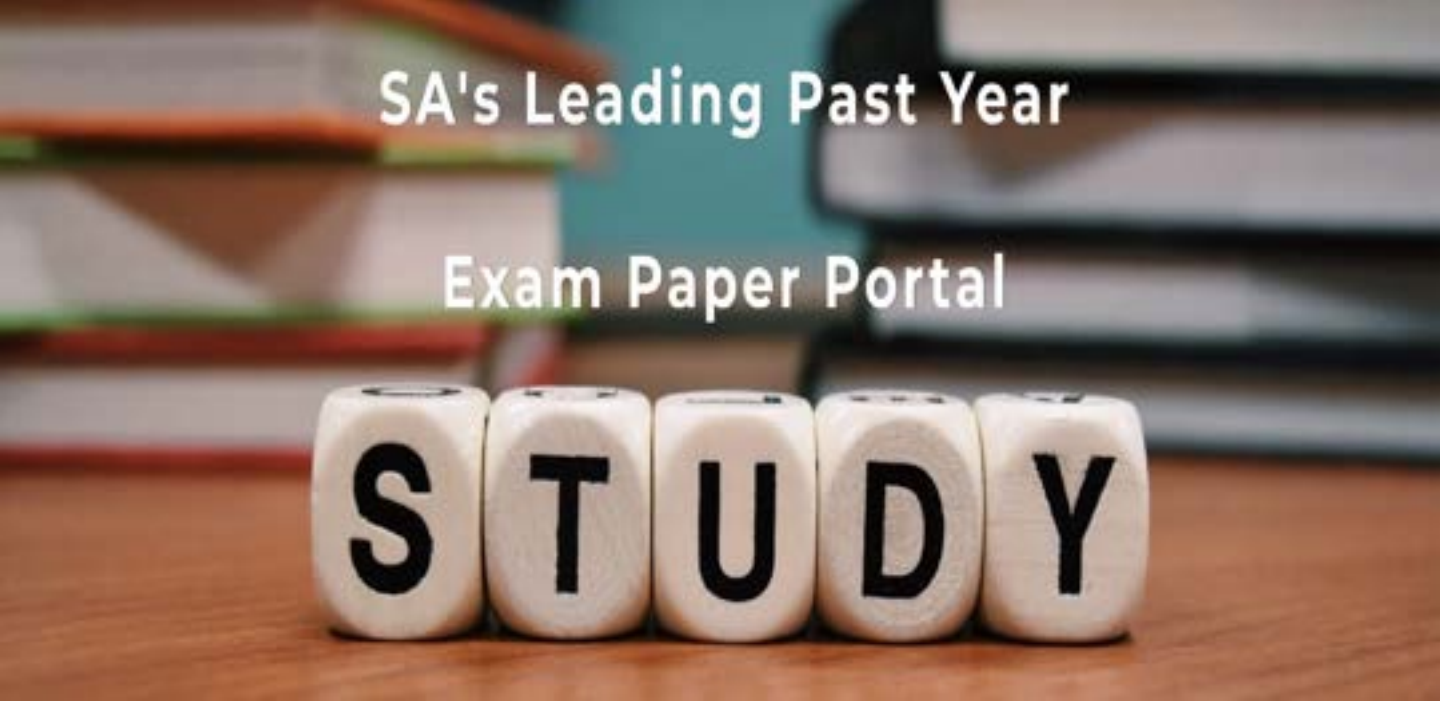

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GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2014

MEMORANDUM

MARKS: 200

This memorandum consists of 19 pages.

