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Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2017

MARKING GUIDELINES

MARKS: 200

These marking guidelines consist of 19 pages.

QUESTION 1: CONSTRUCTION, SAFETY AND MATERIALS

- 1.1
- Never use unsafe supports such as step ladders, drums, loose bricks, or crates on the scaffolding. ✓
 - The worker should have worn a safety harness/safety rope/. ✓
 - The worker should ensure that there are sufficient guard rails on the scaffolding.
 - Always wear protective clothing when working on scaffolding/non slip safety footwear.
 - The worker should ensure that the area is free of liquids and obstacles. (2)

ANY TWO OF THE ABOVE

- 1.2
- To prevent electric shock. ✓
 - To keep the power tools in a working condition.
 - To ensure the safety of the user.
 - Live exposed wires can cause electrocution or fire. (1)

ANY ONE OF THE ABOVE

- 1.3
- The worker can be injured by the moving blade. ✓
 - Measuring tools/tools may be damaged when touching the moving blade.
 - Moving parts of the machine can be damaged (1)

ANY ONE OF THE ABOVE

- 1.4
- Tamping rod/rod ✓
 - Cone/frustum/mould ✓
 - Base plate/waterproof base ✓
 - Folding ruler, tape measure, steel ruler/level/straight edge
 - Shovel (3)

ANY THREE OF THE ABOVE

- 1.5
- Concrete mixer/machine mixed ✓
 - Ready mixed concrete (1)

ANY ONE OF THE ABOVE

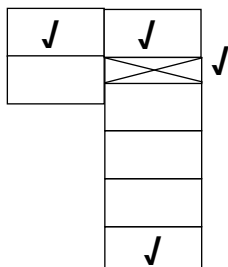
- 1.6
- | | | |
|-------|-------|-----|
| 1.6.1 | B ✓ | (1) |
| 1.6.2 | C ✓ | (1) |
| 1.6.3 | D ✓ | (1) |
| 1.6.4 | F/M ✓ | (1) |
| 1.6.5 | G ✓ | (1) |
| 1.6.6 | J ✓ | (1) |
| 1.6.7 | L ✓ | (1) |

1.6.8 $I \nabla$ (1)

1.6.9 HJ (1)

$$1.6.10 \quad A J \quad (1)$$

1.7 1.7.1



**1.7.2 PLAN COURSE OF A QUOIN IN ENGLISH BOND/
CORNER BUILT IN ENGLISH BOND ✓** (1)

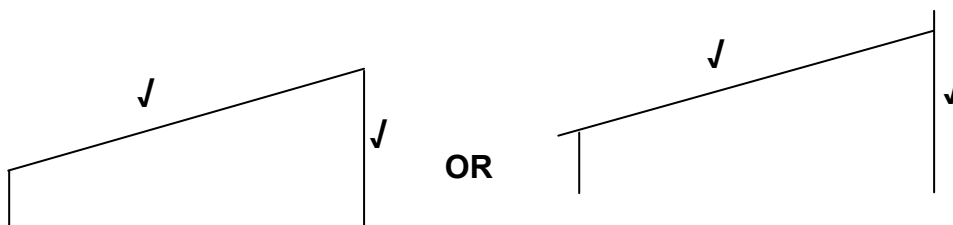
ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Stretcher course	1	
Corner brick	1	
Queen closer	1	
Header course	1	
TOTAL	4	

1.7.3

- The queen closer creates the bond in the wall/quarter lap. ✓
- The queen closer closes the gap in the wall in the header course.
- The queen closer prevents a straight vertical mortar joint.

ANY ONE OF THE ABOVE (1)

1.8



ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Supporting walls	1	
Roof	1	
TOTAL	2	

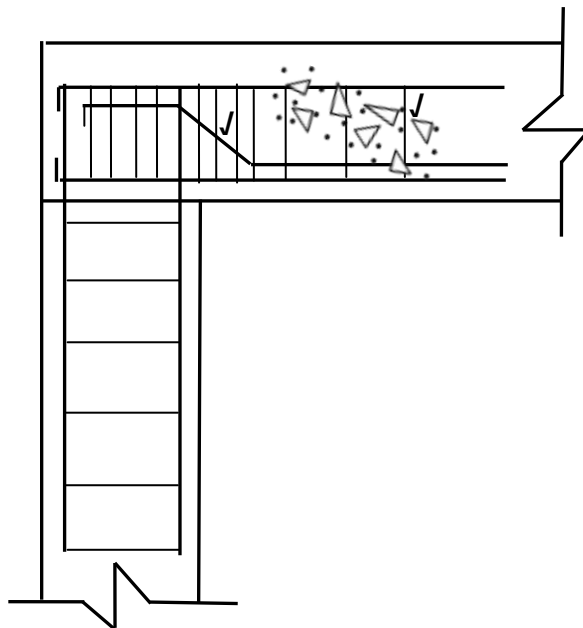
- 1.9 1.9.1
 - A brush/sponge can be used to apply paint to a ceiling. ✓
 - A roller can be used to apply paint to a ceiling.
 - A spray gun/spray-painting equipment can be used to apply paint to a ceiling.
 - A sponge can be used to apply paint to a ceiling.**ANY ONE OF THE ABOVE** (1)
- 1.9.2
 - Painting it with a brush will avoid fine paint spray on the walls and the floors. ✓
 - Using a roller will be quicker than using a brush/prevent stripes.
 - Spray painting will be quicker than painting with a brush and a roller.A sponge can be used for the decorative application of paint.
- **ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (1)
- 1.10 1.10.1 Skirting/tile skirting ✓ (1)
- 1.10.2 Cornice ✓ (1)
- ANY SUITABLE MATERIAL INDICATED FOR THE MANUFACTURING OF THE ABOVE COMPONENTS WILL BE ACCEPTED.**
- [30]**

