



# basic education

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

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**CIVIL TECHNOLOGY  
FEBRUARY/MARCH 2012  
MEMORANDUM**

**MARKS: 200**

**This memorandum consists of 17 pages.**

**QUESTION 1 LO 3 AS 1, 2, 4, 5, 7, 10**

1.1

	<b>TERMINOLOGY</b>		<b>DESCRIPTION</b>
1.1.1	Tripod	J ✓	stand on which dumpy level is mounted
1.1.2	Gradient	H ✓	angle or slope of fall for a sewerage system
1.1.3	Excavation	K ✓	removal of soil to form a trench
1.1.4	Green building	A ✓	environmentally friendly building built with environmentally friendly materials and systems
1.1.5	Pollution	I ✓	contamination of water, air or soil
1.1.6	Aluminium	B ✓	type of metal that will not rust
1.1.7	Perspex	L ✓	can be used in the place of glass
1.1.8	Gypsum board	E ✓	used as ceiling materials
1.1.9	Cement fibre	D ✓	roof sheeting is made of this material
1.1.10	Formwork	G	temporary support for concrete when the concrete is being cast

(10)

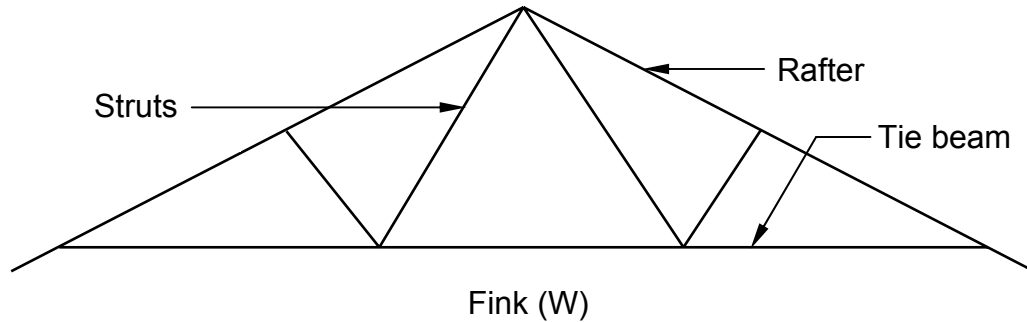
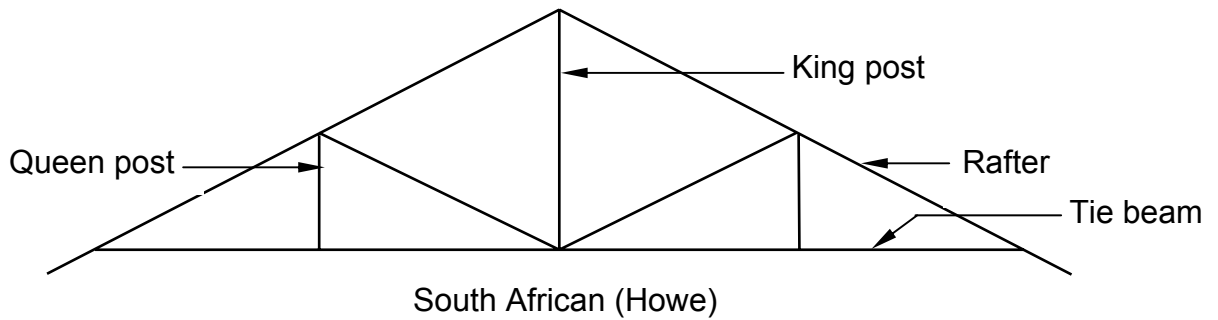
1.2

- Make a person lie in a comfortable position. ✓
- Ensure that the air passage is open. ✓
- Monitor pulse. ✓
- The legs may be lifted 30 centimetres and the clothes should be loosened. ✓
- Do not try to make the casualty sit or stand up.