QUESTION 1: CONSTRUCTION, SAFETY AND MATERIAL

1.1.1

- Wear earmuffs / ear protection/ ear plugs ✓
- Wear an overall ✓
- Wear safety gloves ✓ (3)
- Safety goggles/ Face shield
- Dust mask
- Safety guard on machine
- Safety boots

1.2.1

Safe handling

- Avoid bringing the ladder into contact with electricity. ✓
- Place the ladder so that its stiles are a quarter of its length from its support.
- A ladder that is not securely tied at the top, must be held by a person at the bottom when in use.
- Where ever possible it should project 900 mm (Three steps) above its support.
- A ladder should be inspected regularly.
- As paint conceals defects use varnish or wood oil to preserve ladders.
- Keep ladders clean.
- Do not use / leave ladders on wet ground or expose to weather conditions.
- Ladders lying on floors may cause someone to trip and fall.
- Do not use ladders horizontally as runways or scaffolding.
- Use ropes to haul up tools and equipment.
- Never leave a ladder in front of a door / where it may be knocked over.
- Ladders should be fitted with non slip feet.
- Store ladders in a cool place.
- Use both hands when climbing up or down a ladder.
- Never wedge one stile up when the floor surface is uneven.
- Beware of wet, greasy or icy rungs.
- Never make the ladder stand on something to give it extra height. (1)
- Not more than one person on the ladder at any time.

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.2.2

Maintenance

- Store ladders in a cool/dry place. ✓
- As paint conceals defects use varnish or wood oil to preserve ladders.
- Keep ladders clean.
- Store on hooks / brackets/ horisontaal. (1)
- Inspect ladder regularly.

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.3

- Temporary guard rails must be secured in the opening to prevent a person from falling off. ✓
- Guard rails must be placed at approximately 900 mm high. ✓
- Where materials might fall on a person's head below, a sufficient catch-net should be placed just below the surface.
- Toe boards should be secured on the floor to prevent overstepping.
- Toe boards should be secured on the floor to prevent materials from falling off.
- Sufficient warning notices should be placed.
- Open platforms and stairs should be kept free from rubbish.
- Open platforms and stairs should be kept free from unnecessary obstruction or material.
- Wear safety harness. (Safety clothing not accepted)

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.4

- A notice should be displayed on the machine stating its safe work load. Do not overload hoist. ✓
- A notice should be displayed on the machine, stating that no person must ride on the hoist. ✓
- An automatic and a manual brake must be fitted to prevent materials from over running.
- A builders hoist should also have all the necessary safety features such as safety guards etc.
- Opening on floor where hoist is not park must be fenced of.

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.5

- Remove any traces of dust, rust, oil or grease, clean it. ✓
- Sand down the metal using emery cloth (sandpaper)
- Apply rust proof under coat / primer. ✓
- Apply paint. √

(3)

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.6.1 Double casement window/ Sash rail (1)

1.6.2 A - Frame head ✓
B - Top rail /sash rail/top rail of window ✓
C – Casement (window) stile / Stile ✓
D - Glazing bar / vertical glazing bar/ putty / wooden strip ✓
E – Frame stile/ jamb ✓ (5)

1.7

- To obtain a fairly level smooth surface. ✓
- To remove marks made by the straight edge. ✓
- To help to compact the concrete surface. ✓
- To embed stones just beneath the surface. ✓
- Easy to clean.
- Easier to lay tiles.
- To enhance the appearance.
- To seal the surface.

(4)

ANY FOUR OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.8.1 H-beam/ profile ✓ (1)

1.8.2

- Easy to weld ✓
- Can easily be joined
- Malleable
- Ductile
- Prone to rust
- Grey in colour
- Strong
- Resistant to torsion/ bending
- Strong under compression

(1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.8.3

- Beam above the opening of stage ✓
- Columns supporting a beam
- Under the stage
- Steel roof trusses/pillars/columns

(1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.9

- It prevents wind from penetrating area between the ceiling and the roof. ✓
- It provides good insulation.
- It keep warmth or coolness inside the building.
- It prevents perching and breeding spots for birds.
- It prevents insects and rodents from entering the roof area.
- It prevents dust from entering the area between the ceiling and the roof.

(1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.10

- Time consuming to build beam filling between purlins. ✓
- Hot air is trapped in the roof space.