QUESTION 2: ADVANCED CONSTRUCTION AND EQUIPMENT

- | | | | |
|-----|-------|--|-----|
| 2.1 | 2.1.1 | D ✓ | (1) |
| | 2.1.2 | B ✓ | (1) |
| | 2.1.3 | B ✓ | (1) |
| | 2.1.4 | D ✓ | (1) |
| | 2.1.5 | C ✓ | (1) |
| 2.2 | 2.2.1 | Dumpy level/surveying instrument/levelling instrument ✓ | (1) |
| | 2.2.2 | <ul style="list-style-type: none"> • To measure vertical and horizontal heights/levels ✓ • To measure vertical and horizontal angles • To measure distances • It is used for surveying/setting out of buildings. ANY ONE OF THE ABOVE | (1) |
| | 2.2.3 | Tripod/baseplate ✓ | (1) |
| | 2.2.4 | Telescopic staff/levelling rod ✓ | (1) |
| | 2.2.5 | <ul style="list-style-type: none"> • To prevent it from getting damaged and wet. ✓ • To protect the instrument against dust/moisture/bumps/sun • It is fragile. ANY ONE OF THE ABOVE | (1) |
| 2.3 | 2.3.1 | Rib and block concrete ✓ | (1) |
| | 2.3.2 | A – Concrete floor slab/concrete/slab. ✓
B – Concrete hollow block/rib block/block ✓
C – Reinforced steel mesh/reinforcement bars/bars ✓ | (3) |
| | 2.3.3 | <ul style="list-style-type: none"> • The rib and block method can be used anywhere, even in water. ✓ • Components are precast, thus it saves a lot of building time. • Placing is relatively quick. • Provides excellent resistance against soil movement. • Work can proceed, despite the weather conditions. • Plastering the underside of the floor can take place without any delays. • No extensive formwork or shuttering is necessary. • It is approximately 30% lighter than in situ floor slabs. • No skilled labour is required as the supply company also does the installation. • It is cheaper. • Less quantity of material is used. ANY ONE OF THE ABOVE | (1) |

- 2.4 2.4.1 A - Wall tie ✓
 B - Damp proof course/DPC ✓ (2)
- 2.4.2
 - Under the window sill ✓
 - Under floor slab/Between the sub- and super structure
 - At the base of external and internal walls
 - Vertically at jambs or door frames
 - Roof/parapet wall
 - Above the lintel of a cavity wall (1)
- ANY ONE OF THE ABOVE**
- 2.4.3 The cavity in the walls are to:
 - prevent rain water from penetrating the inner skin of the wall. ✓
 - provide high insulation against heat, cold and sound.
 - enable the use of cheaper or alternative materials for inner skin of the wall. (1)
- ANY ONE OF THE ABOVE**
- 2.5 Intrados – Is the inner surface of arches ✓
 Extrados – Is the outer surface of arches ✓ (2)
- 2.6 2.6.1 Cube/Cube mould/Mould ✓ (1)
- ANY ONE OF THE ABOVE**
- 2.6.2 Tamping rod/Rod/Trowel/Shovel ✓ (1)
- ANY ONE OF THE ABOVE**
- 2.6.3 Cube test ✓ (1)
- 2.6.4
 - The test is done to determine the compressive strength/crushing strength of concrete. ✓
 - Test the strength of concrete. (1)
- ANY ONE OF THE ABOVE**

2.7



ASSESSMENT CRITERIA	MARK	CANDIDATES MARK
Shear bar correctly drawn	1	
Stirrups correctly drawn and spaced	1	
TOTAL	2	

(2)

2.8 2.8.1 Twisted ribbed bar ✓

2.8.2 Ribbed bar ✓

(2)

- 2.9 2.9.1
- Wooden planks/timber ✓
 - Block board
 - Laminated board
 - Shutter board
 - Plywood boards
 - Metal shutter

(1)

ANY ONE OF THE ABOVE

- 2.9.2
- B – Wedges ✓
- C – Yoke ✓
- D – Clamp/Cleat ✓
- E – Threaded rod/bolt and nut/bolt ✓

(4)

- 2.9.3
- The yokes will not be tightened/Yokes will not be able to be joined. ✓
 - The formwork will not be kept in place/collapse.
 - The formwork will not be square.
 - The yokes will not be in place.
 - The formwork will not be rigid.
 - Concrete will escape from the corners of the formwork.