(4)

**ANY FOUR OF THE ABOVE OR OTHER ACCEPTABLE ANSWERS**

1.3.1  
&  
1.3.2



Correctness of:	Marks
SA roof truss	2
Fink roof truss	2
Any two labels	2

(6)

- 1.4
- Type of roof covering. ✓
  - The size of the batten.

(1)

- 1.5
- Hard hat ✓      Worn inside and outside buildings that are under construction ✓
  - No smoking ✓      Placed where flammable and explosives are stored ✓
  - No pedestrians ✓      Placed where construction is taking place and a danger to pedestrians ✓  
Where walking is prohibited

(6)

**ANY OTHER ACCEPTABLE ANSWERS**

- 1.6
- Long steel bolts are placed into wet concrete. ✓
  - Allow concrete to dry. ✓
  - Weld base plate to column/Drill holes in base plate. ✓
  - At a later stage when the concrete is dry, the column fitted with a steel foot plate with holes is placed over the bolts.
  - The column is then bolted firmly onto the concrete base.

**ANY THREE OF THE ABOVE OR OTHER ACCEPTABLE ANSWERS**

(3)  
[30]

**QUESTION 2 LO 3 AS 3, 4, 5, 7**

- 2.1 2.1.1 A – steel helmet/cap. ✓  
B – preformed concrete pile. ✓  
C – steel driving plate. ✓ (3)

- 2.1.2
- Unstable or soft soil. ✓
  - On unstable soil or ground.
  - Where the soil is loose.
  - Non-cohesive soil.
  - Where there is soil movement.
  - Constantly wet areas. (1)

**ANY ONE OF THE ABOVE OR OTHER ACCEPTABLE ANSWERS**

- 2.2
- Bricks ✓
  - Tiles ✓
  - Corrugated iron
  - Concrete
  - Asbestos – Fibre cement
  - PVC
  - Metals (2)

**ANY TWO OF THE ABOVE OR OTHER ACCEPTABLE ANSWERS**

- 2.3 BM – Benchmark ✓ (1)  
BS – Back sight ✓ (1)

2.4

ASPECTS	IN SITU CONCRETE FLOOR SLABS	BLOCK AND BEAM FLOOR SLABS
Cost	Expensive ✓	Economical ✓
Duration	Takes long to install ✓	Quick to install ✓
Formwork	Formwork needs to be erected ✓	Formwork is not required ✓
Insulation	Poor insulation qualities	Good sound and thermal insulation
Labour	Skilled labour is required to erect	No skilled labour is required to install
Weight	Heavy	Lighter in weight

(6)

**ANY THREE FROM EACH CATEGORY OR OTHER ACCEPTABLE ANSWERS**

- 2.5
- Increase the ability of the concrete to carry heavier loads. ✓
  - The volume of concrete of a beam or column can now be reduced due to the extra strength of the steel. ✓
  - Increase the tensile strength of the concrete.
- ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS**
- (2)
- 2.6      2.6.1
- Plastic spacers. ✓
  - Steel stands. ✓
  - Concrete blocks.
- ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS**
- (2)
- 2.6.2
- To prevent steel from rusting. ✓
  - To protect the steel from excessive heat in case of fire.
  - To protect the steel from deterioration when used in certain situations such as sea water.
- ANY ONE OR ANY OTHER ACCEPTABLE ANSWERS**
- (1)
- 2.7      2.7.1      Independent scaffold. ✓
- (1)
- 2.7.2
- It prevents the vertical standards from sinking into the ground. ✓
  - It provides a level flat surface on which the scaffold is erected. ✓
- (2)
- 2.7.3
- Do not throw any tools or materials from a scaffold. ✓
  - Never jump off a scaffold. ✓
  - Never overload a scaffold.
  - Remove or cover sharp edges or corners.
  - Always attach free-standing scaffoldings to a building.
- ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS**
- (2)
- 2.7.4
- It prevents workers from falling off the scaffold. ✓
  - To prevent materials from falling off the scaffold. ✓
  - Used as a hand rail.
  - It used to strap on safety harnesses.
- ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS**
- (2)
- 2.7.5
- To keep the scaffold steady. ✓
  - To brace the scaffold. ✓
- OR ANY OTHER ACCEPTABLE ANSWERS**
- (2)
- 2.7.6
- To prevent materials from falling off the scaffold. ✓
  - To prevent tools from falling off the scaffold. ✓
- OR ANY OTHER ACCEPTABLE ANSWERS**
- (2)
- 2.8      REFER TO ANSWER SHEET 2.8
- (10)  
**[40]**

