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# basic education

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

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**CIVIL TECHNOLOGY**

**FEBRUARY/MARCH 2018**

**MARKING GUIDELINES**

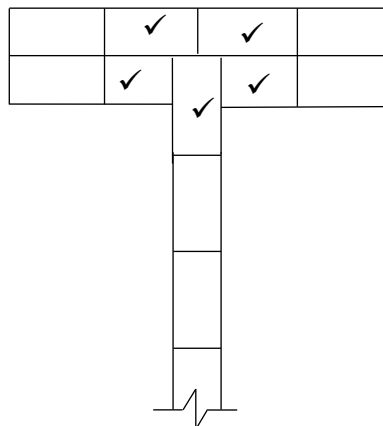
**MARKS: 200**

**These marking guidelines consist of 15 pages.**

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

- 1.1      1.1.1      B ✓ (1)
- 1.1.2      E ✓ (1)
- 1.1.3      A ✓ (1)
- 1.1.4      D ✓ (1)
- 1.1.5      F ✓ (1)
- 1.1.6      C ✓ (1)
- 1.1.7      H ✓ (1)
- 1.1.8      I ✓ (1)
- 1.1.9      G ✓ (1)
- 1.1.10      J ✓ (1)
- 1.2      1.2.1      A – To protect your feet against falling objects. ✓ (1)
- 1.2.2      B – To protect your feet when working with wet material. ✓ (1)
- 1.3      The paint conceals defects ✓ (1)
- 1.4
  - Excavations must be fenced off. ✓
  - Red warning lights should be placed at intervals to warn the public. ✓
  - All excavations must take place under supervision.
  - The contractor must test the stability of the terrain before commencement of excavations.
  - Shoring should be cross braced.
  - Bracing should be strong enough to support the shoring.
  - No tools or materials other than those in use are allowed inside the trench when excavations are in progress.
  - Access to the excavation should be safe e.g. ladders can be used.
  - A responsible person must inspect and investigate underground electricity and water supply.
  - The sides should be braced and protected if deeper than 1,5 meters.**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)
- 1.5
  - Baseplate ✓
  - Mould/Cube ✓
  - Tamping rod ✓
  - Plaster trowel/straight edge/shovel**ANY THREE OF THE ABOVE** (3)

- 1.6
- Water makes the fresh concrete workable. ✓
  - Water acts as a lubricant.
  - Water is also needed for the hydration process.
- ANY ONE OF THE ABOVE** (1)
- 1.7
- 1.7.1 To prevent moisture from getting into the building. ✓ (1)
- 1.7.2 To prevent moisture from moving up in the walls. ✓ (1)
- 1.8
- Preservatives with a base of water-soluble salts. ✓
  - Varnish
- ANY ONE OF THE ABOVE** (1)
- 1.9 Roof tiles/Clay tiles/Concrete tiles ✓ (1)
- 1.10 Ridge capping ✓ (1)
- 1.11 Gang nails/plate connectors ✓ (1)
- 1.12



ASSESSMENT CRITERIA	MARK	CANDIDATES MARK
One brick wall	2	
Half brick wall (T-junction)	1	
Three-quarter bricks	2	
<b>TOTAL</b>	<b>5</b>	

(5)  
[30]

## QUESTION 2: ADVANCED CONSTRUCTION AND EQUIPMENT

ANSWER THIS QUESTION ON A NEW PAGE.