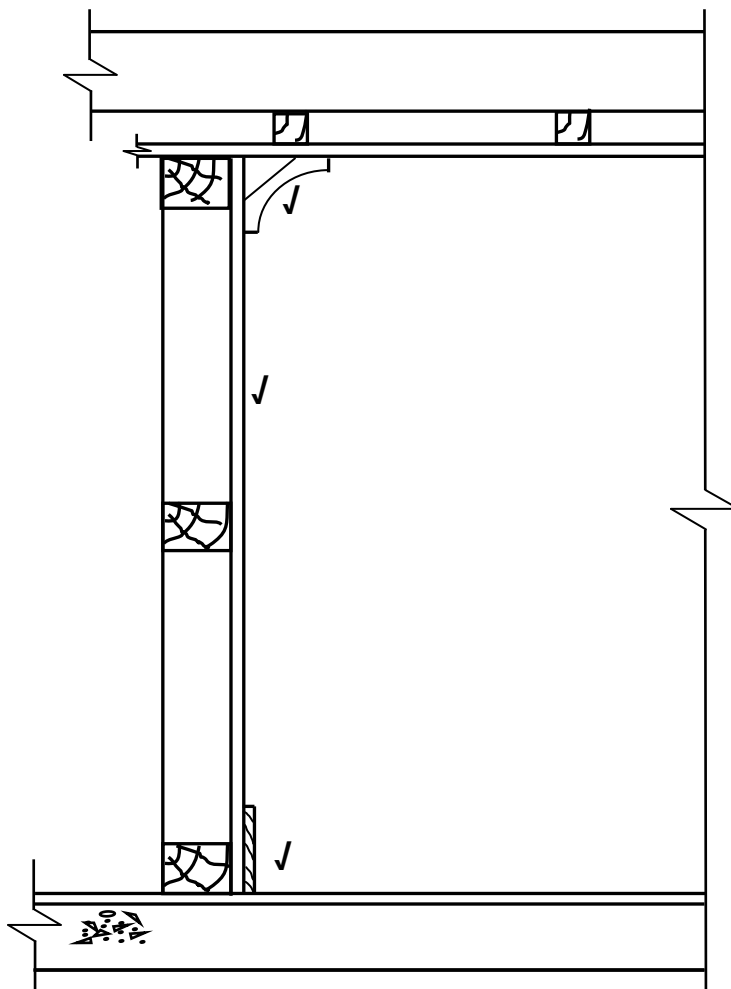
(1)

ANY ONE OF THE ABOVE

- 2.10
- There is insufficient soundproofing ✓
 - There is less insulation against cold and heat
 - It cannot be use externally
 - The dry wall can easily be damaged/burnt
 - The dry wall cannot carry heavy loads
- (1)

ANY ONE OF THE ABOVE

2.11



ASSESSMENT CRITERIA	MARK	CANDIDATES MARK
Cladding correctly drawn	1	
Cornice/moulding at ceiling correctly drawn	1	
Skirting/quadrant at floor correctly drawn	1	
TOTAL	3	

- 2.12
- Preformed concrete piles ✓
 - Steel tube caisson piles
 - Driven in-situ piles
 - Short bored piles
- (1)
- ANY ONE OF THE ABOVE**

[40]

QUESTION 3: CIVIL SERVICES

3.1 3.1.1 S – trap ✓ (1)

3.1.2 To prevent sewer-gas (foul air) from the sewerage system to enter the building. ✓ (1)

3.2 • The season/Cloud cover/weather conditions ✓
 • Time of day ✓
 • Duration of sunshine
 • Cleanliness of glass panel
 • Shadows over glass panels
 • The intensity of direct sunlight
 • The position/orientation of the panel to north
 • Pitch of the panel
 • The type of solar heater/panel (2)

ANY TWO OF THE ABOVE

3.3 3.3.1 Heating element/Element ✓ (1)

3.3.2 • The cold water inlet is placed at the bottom of the geyser so that the incoming cold water does not mix with the hot water/incoming cold water heated by the element. ✓
 • The hot water outlet is placed at the top to discharge hot water which is concentrated at the top of the geyser. ✓ (2)