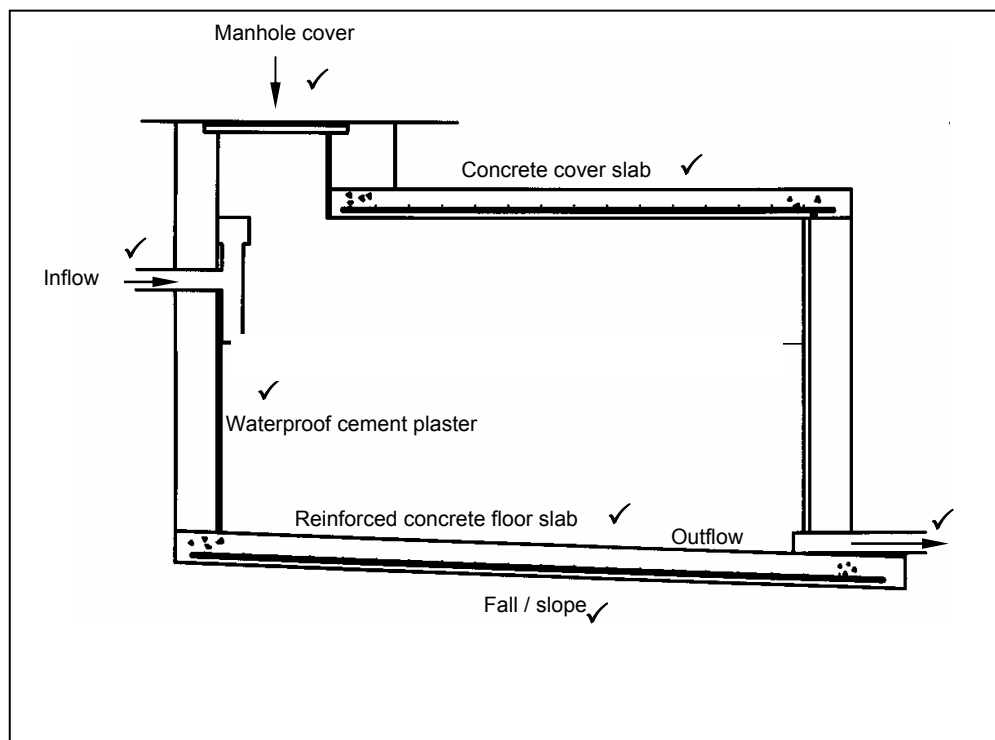
**QUESTION 3 LO 3 AS 5, 8**

- 3.1
- Pipes and gas bottles must be checked regularly. ✓
  - Gas leaks must be checked using soap and water not open flames. ✓
  - Close the shut-off valve when the system is not in use. ✓
  - Do not allow open flames near gas bottles. ✓
  - Ensure that the pilot flame trigger is in good working order.
  - Refill gas bottles when empty, not when half full.
  - Check and clean chimneys regularly. (Method: Test by warming the chimney with a blowlamp for five minutes. Light a smoke tablet and hold it at the bottom end of the chimney to see if it draws properly).