(1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.11.1 Low strength –foundations with no reinforcement, free standing walls, footings

and mass concrete/ filling/ site concrete/ walkways. ✓ (1)

1.11.2 Medium strength – Suspended structural beams, slabs, precast items, heavy duty floor/ walkways reinforced foundations and slabs/light duty house floors. Patios/ steps/ driveways. ✓ (1)

1.11.3 High strength – Foundations with reinforcement and slabs, heavy duty floors(suspended floors), paths, patios, steps, driveways and garage floors suspended structural beams/ precast items/bridges/dams/roads. ✓ (1)

[30]

QUESTION 2 ADVANCE CONSTRUCTION AND EQUIPMENT

2.1

- It should be strong enough to bear the mass of wet concrete. ✓
- It should be able to bear the mass of people and equipment working on it. ✓
- It should be nailed together accurately according to the intended size and shape.
- It should be sealed off to prevent unnecessary loss of concrete which may lead to honeycombing.
- Designed to be easily placed in position by hand or lifting equipment.
- It should be made of material that is easily nailed together or assembled.
- It should be designed to be easily erected and dismantled without replacing any parts.
- Repairable on site.

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

2.2.1 Spirit level – to level and plumb the door frame (horizontal and vertical accuracy) doorframe/door /wall.✓ (1)

2.2.2 Steel Square – To check squareness of the corners of the frame/90˚. ✓ (1)

2.3

- Lubricate and adjust according to instructions. ✓
- Clean after use. ✓
- Store in a safe place.
- Repair or replace damaged electric cord.
- Keep ventilation holes open and clean.
- Service the plane regularly/inspect the plane regularly
- Avoid planing wood that contains nails.
- Handle it so as not to damage it.
- Use machine only for the intended purpose.
- Do not force the electric plane.
- Blades must be sharp and secured properly

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

2.4

Criteria	Rough Arch	Gauged Arch
Materials	Standard bricks can be used. ✓ Stock bricks can be used. Cheaper bricks. (Any one)	Moulded bricks. ✓ Wedge shaped bricks(voussoirs) Face Bricks can be cut into shape. More expensive bricks. (Any one)
Labour	Semi-skilled labour. ✓ Less time consuming. Must be plastered. (Any one)	Skilled labour. ✓ More time consuming. Must not be plastered (Any one)

ANY OTHER ACCEPTABLE ANSWER

(4)

2.5
- Tensile force ✓
- Compressive force ✓
- Shear force / lateral forces (2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

2.6.1
- A – Steel capping/casing ✓
- B – Undisturbed earth / unstable soil / soft soil ✓
- C – Steel tip/steel drive point ✓ (3)

2.6.2 A drop hammer ✓ (1)

2.6.3
- When the soil is not stable / soft /low density ✓
- Water content of soil is high. (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

2.7.1 Main bars: To act against / counteract the tensile forces. ✓ (1)

2.7.2 Anchor bars: To act against the compression forces. ✓ (1)

2.7.3 Shear bars: To act against the shearing forces. ✓ (1)

2.7.4 Stirrups: To hold, bind or join the main bars together / Resist shear stress. ✓ (1)

2.8
- The wall needs to be cleaned. (chipping of the wall not acceptable)✓
- Determine where to start tiling. ✓
- Snap an additional line the width of a tile from each wall using a chalk. line./batten ✓
- Mix the tile cement ✓
- Water proofing the wall
- Apply the tile cement
- Place or press tiles into position, position spacers
- Cut tiles where necessary
- Insert edging on corners
- Grout / remove excess grout (4)

ANY FOUR OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

2.9.1 Ridge capping/ridge/ ridge plate/ galvanised ridge ✓ (1)

2.9.2 To cover/seal the opening between the two galvanised roof sheets at the ridge. ✓
To prevent dust, rain and vermon to enter the roof. (1)

2.9.3 Purlin ✓ 50 mm x 76 mm ✓ (2)

2.9.4 38 mm x 38 mm ✓ (1)