OR ANY OTHER ACCEPTABLE ANSWER

3.3.3 Temperature and pressure safety valve/Safety valve/Pressure valve ✓ (1)

3.4 3.4.1 • The grid receives/drains storm water/allow storm water to enter storm water system/pipe. ✓
 • Water is guided to flow off our roads on to the road kerbs and then into the road channel into the storm water pipes.
 • Prevent waste like paper and plastic bags to block the storm water pipes.
 • For safety purposes (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.4.2 • Roads will overflow with storm water. ✓
 • Damage to the roads may be possible because of the storm water.
 • Storm water will not be able to enter the grid. (1)
 • Storm water will flood surrounding areas

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

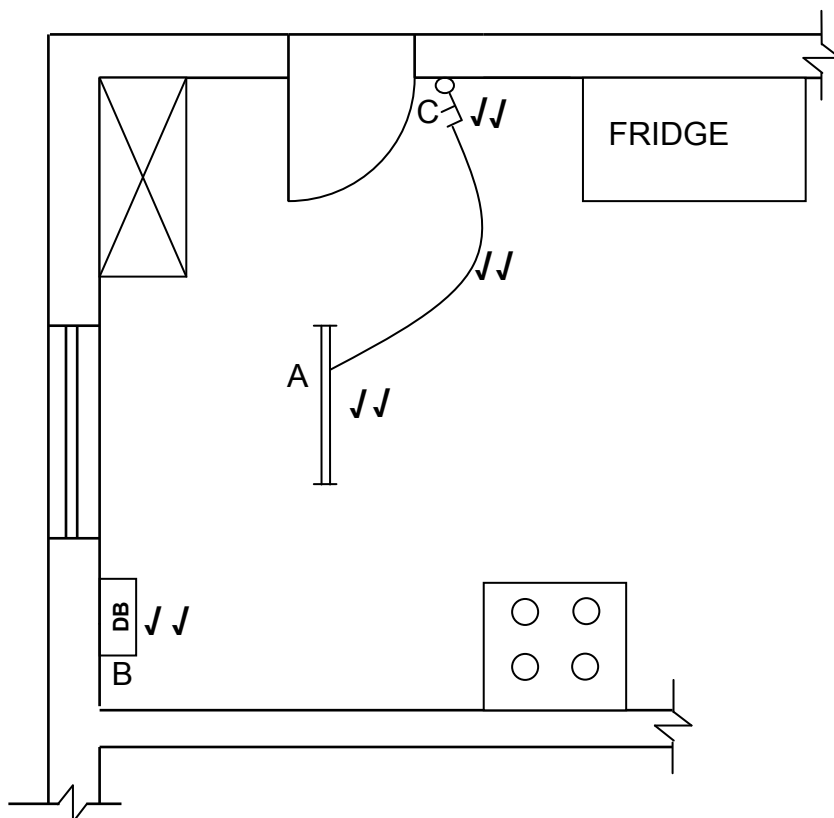
3.5

- Wind pump ✓
- Submersible water pump ✓
- Water pump
- Manual hand pump/hand pump
- Electric pump
- Solar powered pump

ANY TWO OF THE ABOVE

(2)

3.6

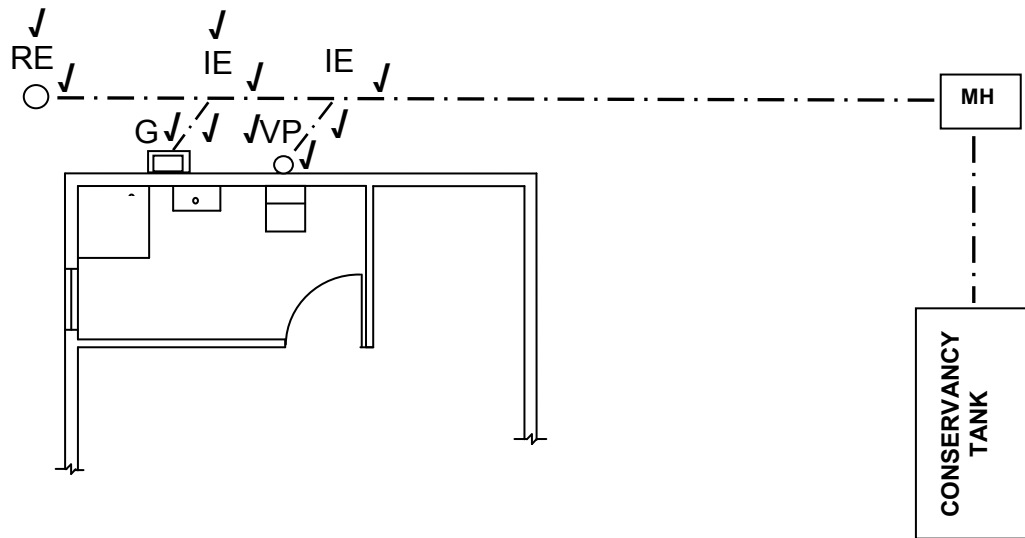


ASSESSMENT CRITERIA	MARK	CANDIDATES MARK
Fluorescent light	2	
Distribution board	2	
Double-pole light switch (one-way)	2	
Electric wiring	2	
TOTAL	8	

