 Green ✓ Green on white (1)

2.5

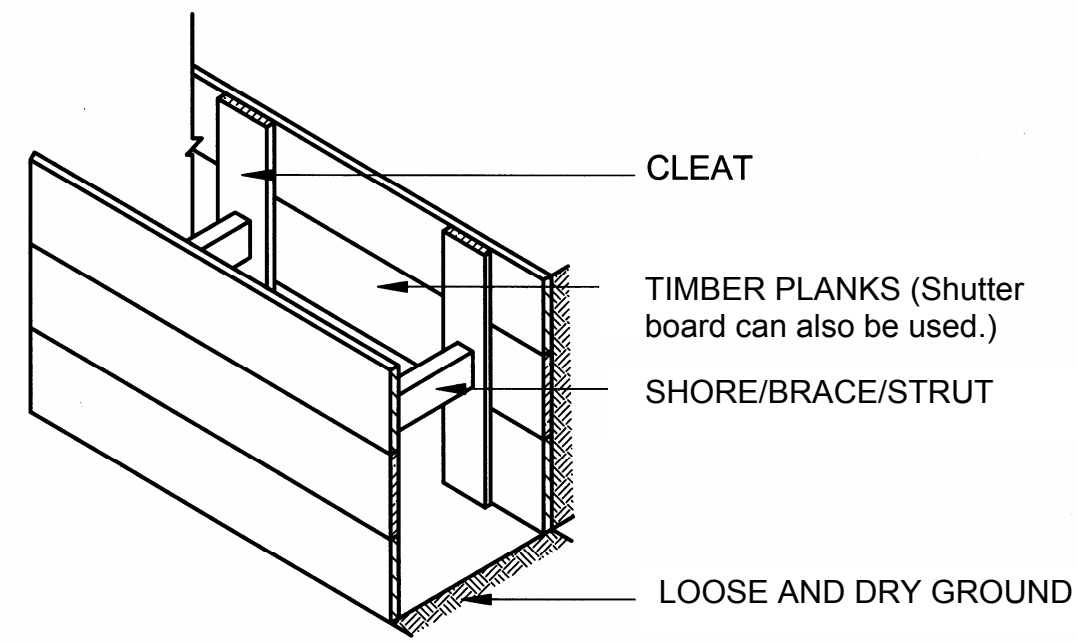


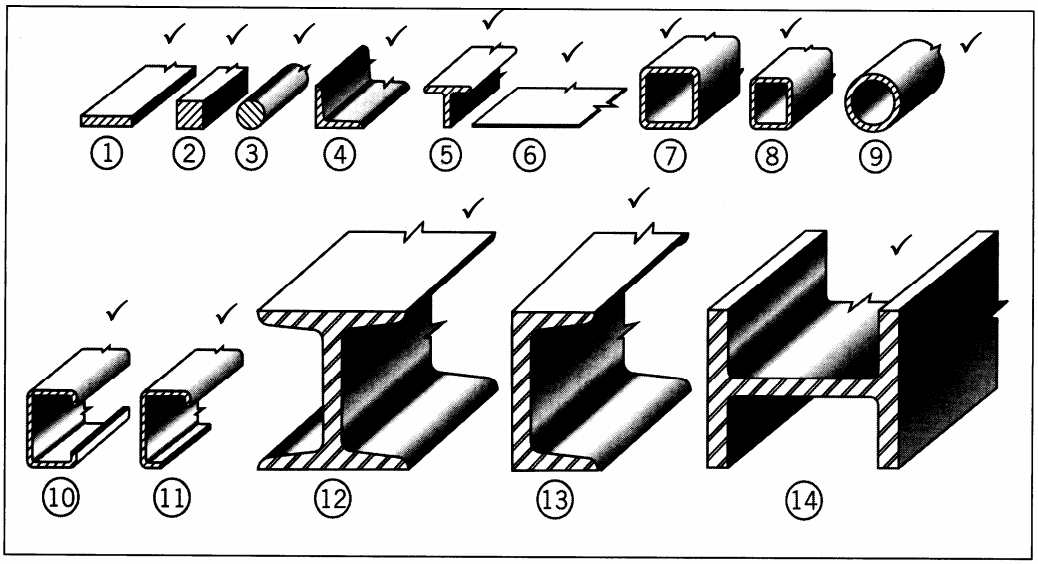
FIGURE 2.5

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
TOTAL	**7**

(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]