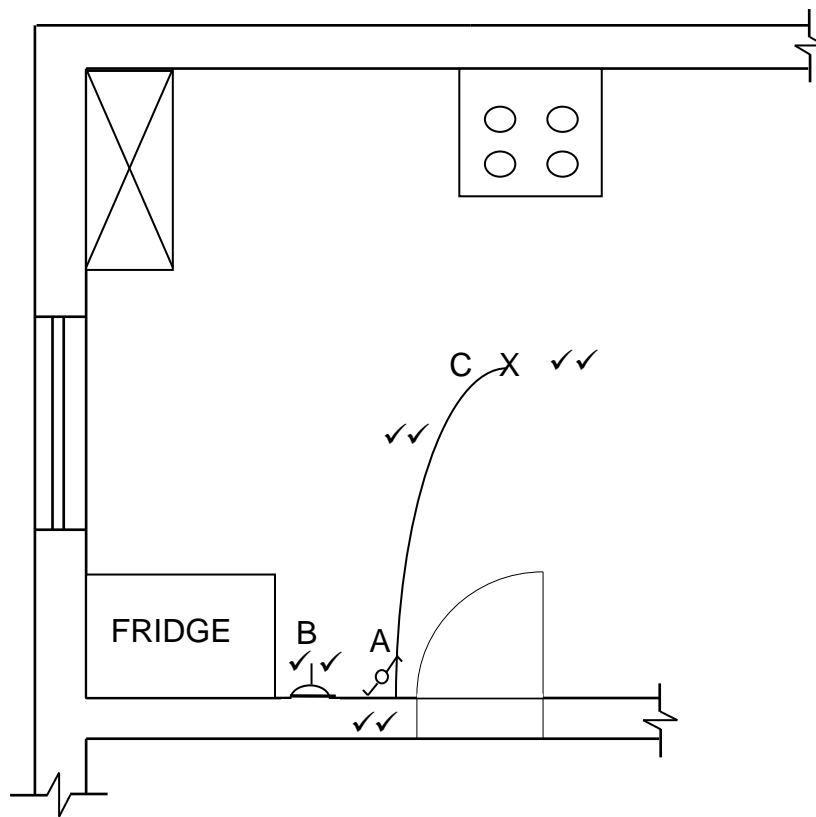
- |     |       |   |     |
|-----|-------|---|-----|
| 2.1 | 2.1.1 | C ✓   | (1) |
|     | 2.1.2 | D ✓   | (1) |
|     | 2.1.3 | A ✓   | (1) |
|     | 2.1.4 | B ✓   | (1) |
|     | 2.1.5 | A ✓   | (1) |
| 2.2 | 2.2.1 | Portable electric generator ✓ – It is used to generate electricity ✓  | (2) |
|     | 2.2.2 | Portable electric circular saw ✓ – It is used for cross cutting and ripping of timber. ✓  | (2) |
| 2.3 |       | Chalk line ✓  | (1) |
| 2.4 |       | <ul style="list-style-type: none"> <li>• Flat steel square ✓</li> <li>• Tape measure</li> </ul> <b>ANY ONE OF THE ABOVE</b>   | (1) |
| 2.5 |       | <ul style="list-style-type: none"> <li>• Rough arch will be built with common bricks ✓</li> <li>• Gauge arch will be built with face bricks ✓</li> </ul>  | (2) |
| 2.6 | 2.6.1 | Driven in-situ pile ✓   | (1) |
|     | 2.6.2 | <ul style="list-style-type: none"> <li>• Low bearing capacity of soil ✓</li> <li>• Subsoil – subjected to movement ✓</li> <li>• Subsoil – subjected to high moisture content.</li> <li>• Recently placed filling materials that is not sufficiently compacted</li> <li>• Unstable soil structure</li> <li>• High water table</li> </ul> <b>ANY TWO OF THE ABOVE</b> | (2) |
|     | 2.6.3 | Steel reinforcement ✓   | (1) |
| 2.7 | 2.7.1 | Twisted square bar ✓  | (1) |
|     | 2.7.2 | Round bar (mild steel) ✓  | (1) |
| 2.8 |       | A – Landing ✓<br>B – Rise ✓<br>C – Tread ✓  | (3) |