**ANY FOUR OF THE ABOVE**

(4)

3.2



**FIGURE 3.2**

**NOTE: Other sketches showing the basic principles as indicated above will also be correct.**

<b>CORRECTNESS OF DRAWING</b>	<b>MARK</b>
Manhole cover	1
Concrete cover slab	1
Inflow	1
Waterproof cement plaster	1
Reinforced concrete floor slab	1
Outflow	1
Fall/Slope/Gradient	1
<b>TOTAL FOR DRAWING</b>	<b>7</b>
1 mark for each of the above labels	7
<b>GRAND TOTAL</b>	<b>14</b>

- 3.3 3.3.1 Sun ✓ (1)
- 3.3.2 Reduce/cut ✓ (1)
- 3.3.3 Hydro energy ✓ (1)
- 3.3.4 Waste products ✓ (1)

**OR ANY OTHER ACCEPTABLE ANSWERS**

3.4

<b>ADVANTAGES</b>	<b>DISADVANTAGES</b>
Solar energy is reliable ✓	The initial investment cost, although falling, is still very high ✓
Involves no moving parts ✓	Very large areas of solar panels are required to produce useful amounts of electricity ✓
Maintenance cost is very low	Generates only DC (direct current)
Solar energy operation is silent	Work only when sunlight is available

(4)

**ANY TWO IN EACH CATEGORY**

- 3.5 3.5.1 A Compression joint ✓  
B Capillary joint ✓ (2)
- 3.5.2 **COMPRESSION JOINT**  
Quicker to assemble ✓  
Can be easily dismantled
- CAPILLARY JOINT**  
Cheaper ✓  
Lighter than compression fittings (2)

**OR ANY OTHER ACCEPTABLE ANSWERS****[30]**

**QUESTION 4 LO 3 AS 2, 3, 7, 8**

4.1

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	
4.1.1	1/	9,11		Area of building	
		<u>6,11</u> ✓	<u>55,66 m<sup>2</sup></u> ✓		(2)
4.1.2				Inside length of long walls = 9,110 – 0,440 = 8,67 m ✓	
	2/	<u>8,67</u>	17,34 m	Length of skirting of long wall = 17,340 – 0,900 = 16,44 m✓	
				Inside length of short walls = 6,110 – 0,440 = 5,67 m ✓	
	2/	<u>5,67</u>	11,34 m✓	Total length of skirting for short walls	
				Total length of skirting required  16,44 <u>11,34</u> = 16,44 + 11,34 = 27,78 m✓	
			27,78 m	Therefore 27, 8 m of skirting is required.	(5)
4.1.3	1/	8,67 5,67 <u>0,075</u> ✓	3,69 m <sup>3</sup> ✓	Volume of concrete for floor slab  Therefore 3,69 m <sup>3</sup> of concrete is needed for the floor slab	(2)
4.1.4	1/	3,69 <u>R575,00</u> ✓	✓ R2 121,75	Cost of concrete slab Therefore the cost of concrete is R2 121,75	(2)

**OR**



- 4.1.1 Area of building =  $9,11 \text{ m} \times 6,11 \text{ m} \checkmark$   
=  $55,66 \text{ m}^2 \checkmark$  (2)
- 4.1.2 Inside measurements – long walls =  $9\ 110 \text{ mm} - 440 \text{ mm}$   
=  $8\ 670 \text{ mm} \checkmark$   
Length of skirting – long walls =  $2(8\ 670 \text{ mm}) - 900 \text{ mm}$   
=  $17\ 340 \text{ mm} - 900 \text{ mm}$   
=  $16\ 440 \text{ mm} \checkmark$
- Inside measurements – short walls =  $6\ 110 \text{ mm} - 440 \text{ mm}$   
=  $5\ 670 \text{ mm} \checkmark$   
Length of skirting – short walls =  $5\ 670 \text{ mm} \times 2$   
=  $11\ 340 \text{ mm} \checkmark$
- Total length of skirting =  $16\ 440 \text{ mm} + 11\ 340 \text{ mm}$   
=  $27\ 780 \text{ mm} \checkmark$  (5)
- 4.1.3 Volume of concrete for floor slab = length x breadth x depth  
=  $8,67 \text{ m} \times 5,67 \text{ m} \times 0,075 \text{ m} \checkmark$   
=  $3,69 \text{ m}^3 \checkmark$  (2)
- 4.1.4 Cost of concrete slab =  $3,69 \text{ m}^3 \times \text{R}575,00 \checkmark$   
=  $\text{R}2\ 121,75 \checkmark$  (2)
- 4.2 4.2.1 False  $\checkmark$  (1)
- 4.2.2 True  $\checkmark$  (1)
- 4.2.3 False  $\checkmark$  (1)
- 4.2.4 False  $\checkmark$  (1)
- 4.2.5 False  $\checkmark$  (1)
- 4.2.6 True  $\checkmark$  (1)
- 4.2.7 True  $\checkmark$  (1)
- 4.3 4.3.1
- Particle board (chipboard)  $\checkmark$
  - Compressed fibre board (supawood)  $\checkmark$
  - Plywood
  - Laminated board/melamine chip board
- ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS** (2)