DRAWING SYMBOLS IN TEXTBOOKS FOR ABOVE ITEMS WILL ALSO BE ACCEPTED

(8)

3.7



ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Rodding eye	1	
Gully	1	
Ventilation pipe/Vent pipe	1	
Branch pipes 45°	2	
Inspection eyes	2	
Any THREE abbreviations	3	
TOTAL	10	

(10)
[30]

QUESTION 4 QUANTITIES AND CALCULATIONS AND JOINING

- 4.1 4.1.1 Chipboard/drywall/counter sunk head screw/pozi drive screw ✓
Use:
Joining fabricated boards/machine made boards/board products/timber ✓ (2)
- 4.1.2 Steel cut nail/masonry nail ✓
Use:
Mainly used to fix skirting and cleats to brickwork ✓
- OR**
- Oval nail
Use:
Used at edge of timber to prevent the timber from splitting
- OR**
- Floor nail
Use:
Used to secure floor planks (2)
- 4.1.3 Sleeve anchor/Rawlbolt ✓
Use:
Fixing objects into concrete and brickwork/to join truss hangers against a wall ✓ (2)
- 4.2 • Wire nails/clamp/hurricane clamps ✓ (1)
- 4.3 Nails:
• Quicker to drive in than screws ✓
• Available in a variety of lengths, thicknesses and strengths ✓
• Various heads for invisible or decorative use
• Cheaper than screws
• Can be made of rust proof material (copper or stainless steel)
• Can be quickly removed
• Tough and resilient
• Can be straightened and reused
• Nails requires a less skilful worker
• Not as time consuming as when inserting screws.
• Application of nails is much faster than screws. (2)
- ANY TWO OF THE ABOVE**
- 4.4 • Copper pipe/polycop pipes/PVC pipes/Composite pipes ✓ (1)

4.5	4.5.1	38/38 mm ✓	(1)
	4.5.2	3 ✓	(1)
	4.5.3	3 374/3 374 mm ✓	(1)
	4.5.4	3 600/3 600 mm ✓	(1)
	4.5.5	9 600/9 600 mm ✓	(1)
	4.5.6	3 600/3 600 mm ✓	(1)
	4.5.7	17 250/17 250 mm ✓	(1)

4.6

A	B	C	D
			<u>Inside measurement of:</u>
			Long walls = 7 000 mm – 2/220 mm ✓
			= <u>6 560 mm</u> ✓
			Short walls = 4 000 mm – 2/220 mm ✓
			= <u>3 560 mm</u> ✓
			(4)
1/	6,56		<u>Inside area of the room is</u>
	<u>3,56</u> ✓	<u>23,35 m²</u> ✓	
			(2)
			<u>Area of one ceiling board:</u>
1/	4,2 ✓		One board is 4 200 mm x 1 200 mm
	<u>1,2</u> ✓	<u>5,04 m²</u> ✓	(3)
			<u>Length of skirting:</u>
			= (6 560 + 3 560) x 2 ✓
			= 20 240 ✓ – 3 000 mm ✓
			= <u>17,24 m</u> ✓
			OR
			= 13 120 ✓ + 7 120 ✓ - 3 000 mm ✓
			= 17 240 mm
			= 17,24 m ✓
			OR
			= 6 560 + 6 560 ✓ + 3 560 + 3 560 ✓ - 3 000 mm ✓
			= 17 240 mm
			= 17,24 m ✓
			(4)

[30]

IF A CANDIDATE DID NOT USE THE ANSWER SHEET TWO MARKS MUST BE DEDUCTED FROM THE TOTAL

IF A CANDIDATE DID NOT CONVERT TO METRES THE CANDIDATE SHOULD NOT BE PENALISED BUT THE FINAL ANSWER MUST BE IN SQUARE METRES/METRES
IF THE CANDIDATE WROTE THE MEASUREMENTS IN THE WRONG COLUMN ONE MARK MUST BE DEDUCTED FROM THE TOTAL

QUESTION 5: APPLIED MECHANICS

5.1 5.1.1
$$\frac{(A_1 \times d) + (A_2 \times d)}{\text{Total area}}$$

$$\begin{aligned}
 &= \frac{\overset{\checkmark}{(3\,600\text{ mm}^2 \times 30\text{ mm})} + \overset{\checkmark}{(675\text{ mm}^2 \times 25\text{ mm})}}{\overset{\checkmark}{4\,275\text{ mm}^2} \checkmark} \\
 &= \frac{\overset{\checkmark}{108\,000\text{ mm}^3} + \overset{\checkmark}{16\,875\text{ mm}^3}}{\overset{\checkmark}{4\,275\text{ mm}^2}} \\
 &= \frac{124\,875 \checkmark \text{ mm}^3}{4\,275\text{ mm}^2} \\
 &= 29,21 \checkmark \text{ mm} \checkmark
 \end{aligned}$$