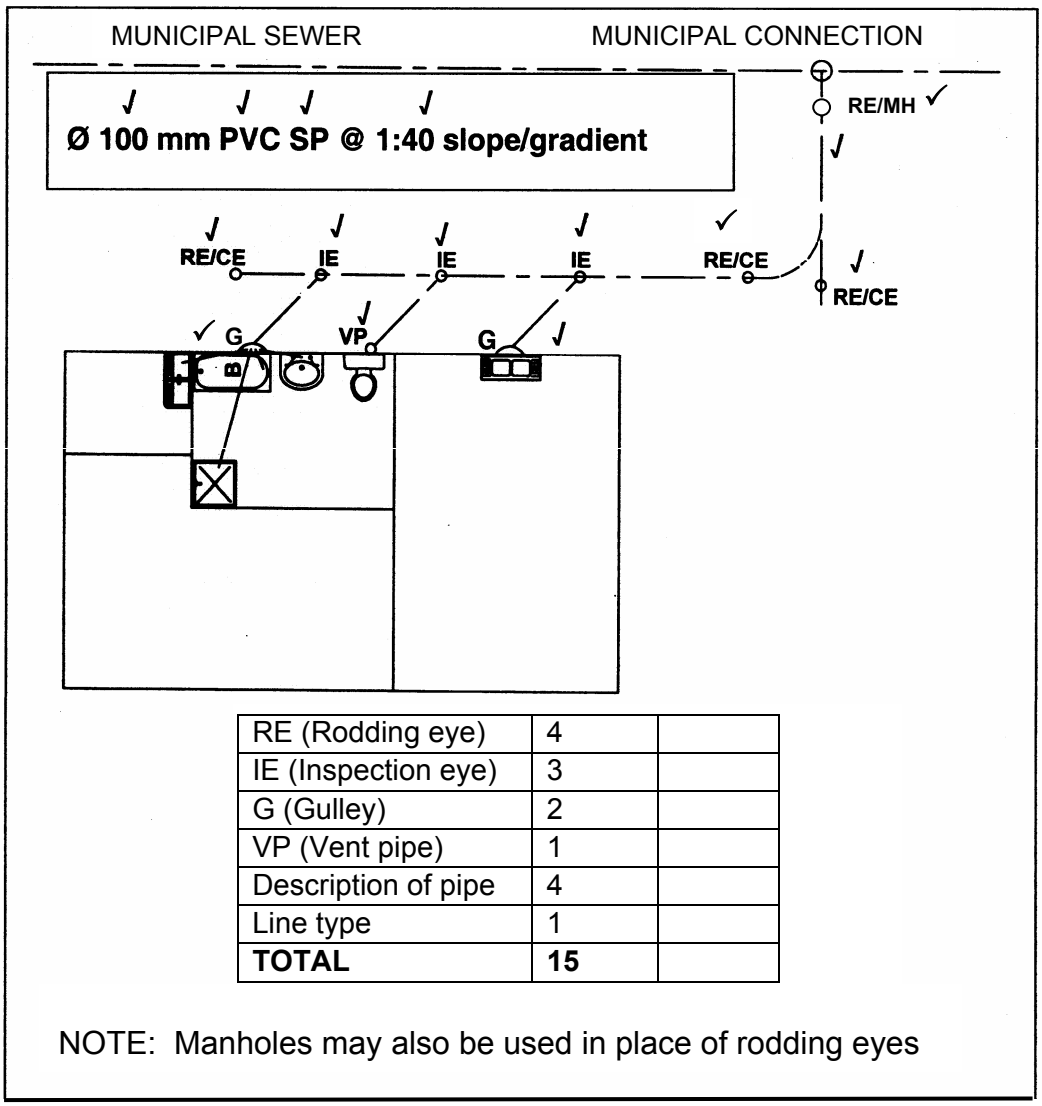
QUESTION 3 LO3 AS5,8,10

3.1 3.1.1

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

(6)

3.1.2



RE (Rodding eye)	4	
IE (Inspection eye)	3	
G (Gulley)	2	
VP (Vent pipe)	1	
Description of pipe	4	
Line type	1	
TOTAL	**15**	

NOTE: Manholes may also be used in place of rodding eyes

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
- Sea waves
- Bio gas
- Fossil oils
- Fossil gas
- Geothermal

(3)