4.3.2	<b>BOARD PRODUCTS</b> Available in large sheets ✓ More stable than solid timber	<b>SOLID TIMBER</b> Available in narrow widths ✓ Twists and warps if not seasoned properly
-------	---	---

**OR ANY OTHER ACCEPTABLE ANSWERS** (2)

- 4.3.3
- The wood must be thoroughly sanded and dusted. ✓
  - Fill open grain and holes using wood filler that suits the wood. ✓
  - Seal the surface with sanding sealer. ✓
  - Rub down with fine sandpaper and dust off. ✓
  - Apply varnish with a soft brush or spray gun.
  - Let dry and sand with fine sandpaper- smooth the wood, but don't remove the varnish.
  - Apply the next coat of varnish – several coats may be applied, which must be sanded between coats. (4)

**ANY FOUR OF THE ABOVE**

- 4.4 4.4.1
- The mould must first be cleaned. ✓
  - Apply with mould oil or release oil on the inside. ✓ (2)

- 4.4.2
- The concrete should be placed in the mould in layers of 50 mm each. ✓
  - Each layer should be tamped at least 45 times with a rounded tamping rod to get rid of all the air bubbles. ✓
  - The last layer should be filled higher than the top of the mould and then struck off with a steel float. (2)

**ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS** [30]

**QUESTION 5 LO 3 AS 5, 6**

5.1 5.1.1 Distance of centroid of rectangle from A-A = 115 mm ✓ (1)

5.1.2 Distance of centroid of right angle triangle from A-A = 60 mm ✓ (1)

$$\begin{aligned}
 5.1.3 \text{ Position of centroid} &= \frac{(A_1 \times d) + (A_2 \times d)}{\text{Total Area}} \\
 &= \frac{(5\,000 \times 115) + (1\,350 \times 60)}{6\,350} \\
 &= \frac{575\,000 + 81\,000}{6\,350} \\
 &= \frac{656\,000 \text{ mm}^3}{6\,350 \text{ mm}^2} \\
 &= 103,31 \text{ mm}
 \end{aligned}$$

**OR**

Take moments about B left side

$$\begin{aligned}
 6\,350 \text{ mm}^2 \times X &= (5\,000 \times 115) + (1\,350 \times 60) \\
 &= 575\,000 + 81\,000 \\
 &= \frac{656\,000 \text{ mm}^3}{6\,350 \text{ mm}^2} \\
 &= 103,31 \text{ mm}
 \end{aligned}$$

**OR**

	AREA (A)	X	Area of Y (Ay)
Rectangle	5 000 ✓	$\frac{L}{2} = \frac{50}{2} = 25 + 90 = 115$ ✓	575 000 mm <sup>2</sup>
Triangle	+ 1 350 ✓	$\frac{b}{3} = \frac{90}{3} = 30$ From right angle 90 – 30 = 60 ✓ From A – A	+ 81 000 mm <sup>2</sup>
Σ	6 350 ✓		656 000 mm <sup>3</sup>

$$\begin{aligned}
 &\frac{\Sigma Ax}{\Sigma A} \\
 &= \frac{656\,000 \text{ mm}^3}{6\,350 \text{ mm}^2} \\
 &= 103,31 \text{ mm}
 \end{aligned}$$

(8)

- 5.2      5.2.1      REFER TO ANSWER SHEET 5.2      (9)
- 5.2.2      REFER TO ANSWER SHEET 5.2      (1)
- 5.2.3      REFER TO ANSWER SHEET 5.2      (4)