- 2.9
- Blow holes ✓
  - Uneven colour/discoloration ✓
  - Honey comb effect/Leaking of grout
- ANY TWO OF THE ABOVE** (2)
- 2.10
- 2.10.1 Cavity wall ✓ (1)
- 2.10.2
- A – Wall tie ✓
  - Keeps the two skins of the wall securely together. ✓
  - It strengthens the wall
- ANY TWO OF THE ABOVE** (2)
- 2.10.3
- B – Weak concrete mixture ✓
  - Concrete mixture
- ANY ONE OF THE ABOVE** (1)
- 2.10.4
- To strengthen the wall below the DPC (damp proof course) ✓
  - To close the cavity below the damp proof course
- ANY ONE OF THE ABOVE** (1)
- 2.10.5 C – Damp-proof membrane ✓ (1)
- 2.10.6 50 mm ✓ (Unit must be part of the answer) (1)
- 2.11
- 2.11.1 A – Cladding (or any cladding material) ✓
- B –
- Timber floor board ✓
  - Base plate
  - Base board
- ANY ONE OF THE ABOVE FOR B** (2)
- 2.11.2
- Steel ✓
  - Metal
  - Aluminium
- ANY ONE OF THE ABOVE** (1)
- 2.11.3
- There is no wet material ✓
  - There is no heavy material to carry ✓
  - Dry walls are light in weight.
  - Dry walls are easier to install
  - Dry walls are easy to remove if required
- ANY TWO OF THE ABOVE** (2)
- 2.12
- 2.12.1 Rib and Block floor ✓ (1)
- 2.12.2
- A – Rib ✓
- B – Hollow block/Block ✓
- C – Reinforcing steel/Steel rod/Reinforcement ✓ (3)
- [40]**

**QUESTION 3: CIVIL SERVICES**

- 3.1      3.1.1      P-trap ✓ (1)
- 3.1.2      Washbasin/Urinal/Shower/Sink ✓ (1)  
                         **ANY ONE**
- 3.2      3.2.1      A-Is the inlet pipe for cold water ✓  
                         B-Is the outlet pipe for warm water ✓ (2)
- 3.2.2      To shut down water supply during maintenance. ✓  
                         **ANY OTHER ACCEPTABLE ANSWER** (1)
- 3.2.3      • To prevent water from leaking through the ceiling ✓  
                         • It is compulsory to install a drip tray  
                         **ANY ONE OF THE ABOVE** (1)
- 3.3      3.3.1      Storm water is hail, snow, rain that falls to the earth in large quantities. ✓  
                         **ANY OTHER ACCEPTABLE ANSWER** (1)
- 3.3.2      Storm water is guided into the channels where after the water is guided to storm water pipes and catchment areas. ✓  
                         **ANY OTHER ACCEPTABLE ANSWER** (1)
- 3.4      Water in shallow wells is:  
             • Easily dug out ✓  
             • Cheap  
             • Relatively reliable  
             **ANY ONE OF THE ABOVE** (1)
- 3.5      Wind pump ✓ (1)