OR

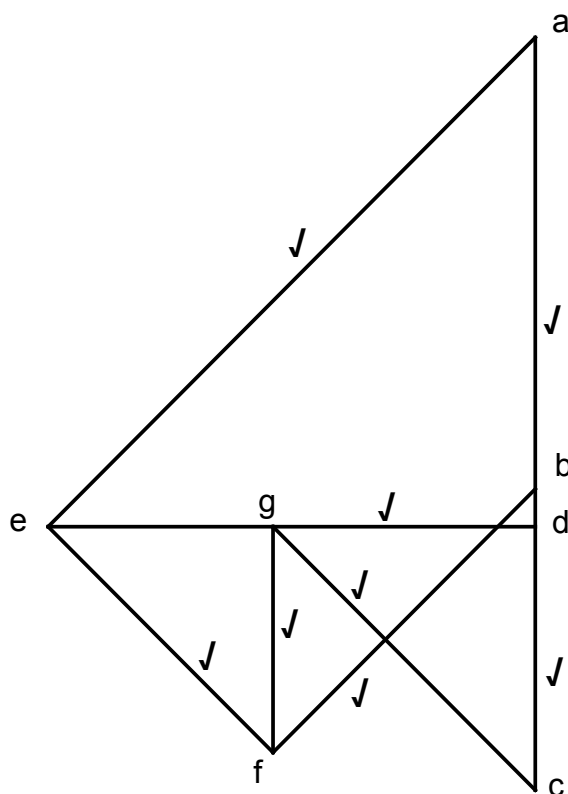
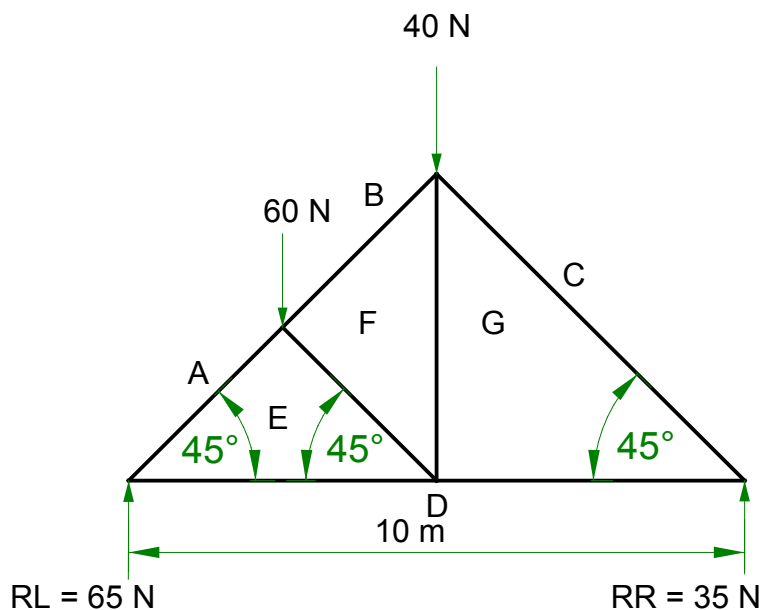
Part	Area A (A)	X	AX
1	3 600 mm ² ✓	30 mm ✓	3 600 mm x 30 mm = 108 000 mm ³ ✓
2	675 mm ² ✓	25 mm ✓	675 mm x 25 mm = 16 875 mm ³ ✓
Σ	4 275 mm ² ✓		124 875 mm ³

$$\begin{aligned}
 X &= \frac{\sum Ax}{\sum A} \\
 &= \frac{124\,875 \checkmark \text{ mm}^3}{4\,275\text{ mm}^2} \\
 &= 29,21 \checkmark \text{ mm} \checkmark
 \end{aligned}$$

IF A CANDIDATE SWOP AREA 1 AND 2 AROUND DEDUCT 1 MARK

(10)

5.2.1



(8)

5.2.2

MEMBER	NATURE	MAGNITUDE
AE	Strut ✓	92 N ✓
DG	Tie ✓	35 N ✓

(4)