(ANY THREE OF THE ABOVE) **[30]**

QUESTION 4

LO3 AS2,5,9

4.1 Visual grading is done visually/looking at it ✓whilst mechanical grading is done with testing equipment (machines). ✓ (2)

4.2 4.2.1 In mechanical grading the strength or stiffness of timber is tested. ✓ (1)

4.2.2 In visual grading – The size of the knots, or the arrangements of the grain or the number of the annual rings, or colour or the estimated strength 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 ✓
			2 / 3 000 = 6 000✓
			= 18 000✓
			Less 4 / 600 = 2 400✓
			= 15 600 ✓
1/	15.6✓		
	0.60✓		Volume of concrete required for foundation
	0.25✓	2,34 m³✓	2,34 m³

(9)

Penalise the first error only and mark positively.

4.4.2

			FLOOR SLAB
			(Floor is cast up to the middle of one-brick wall)
			6 000 – 2(190 + 110) = 6 000 – 600 = 5 400 ✓
			3 000 – 2(190 + 110) = 3 000 – 600 = 2 400 ✓
1/	5.4 ✓		
	2.4 ✓		Volume of concrete required for floor slab
	0.075✓	0,972 m³✓	0,972 m³
			OR
			(Floor is cast up to the middle of one-brick wall)
			6 000 – 380 = 5 620 (External measurements of wall)
			5 620 – (2 x 110) = 5 400 ✓
			3 000 – 380 = 2 620 (Short wall)
			2 620 – (2 x 110) = 2 400 ✓
1/	5.4 ✓		
	2.4 ✓		
	0.075✓	0,972 m³✓	
			OR (Floor is cast between external walls)
			6 000 – 380 = 5 620 (External measurements of wall)
			5 620 – (2 x 220) = 5 180 ✓
			3 000 – 380 = 2 620 (External measurements of wall)
			2 620 – (2 x 220) = 2 180 ✓
1/	5.18 ✓		
	2.18 ✓		
	0.075 ✓	0,847 m³✓	

			OR (Floor is cast over external walls)
			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 m³✓	

(6)

Mark positively with the candidate's error.

IF A CANDIDATE USED ANOTHER CALCULATION METHOD IT WILL STILL BE ACCEPTED FOR 2009 IF THE ANSWERS ARE CORRECT

4.5

TYPE OF GLASS	**WHERE USED**
Rolled glass/Sheet glass/window glass	Windows/Mirrors
Patterned/translucent/obscured glass	Windows
Safety/Reinforced/shatterproof/laminated/armoured glass	Shower doors Sliding doors Safety doors Windows
Glass bricks	Transparent walls

Trade names are also acceptable

(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.
- Durable
- Not much resale value (stolen)

(4)

[30]

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

QUESTION 5

LO3 AS5,6

5.1 5.1.1 **SHEAR FORCES**

SF A = 25 N ✓✓

SF B = 25 – 40 ✓
= -15 N ✓

SF C = 25 – 40 – 20 ✓
= -35 N ✓

OR

SF C = -15 – 20
= -35 N

SF D = 0 N ✓

OR

SF D = 25 – 40 – 20 + 35
= 0 N

OR

SF D = -35 + 35
= 0 N

OR

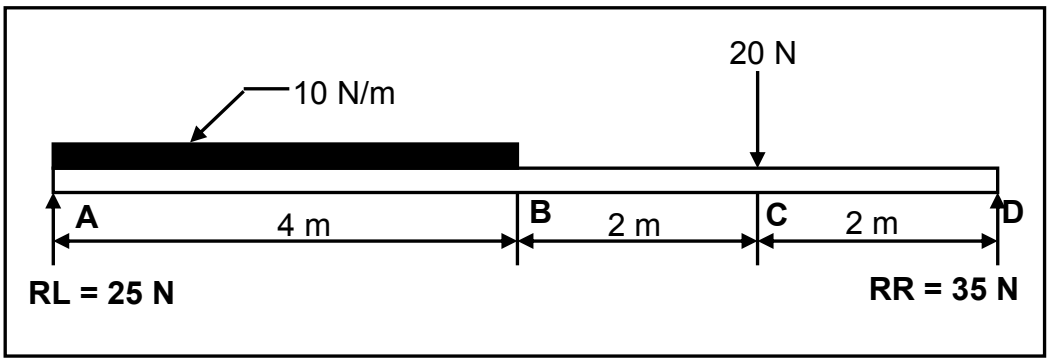
(7)