2.9.5 IBR or Corrugated galvanised roof sheeting /cement fibre sheets/Perspex sheet/ fibre glass/ metal sheeting.✓ (1)

2.9.6 King post (1)

2.10 Formwork can be described as a mould or a box/temporally support, ✓ which is prepared in situ into which fresh concrete can be poured to form the shape of the required structure/staircase// similar structures/ columns. ✓ (2)

OR ANY OTHER EXPLANATION MEANING THE SAME AS ABOVE

2.11
- Can be used repeatedly ✓
- No colour differences between different castings of concrete ✓
- Lasting longer /stronger
- Not easily damaged
- Quicker to install and dismantle

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

2.12.1 Distance = (Top stage line reading – Bottom stage line reading) × 100
= (1,535 – 1,485) ✓× 100
= 0,05 ✓× 100 ✓
= 5 ✓ m (4)
OR

=(1,535√ -1,485) x100√
= 5 m √√

Only the answer 2 marks

[40]

QUESTION 3: CIVIL SERVICES

3.1.1

- It is reliable under normal conditions. ✓
- It is relatively cheap. (Only capital expense is in sinking the borehole) ✓
- Water is good enough for human consumption if water is not contaminated.
- It is independent from municipal supply.
- You will have your own water supply.
- There is no restriction on the use of water from boreholes.
- It saves money.
- It can add value to your property.
- Easy to use.
- Possible better taste/cleaner water.

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.1.2

- The pump can be stolen ✓
- The pump can break ✓
- The pipes can get clogged and takes time to be cleaned.
- Water can become contaminated.
- Electric cables can be stolen/power outages.
- Draught/ water table.
- Reliable water.

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.2 It reduces the incoming water supply with too high pressure to an acceptable pressure value. ✓
It forwards a constant pressure into the installation. ✓
It regulates the water pressure entering the geyser /makes it possible to open two hot water taps at the same time without the pressure dropping. (2)

ANY OTHER ACCEPTABLE ANSWER

3.3.1 Any setting between 30°C and 70°C (centigrade) is acceptable ✓ (1)

3.3.2 Element ✓ (1)

3.4.1

- The system should be installed in a manner so that enough space is left for maintenance and repair work. ✓
- All pipe joints must be leak free. ✓
- Gas pipes leading to the system should be flexible to ease installation.✓
- The system must have a cut off valve and a drain valve to cut off gas in case of an emergency.
- Gas cylinder should be placed outside on a concrete slab.
- A safety sign “No open flames” should be visible at the gas cylinder.
- If the gas cylinder have to be on the inside of the room, it should be well ventilated.
- Gas pipes should never be chased into a brick wall.
- Gas pipes should pass through a steel tube through the exterior wall.
- Should be installed out of reach of children.

- Must be installed according to sans and municipal regulations. (3)
- Must be installed by a qualified person.
- Not installed near flammable materials.
- Must be installed in rooms larger that 20 square meters.

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.4.2
- Does not use electricity ✓
- Water is rapidly heated ✓ (2)
- Hot water available all the time as long as there is gas, even during electricity outages / failure.
- Running/Maintenance cost is cheaper.

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.5.1 Prepaid electrical meter/ electrical meter ✓ (1)

3.5.2 To punch in the prepaid voucher number. ✓
To punch in the number on your slip.
To punch in the number/ code. (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.5.3 An electrician /municipality ✓ (1)

3.5.4 Install in the kitchen or in the passage or can also be installed outside the house in the meter box. ✓
To monitor and manage electricity consumption. ✓ (2)
Open-ended

3.5.5 Against the wall, ✓ so that it can be monitored easily ✓ or
In a cupboard, so that it is not visible for esthetic purposes. (2)
Open-ended

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.6 Conduits are used as sleeves for electrical wiring ✓or
Conduits protect wires against damage by rodents. (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.7 Chased conduits are placed in channels that are chased into the wall or floor. ✓
Chased conduits are plastered into the channels and are not visible.

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

Surface mounted conduits are fitted on to the surface of the walls and secured with saddle clamps. ✓ (2)
Surface mounted conduits are visible.