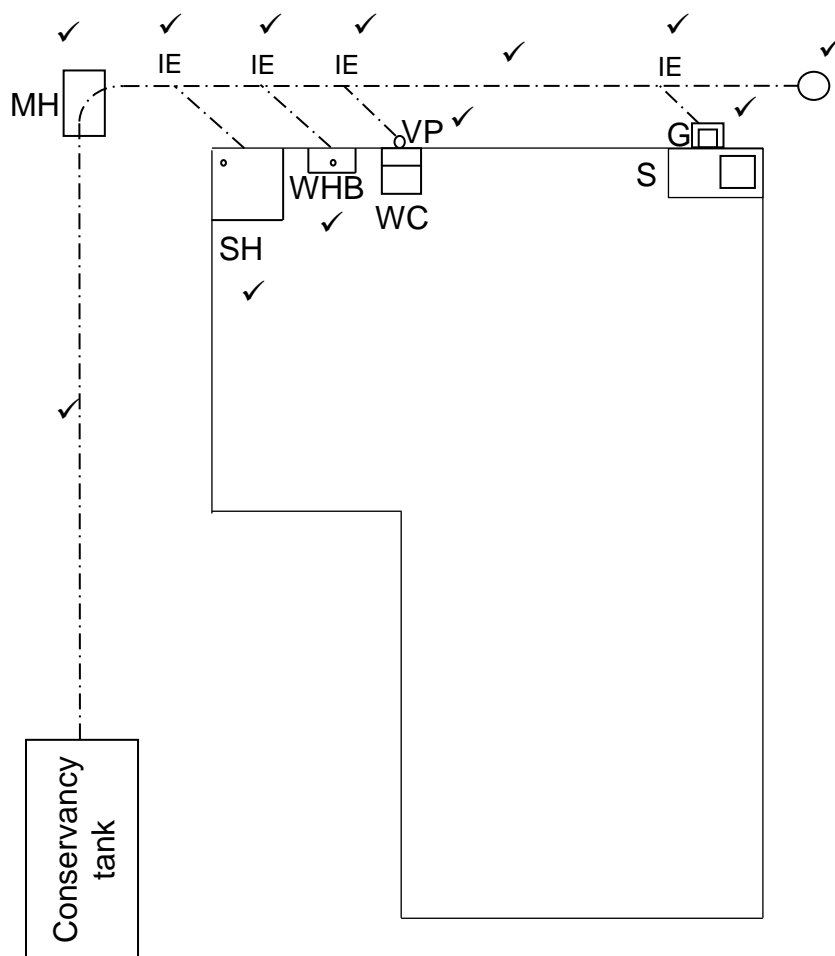
3.6



ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
2 way light switch	2	
Socket outlet	2	
Light	2	
Electrical wire	2	
<b>TOTAL</b>	<b>8</b>	

(8)



3.7 **ANSWER SHEET 3.7**

ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Rodding eye	1	
Gully	1	
Vent pipe	1	
Main sewerage pipes	2	
Inspection eyes	4	
Manhole	1	
Any TWO abbreviations for the sanitary fixtures	2	
<b>TOTAL</b>	<b>12</b>	

(12)

**[30]**

**QUESTION 4: QUANTITIES, MATERIALS AND JOINING**

- 4.1      4.1.1      • Gang nail ✓ (1)  
USE:  
• Gang nails are used to join the members of roof trusses. ✓  
• Extend the length of a timber board/beam.  
**ANY ONE OF THE ABOVE USES** (1)
- 4.1.2      • Bolt and nut ✓ (1)  
USE:  
• Bolts and nuts are used to join the members of roof trusses. ✓  
• Join material to brackets  
• To fix truss hangers to rafters  
**ANY ONE OF THE ABOVE USES** (1)
- 4.1.3      • Dry wall screw ✓ (1)  
USE:  
• Drywall screws are used to fix dry wall materials. ✓  
• Joining ceilings and battens to other members  
• Joining timber to each other  
**ANY ONE OF THE ABOVE USES** (1)
- 4.2      • Rawl bolt/Expansion anchor ✓  
• Sleeve anchor  