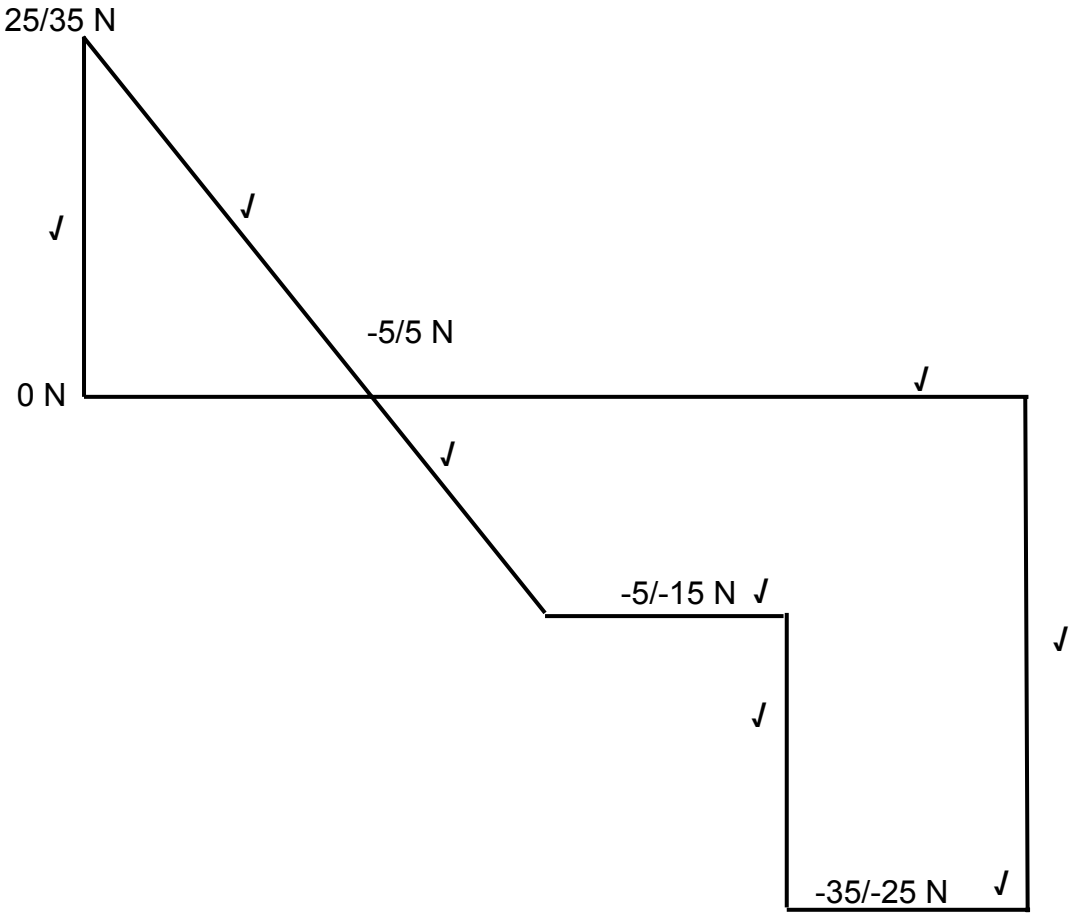
a- = 0N

a+ = +35N
b- = +35 (-10 X 4) = -5N
b+ = -5N
c- = -5N
c+ = (+35) (-10 X 4) (-20) = -25N
d- = -25N
d+ = (+35) (-10 X 4) (-20) (+25) = 0N

NB: 1 mark is given for the units if indicated in all answers.

5.1.2





(7)

DEDUCT 1 MARK IF THE WRONG SCALE WAS USED. CREDIT CANDIDATE FOR THE REST OF THE DIAGRAM.