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.8.1 INVERT LEVEL AT A: = Ground cover + Pipe diameter
= 340 mm ✓ + 110 mm ✓
= 450 mm ✓ (3)

INVERT LEVEL AT B: = Invert level at A +(distance x slope)
= 450 mm ✓ + (40 000 x 1 ÷ 40) ✓
= 450 mm + 1 000 mm
= 1 450 mm ✓ (3)

3.8.2 Rodding eye/ manhole ✓ (1)
[30]

QUESTION 4 QUANTITIES AND CALCULATIONS AND JOINING

4.1 Truss hanger ✓
Roof wire / hoop iron ✓
Galvanised strips / straps
Galvanised steel ribbon (2)
Bolt and clamp
Rawl bolts

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS

4.2 Rawl bolt ✓ (1)
To fasten gates / brackets onto brickwork, concrete ✓ (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS

4.3.1 Soldered together/capillary ✓
Compression joint (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

4.3.2 Threaded joints /fittings ✓ (1)

4.4.1 Used to attach materials on to concrete or brick wall. ✓ (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

4.4.2 Used in cabinet making ✓
Fixing quarter rounds and mouldings ✓
Built-in cupboards/ knotty pine ceilings (1)
Window beads/ beadings/picture frames

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

4.5 Screws takes longer to drive in √ but has a greater holding power √
Nail are quicker to install it has not got the same holding power (2)

OR ANY OTHER ACCEPTABLE ANSWER

4.6
- Component / description/ item/ part ✓
- Number / quantity ✓
- Unit
- Length/dimensions
- Breadth
- Thickness
- Sub-total
- Total
- Material

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

ANSWER SHEET 4.7 / ANTWOORDBLAD 4.7

4.7

A	B	C	D
			Centre line: Superstructure
			2/ 6 000 mm = 12 000 mm
			2/ 3 500 mm = 7 000 mm
			TOTAL: = 19 000 mm
			Minus 4/ 220 = 880 mm
			= 18 120 mm ✓✓
			Centre line = 18,12 m
1/	18,12 ✓		Area of wall for superstructure
	2,6 ✓	47,11 ✓	
1/	2 ✓		Area of side door
	0,8 ✓	1,6 m² ✓	
1/	2,4 ✓		Area of garage door
	2,1 ✓	5,04 m²✓	
1/	1,5 ✓		Area of window
	0,9 ✓	1,35 m²✓	
			Total area of wall after deductions
			= 47,11 m²- 1,6 m² - 5,04 – 1,35
			= 39,12 m² ✓
2/	39,12 ✓		
	50 ✓	3 912 ✓	3 912 bricks will be needed for the superstructure
	OR		
1/	39,12		
	100	3 912	3 912 bricks will be needed for the superstructure
			(18)
When answers are done in wrong columns it must be marked and learner penalised with 2 marks			

[30]

QUESTION 5: APPLIED MECHANICS

5.1 ANSWER SHEET 5.1

Total Area= 900 mm² + 3 300 mm² - 450 mm²
= 3 750 mm²

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

✓ ✓ ✓

= $\frac{(900 \times 20) + (3\,300 \times 30) - (450 \times 50)}{3\,750}$ ✓

= $\frac{18\,000 + 99\,000 - 22\,500}{3\,750}$ ✓

= $\frac{94\,500 \text{ mm}^3}{3\,750 \text{ mm}^2}$ ✓

= 25,2 mm ✓

OR

Take moments around A on Y –axis

✓ ✓ ✓ ✓

3 750 mm² x Y = (900 x 20) + (3 300 x 30) – (450 x 50)