• Dina bolt  
**ANY ONE OF THE ABOVE** (1)
- 4.3      • Compression joint ✓  
• Capillary joint  
**ANY ONE OF THE ABOVE** (1)
- 4.4      • Screws have greater holding power than nails ✓  
• They can be fixed where vibration has to be avoided ✓  
• Screws can easily be removed  
• The appearance of screws is better in finishing than nails  
**ANY TWO OF THE ABOVE** (2)
- 4.5      4.5.1      38 or 38 mm ✓ (1)  
4.5.2      2 349 or 2 349 mm ✓ (1)  
4.5.3      5 ✓ (1)  
4.5.4      2 575 or 2 575 mm ✓ (1)  
4.5.5      5 150 or 5 150 mm ✓ (1)  
4.5.6      4 500 or 4 500 mm ✓ (1)  
4.5.7      10 300 or 10 300 mm ✓ (1)

4.6

A	B	C	D
			<u>Inside measurement of:</u>
			Long walls = 6 500 – 2/220 ✓
			= 6 060 mm ✓
			Short walls = 3 800 – 2/220 ✓
			= 3 360 mm ✓
			(4)
1/	6,06		<u>Inside floor area of the room is</u>
	<u>3,36</u> ✓	<u>20,36 m<sup>2</sup></u> ✓	(2)
			<u>Area of one ceiling board:</u>
1/	3,9		One board is 3 900 mm x 900 mm
	<u>0,9</u> ✓	<u>3,51 m<sup>2</sup></u> ✓	(3)
			<u>Length of skirting:</u>
			= 2(6 060 ✓ + 3 360 ✓) – 900 mm ✓
			= 17,94 m ✓
			<b>OR</b> 12 120 + 6 720 - 900
			=17,94 m
			<b>OR</b> 6 060 + 6 060 + 3 360 + 3 360 - 900
			=17,94 m
			(4)
			(13)