NOT TO SCALE

5.2 5.2.1 Area of triangle = ½ b x h
= ½ x 120 mm x 250 mm ✓
= 15 000 mm² ✓

Area of rectangle = l x b
= 400 mm x 120 mm ✓
= 48 000 mm² ✓

Area of square = l x b
= 100 mm x 100 mm ✓
= 10 000 mm² ✓

Total area = 15 000 mm² + 48 000 mm² + 10 000 mm²
= 73 000 mm² ✓ (7)

5.2.2 Take moments about B left side
✓ ✓ ✓ ✓ ✓ ✓
73 000 mm² x X = (15 000 x 180) + (48 000 x 160) + (10 000 x 50)
73 000 mm² x X = 2 700 000 + 7 680 000 + 500 000 ✓
$X = \frac{10\ 880\ 000}{73\ 000}$ ✓
X = 149,04 mm OR 149 mm✓

OR

PART	**AREA (A)**	**X**	**AREA of X (AX)**
Triangle	15 000 ✓	$\frac{b}{3}$ = 180 ✓	2 700 000
Rectangle	48 000 ✓	$\frac{b}{2}$ = 160 ✓	7 680 000 ✓
Square	10 000 ✓	$\frac{b}{2}$ = 50 ✓	500 000
∑	73 000		10 880 000

$X = \frac{\sum Ax}{\sum A}$
$= \frac{10\ 880\ 000}{73\ 000}$ ✓
= 149,04 mm ✓ OR 149 mm

OR

Position of centroid $= \frac{(A1 \times d) + (A2 \times d) + (A3 \times d)}{\text{Total area}}$

✓ ✓ ✓ ✓ ✓ ✓

$= \frac{(1\,500 \times 180) + (4\,800 \times 160) + (10\,000 \times 50)}{73\,000}$

$= \frac{2\,700\,000 + 7\,680\,000 + 500\,000}{73\,000}$ ✓

$= \frac{10\,880\,000}{73\,000}$ ✓ (9)

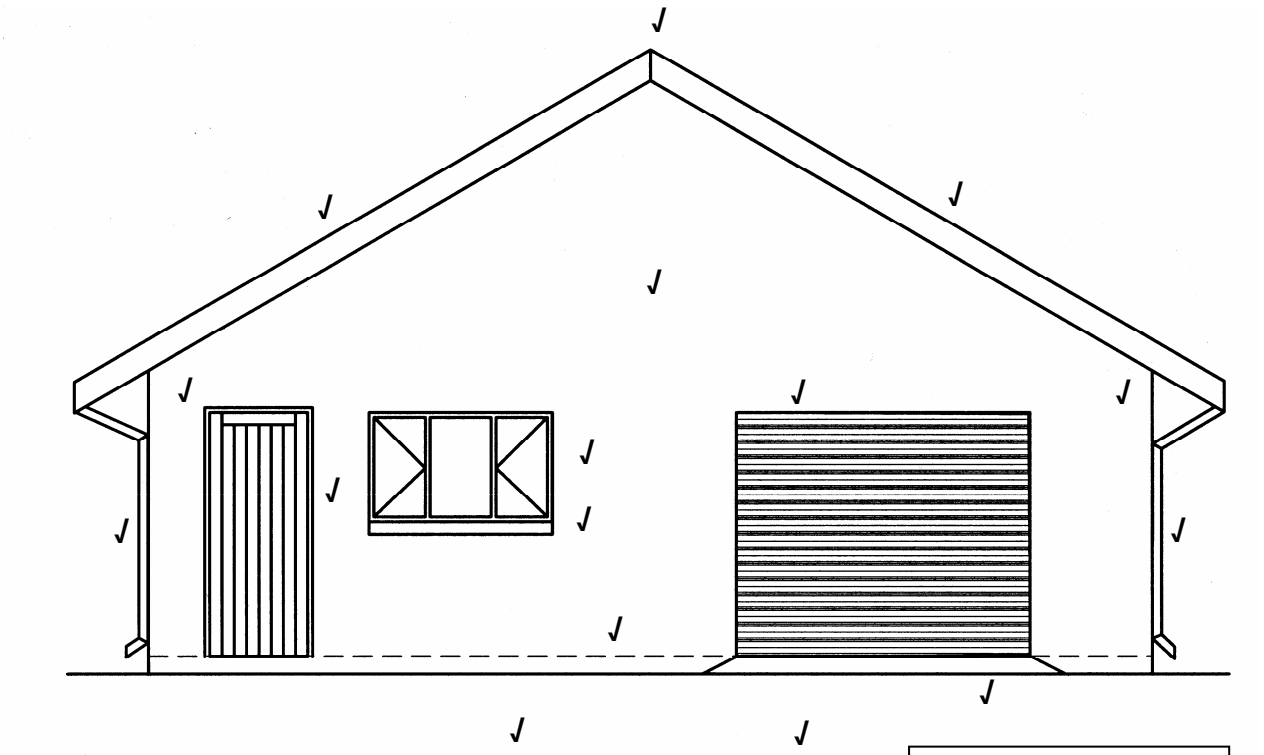
[30]