3 750 mm² x Y = $\frac{117\,000 - 22\,500}{3\,750 \text{ mm}}$ ✓

= $\frac{94\,500 \text{ mm}^3}{3\,750 \text{ mm}^2}$ ✓

= 25,2 mm ✓

OR

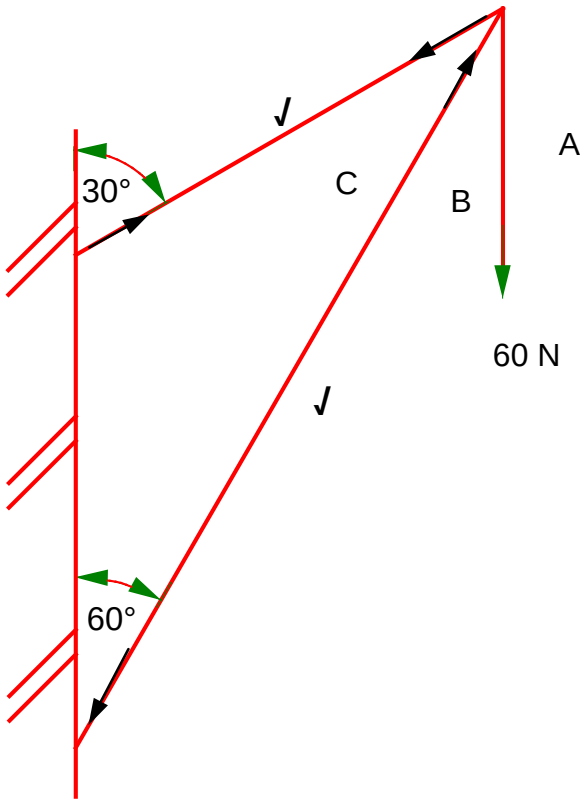
Part	AREA (A)	X	AREA OF X (Ax)
Right-angled triangle	900 mm²	$\frac{h}{3} = \frac{60}{3}$ = 20 mm ✓	18 000 mm³
Rectangle	3 300 mm²	$\frac{b}{2} = \frac{60}{2}$ = 30 mm ✓	99 000 mm³
Isosceles triangle	450 mm²	$\frac{h}{3} = \frac{30}{3}$ = 10 mm C = 60 -10 = 50 mm ✓ OR C = 30+20 = 50 mm	- 22 500 mm³
Σ	3 750 mm²✓		94 500 mm³

$\frac{\Sigma AX}{\Sigma A}$ (7)

= $\frac{94\,500 \text{ mm}^3}{3\,750 \text{ mm}^2}$ ✓ ✓

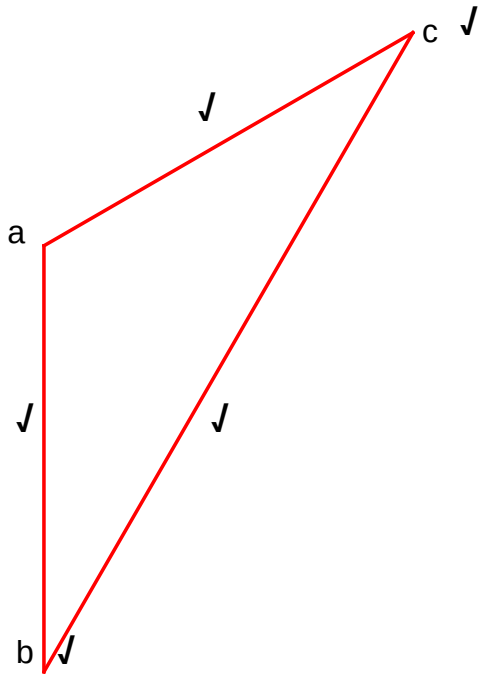
= 25,2 mm ✓

5.2



(2)

SPACE DIAGRAM
Nature of forces BC and AC = 2 marks



(5)

VECTOR DIAGRAM
NOT ACCORDING TO SCALE

USE A MASK TO MARK THIS QUESTION

MEMBER	NATURE	MAGNITUDE
BC	Strut ✓	104 N ✓
CA	Tie ✓	60 N ✓

Tolerance of 1 N to either side (4)