[30]

**QUESTION 5: APPLIED MECHANICS**

5.1

5.1.1

$$\begin{aligned}
 & \frac{(A_1 \times d) + (A_2 \times d)}{\text{Total area}} \\
 & \quad \checkmark \quad \checkmark \quad \checkmark \quad \checkmark \\
 & = \frac{(3\,200 \times 20) + (900 \times 60)}{4\,100} \checkmark \\
 & = \frac{64\,000 \text{ mm}^3 + 54\,000 \text{ mm}^3}{4\,100} \checkmark \\
 & = \frac{118\,000 \text{ mm}^3}{4\,100 \text{ mm}^2} \checkmark \\
 & = 28,78 \checkmark \text{ mm} \checkmark
 \end{aligned}$$

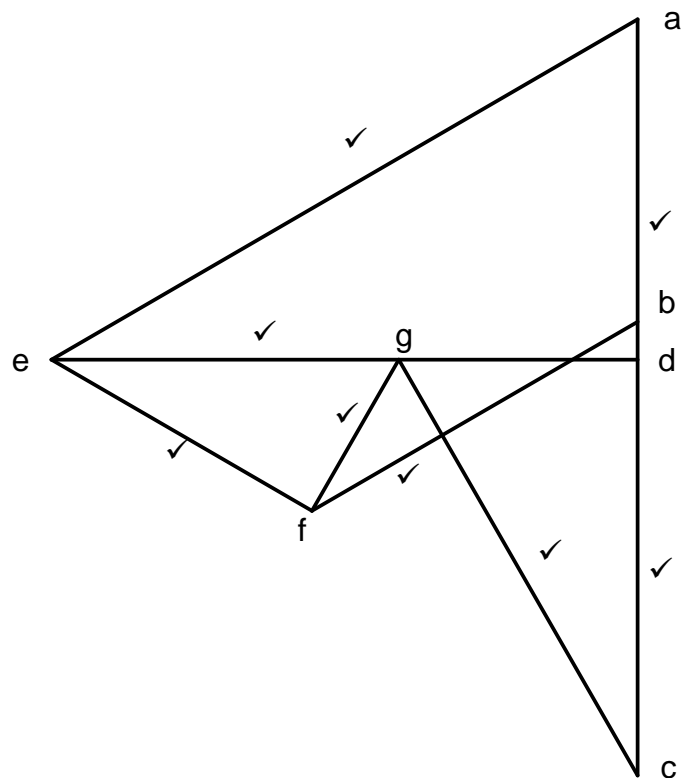
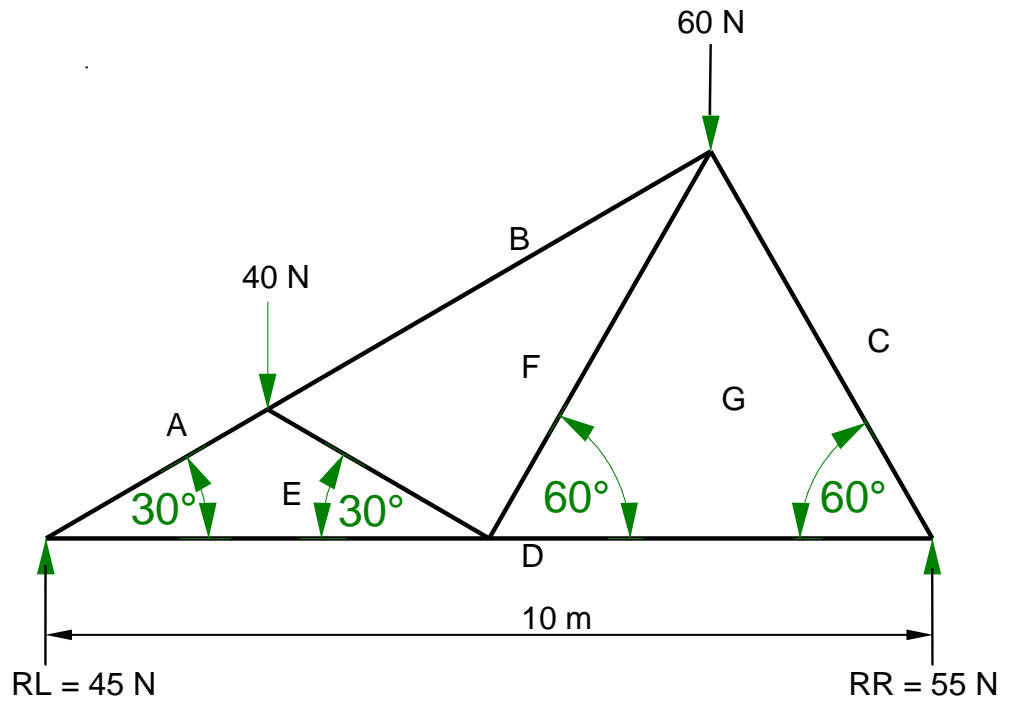
**OR**