= 149,04 mm OR 149 mm✓

NB: MARK POSITIVELY WITH THE MISTAKE
DO NOT PENALISE CANDIDATES FOR OMITTING UNIT/ SYMBOL

QUESTION 6 LO3 AS4,5

6.1



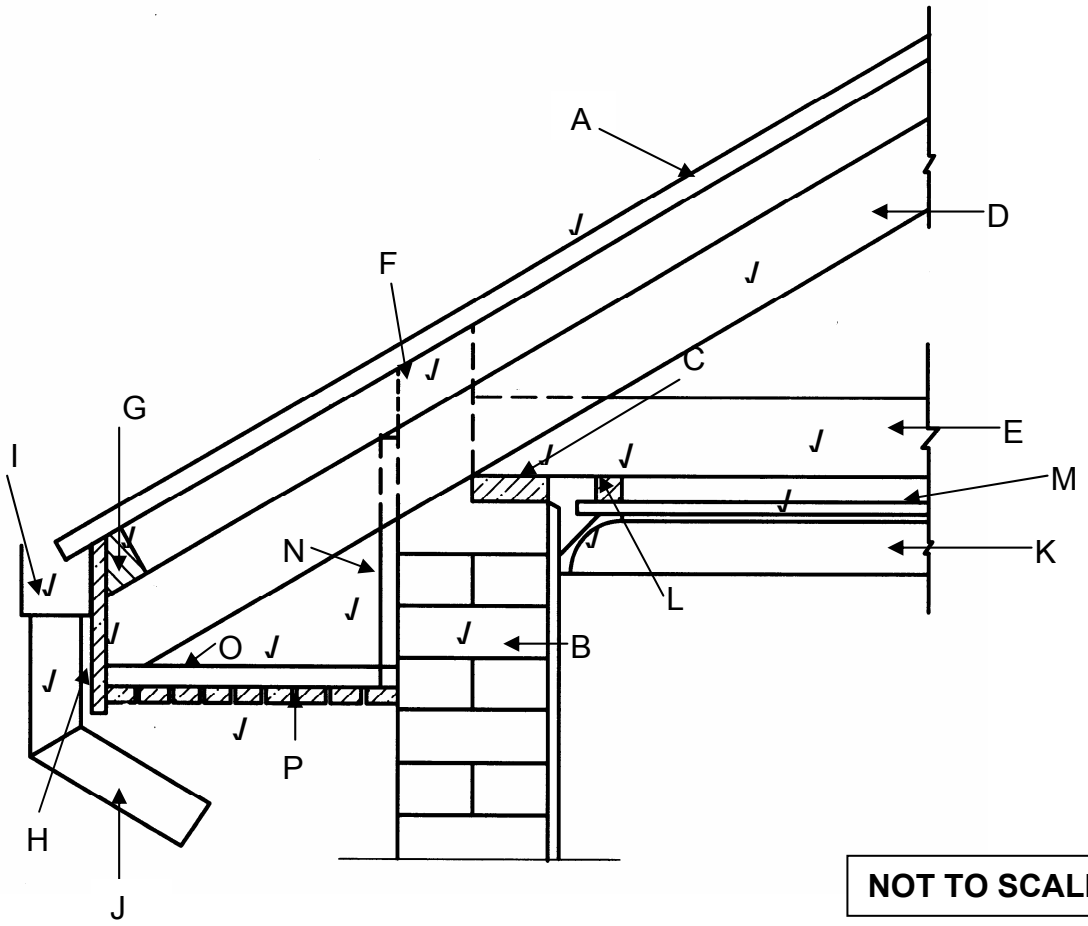
NORTH ELEVATION – SCALE 1:50 **NOT TO SCALE**

NB: THE ROOF CAN SPAN THE SHORTER OR LONGER WALL

NOTE: Use a mask to mark the accuracy of this question. (20)

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/Roof	1
Wall height	2
Roof pitch/Ridge	1
North elevation	1
Scale	1
Accuracy	4
TOTAL	**20**

6.2



NOT TO SCALE

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	Brandering (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
	TOTAL	**20**

(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