5.3

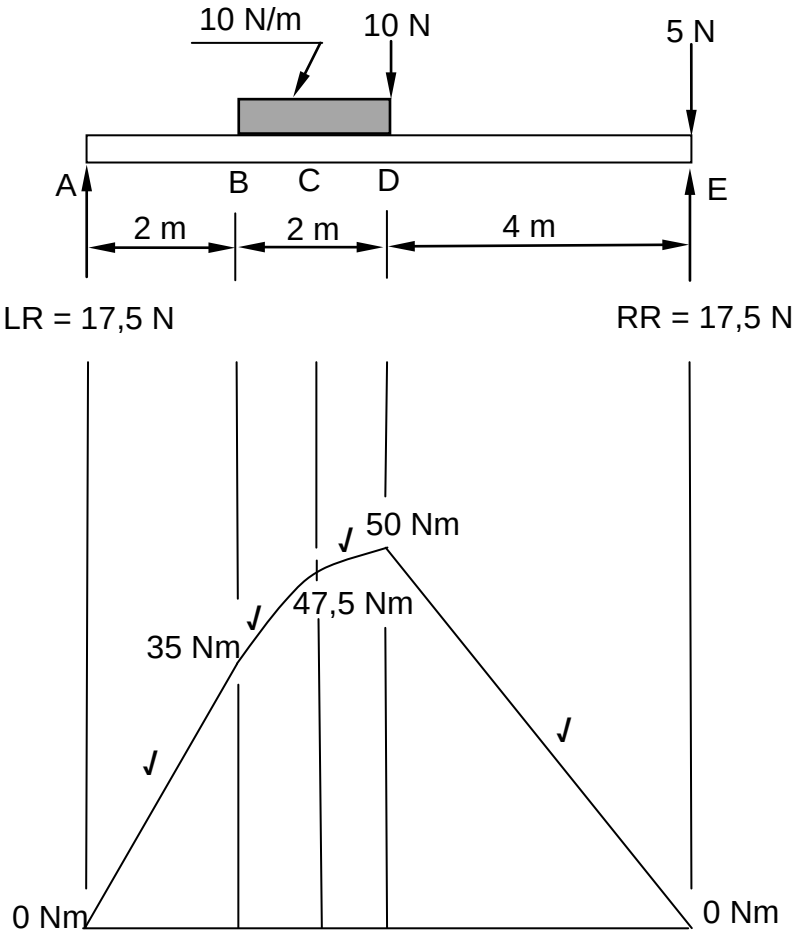
5.3.1 20 N ✓ (1)

5.3.2 5 ✓ m (1)

5.3.3 SFd (4 meters from A) = left reaction force – uniformly distributed load – point load b
= 17,5 N ✓ – 20 N ✓ – 10 N ✓
OR
= 17.5 √ - 30 √√
= - 12,5 N (3)

SFe (8 meters from A) = left reaction force – uniformly distributed load – point load b - point load c - point load d + RR
= 17,5 N – 20 N – 10 N – 5 N + 17,5 N✓✓✓
= 0 N
OR
= -12,5N-5N +17,5N
= 0 N (3)

5.3.4



(4)

Bending moment diagram

Marks are given for lines in 5.3.4 incorrect scale -1. **[30]**

CENTRE NUMBER:								