Part	Area (A)	Y	AY
1	3 200 mm <sup>2</sup> ✓	20 mm ✓	3 200 x 20 = 64 000 mm <sup>3</sup> ✓
2	900 ✓ mm <sup>2</sup>	60 mm ✓	900 mm x 60 mm = 54 000 mm <sup>3</sup> ✓
Σ	4 100 mm <sup>2</sup> ✓		118 000 mm <sup>3</sup>

$$\begin{aligned}
 Y &= \frac{\sum Ay}{\sum A} \\
 &= \frac{118\,000 \text{ mm}^3}{4\,100 \text{ mm}^2} \checkmark \\
 &= 28,78 \checkmark \text{ mm} \checkmark
 \end{aligned}$$

(10)

## 5.2.1



(8)

## 5.2.2

MEMBER	NATURE	MAGNITUDE
FG	Tie ✓	23 N ✓
BF	Strut ✓	50 N ✓

(4)

Tolerance of 1 N to either side

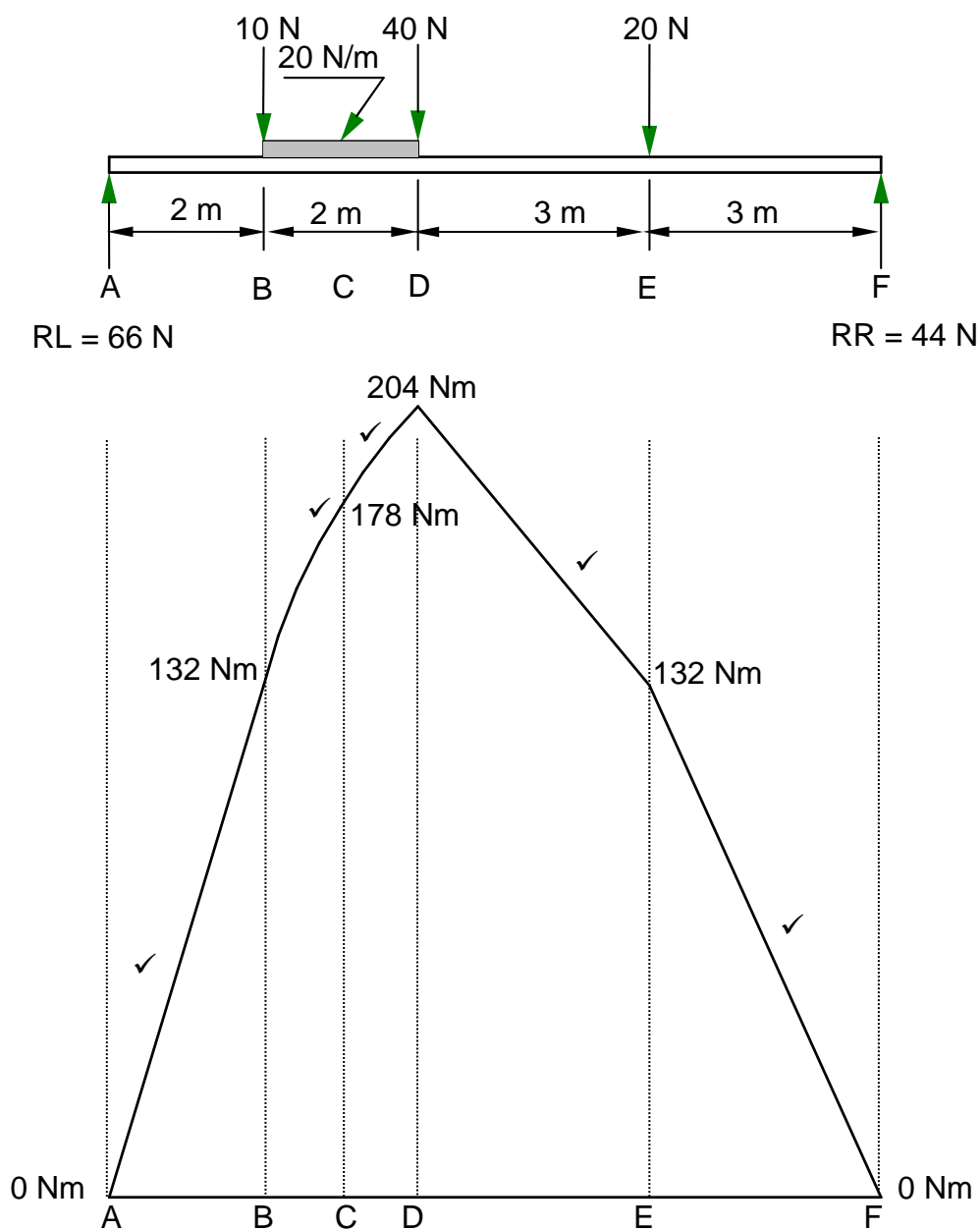
**NOT TO SCALE DUE TO ELECTRONIC TRANSFER  
USE A MASK TO MARK THIS QUESTION**

5.3 5.3.1 40 Nm ✓ (1)

5.3.2 7 m ✓ (1)

5.3.3 3 m ✓ (1)

5.3.4



SCALE 1 mm = 2 Nm

**NOT TO SCALE DUE TO ELECTRONIC TRANSFER**

**USE A MASK TO MARK THIS QUESTION**

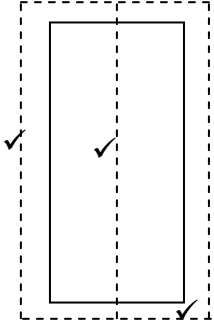
If the bending moment diagram is not to scale, deduct 1 mark.

Marks are allocated for each line between A to F.