Tolerance of 1 N to either side

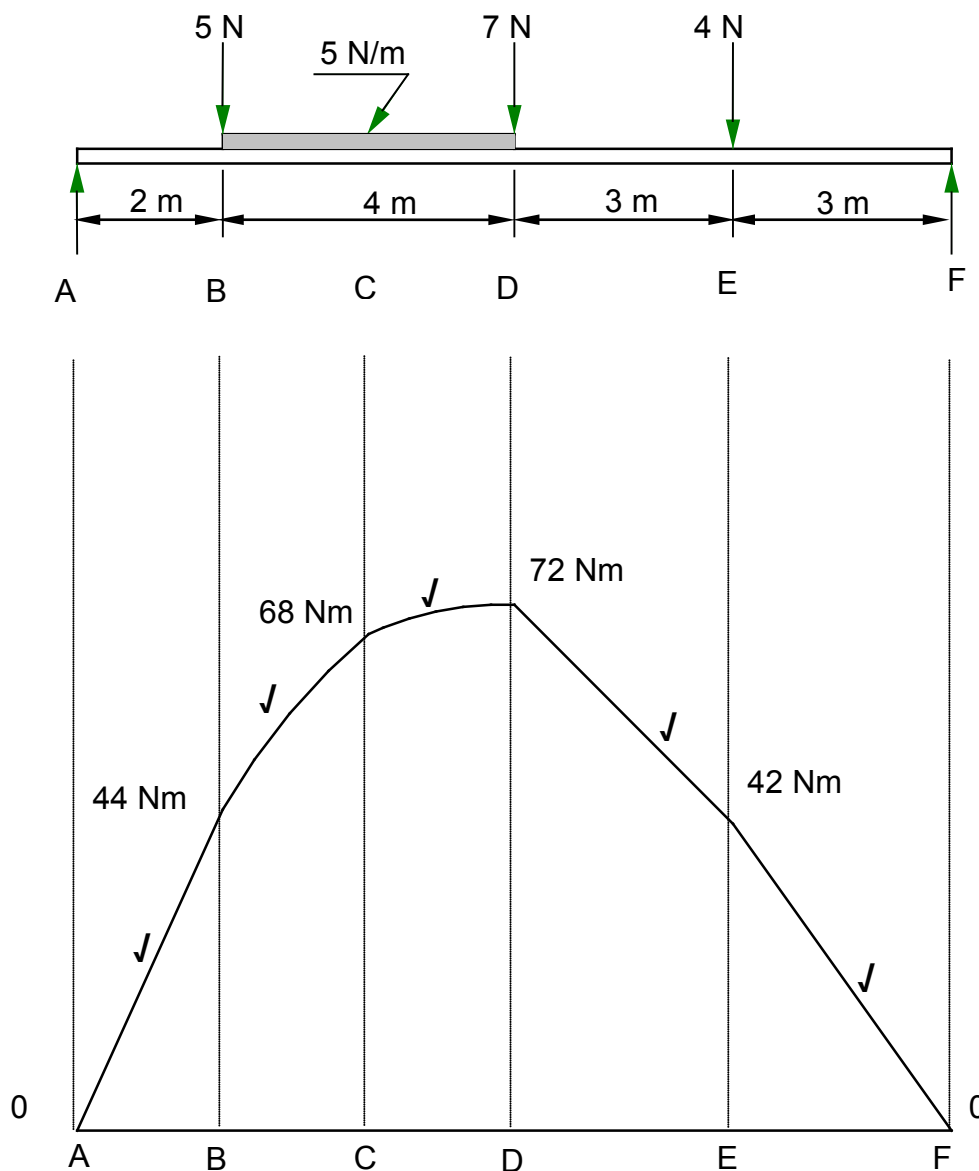
NOT TO SCALE DUE TO ELECTRONIC TRANSFER.**USE A MASK TO MARK THIS QUESTION.****IF THE CANDIDATE WROTE THE MEASUREMENTS IN THE WRONG COLUMN
ONE MARK MUST BE DEDUCTED FROM THE TOTAL**

5.3 5.3.1 20 N/m ✓ (1)

5.3.2 8 m ✓ (1)

5.3.3 4 m ✓ (1)

5.3.4



If the lines between B and D are straight lines no marks may be awarded for these lines.

NOT TO SCALE DUE TO ELECTRONIC TRANSFER.

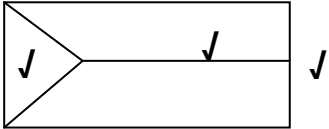
USE A MASK TO MARK THIS QUESTION.

BECAUSE DISTANCES BETWEEN AB, BC, ECT. MAY DIFFER ON THE ANSWER SHEETS OF THE PROVINCES.