EXAMINATION NUMBER													

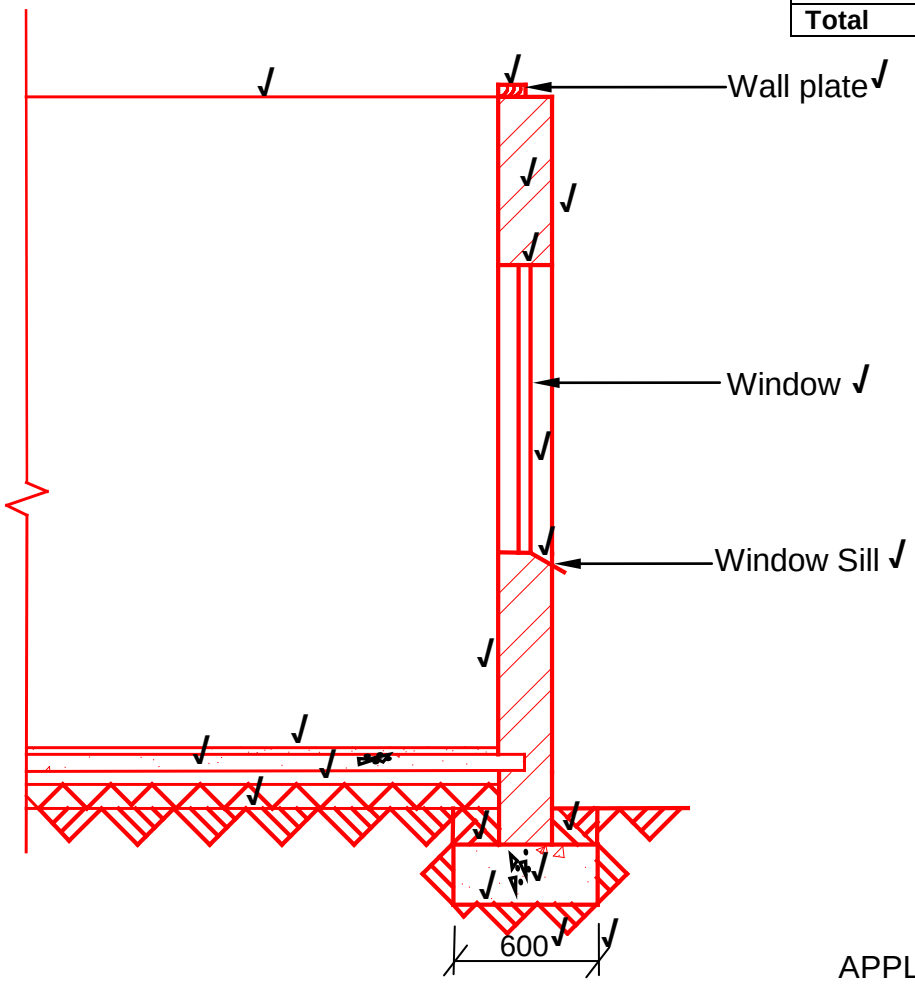
ANSWER SHEET 6.1

NO.	QUESTIONS	ANSWERS	MARKS
1	Identify number **1**.	Shower	1
2	Calculate the perimeter of the building.	30 200 mm / 30,2 m	1
3	Draw the symbol for the gully.		1
4	What is the thickness of the inner walls?	110 mm	1
5	Calculate the total area of the house in m^2.	56,0 m^2	2
6	Describe the purpose of number **2**.	To wash hands, face and your body	1
7	Give the abbreviation for number **3**.	WC	1
8	Identify number **4**.	Single sink/ sink	1
9	Identify number **5**.	Sliding door	1
10	Name the type of roof of the house.	Gable roof	1
11	Identify the electrical symbol at **6**.	Distribution board	1
12	Identify number **7**.	Socket outlet / Wall plug Power point	1
13	On which elevations will the gutters be placed in this house?	North and South (Show both for one mark)	1
14	Identify number **8**.	Single-pole one-way light switch	1
		Total	**15**

QUESTION 6: GRAPHICS AND COMMUNICATION

ANSWER SHEET 6.2
QUESTION 6.2

Aspect	Marks	Learners mark
Correctness of substructure	6	
Correctness of super-structure	7	
Correctness of any three drawing symbols	3	
Printing of any three labels	3	
Dimension and dimension lines	2	
Print the scale	1	
Application of scale One or two incorrect = 3 Three or four incorrect = 2 More than five incorrect = 1 No measurement correct = 0	3	
Total	**25**	



APPLICATION OF SCALE √ √ √

SCALE 1:20 √

NOT TO SCALE: USE A MASK TO MARK THIS QUESTION
FLOOR ON WRONG SIDE: -1 MARK

[40]

TOTAL : 200