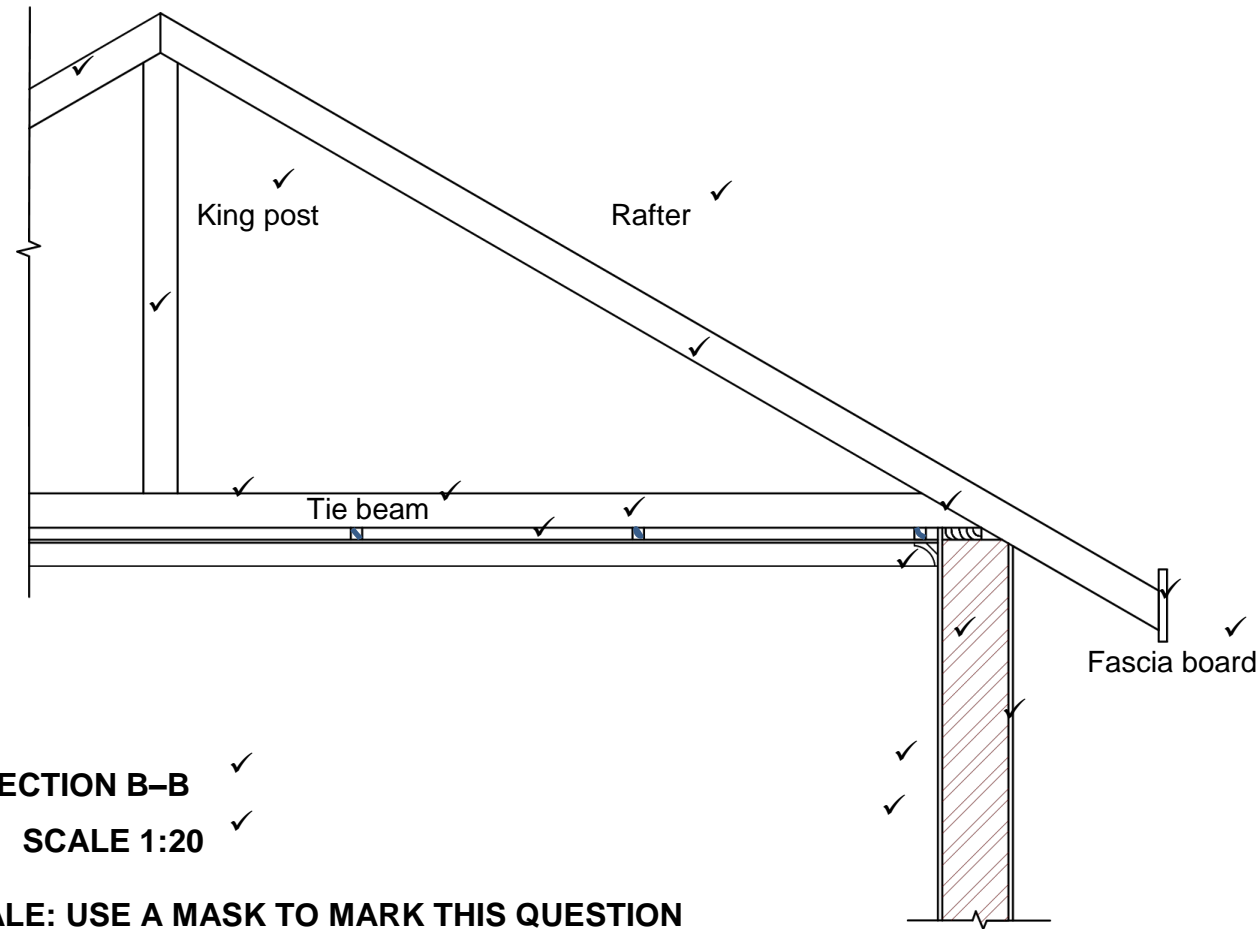
If the lines between B and D are straight lines no marks will be awarded for these lines.

[30]

**ANSWER SHEET 6.1**

NO.	QUESTIONS	ANSWERS	MARKS
1	Name the scale used for the West elevation.	1:100 ✓	1
2	Identify number 1.	Barge board ✓	1
3	Identify number 2.	Window/window pane/glass casement ✓	1
4	Identify number 3.	Door/door opening ✓	1
5	Identify number 4.	FFL/Finished floor level ✓	1
6	Identify number 5.	Step ✓	1
7	Identify number 6.	NGL/Natural ground level ✓	1
8	Identify number 7.	Window sill ✓	1
9	Name the material that can be used for the soffit board at a closed eave?	Fibre cement ✓	1
10	Recommend a suitable exterior finish for the wall.	Paint/plaster/face brick/cladding ✓	1
11	Deduce on which elevations will the gutters be placed in this house?	North elevation ✓ and South elevation ✓	2
12	Draw the roof lines for the roof of the building shown in FIGURE 6.1 in the column alongside.		3
		<b>TOTAL</b>	<b>15</b>

QUESTION 6: GRAPHICS AND COMMUNICATION  
ANSWER SHEET 6.2



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	
King post	1	
Branding	1	
Ceiling board	1	
Cornice	1	
Fascia board	1	
Print title and scale	2	
Any FOUR labels	4	
<b>Application of scale:</b> 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

Correctness of drawing ✓✓✓  
✓✓✓

All parts of the drawing must be correctly drawn to receive a mark.  
If the section is drawn the wrong way around deduct 1 mark.

[40]  
200