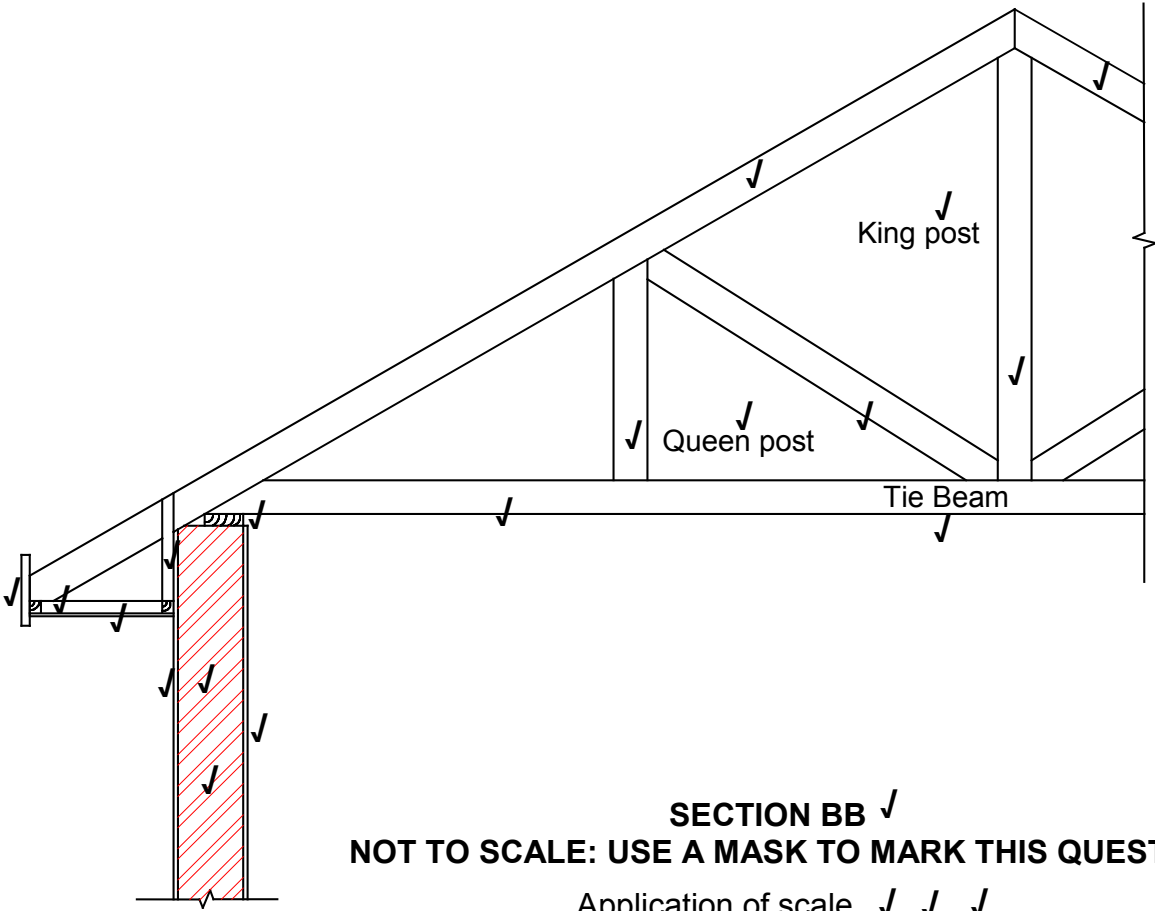
(5)

[30]

ANSWER SHEET 6.1

NO.	QUESTIONS	ANSWERS	MARKS
1	Name the title of the drawing	South Elevation ✓	1
2	Identify number 1.	Ridge/Ridge capping/Ridging ✓	1
3	Identify number 2.	Tile roof/Tile/Roof tile/Concrete tile/roof covering ✓	1
4	Identify number 3.	Gutter ✓	1
5	Identify number 4.	Downpipe ✓	1
6	Identify number 5.	North point/North direction/True North ✓	1
7	Identify number 6	NGL/Natural ground level/Ground level ✓	1
8	Identify number 7	Window Sill ✓	1
9	Name the type of roof on the eastern side of the house.	Gable ✓	1
10	Name the type of roof on the western side of the house.	Hipped roof ✓	1
11	Name the material that can be used for the fascia board?	Wood/Timber/Cement fibre/uPVC/Plastic/Galvanised sheet metal ✓	1
12	On how many sides of the building will you find fascia boards?	3 sides ✓	1
13	Draw the top view (roofline) of the roof for the elevation indicated in FIGURE 6.1 in the column alongside .		3
		TOTAL	15

QUESTION 6: GRAPHICS AND COMMUNICATION
ANSWER SHEET 6.2



Application of scale ✓ ✓ ✓

Correctness of drawing: Wall ✓ Closed eave ✓ Roof truss ✓

- All parts of the drawing must be correctly drawn to receive a mark.
- If the section is drawn the wrong way around deduct one mark

ASSESSMENT CRITERIA	MARKS	LM
Correctness of drawing	3	
External wall	1	
Symbol for wall	1	
Plaster	2	
Wall plate	1	
Tie beam	1	
Rafters	2	
Strut	1	
Queen post	1	
King post	1	
Fascia board	1	
Hanger	1	
Bearer	1	
Fibre cement ceiling board	1	
Any THREE labels	3	
Print 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	
Total	25	

[40]