5.3      Take moments around RL

$$5 \text{ RR} = (3 \text{ kN} \times 0 \text{ m}) + (4 \text{ kN} \times 1 \text{ m}) + (5 \text{ kN} \times 3 \text{ m}) + (4 \text{ kN} \times 4 \text{ m}) \checkmark$$

$$= 0 \text{ kNm} + 4 \text{ kNm} + 15 \text{ kNm} + 16 \text{ kNm} \checkmark$$

$$\text{RR} = \frac{35 \text{ kNm}}{5 \text{ m}} \checkmark$$

$$\text{RR} = 7 \text{ kN} \checkmark \checkmark$$

(6)  
**[30]**

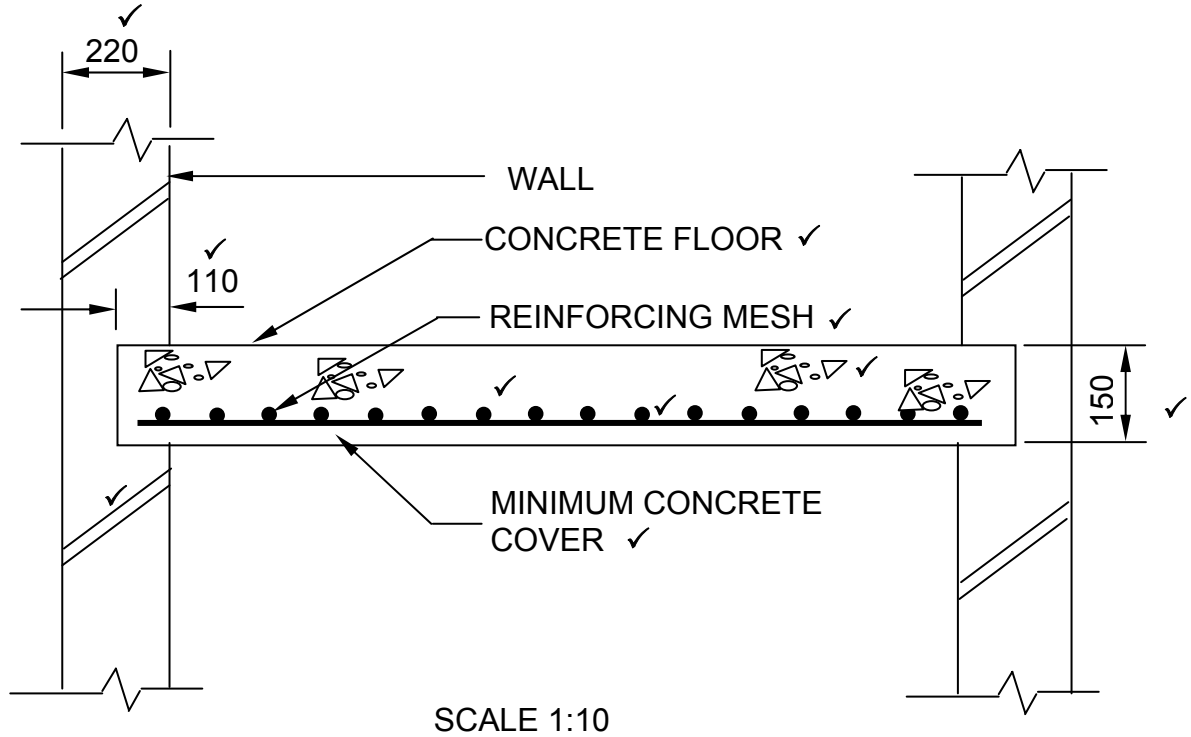
**QUESTION 6   LO 6   AS 4, 5, 7, 8**

6.1      REFER TO ANSWER SHEET 6.1      (15)

6.2      REFER TO ANSWER SHEET 6.2      (25)  
**[40]**

**QUESTION 2.8**

**ANSWER SHEET 2.8**

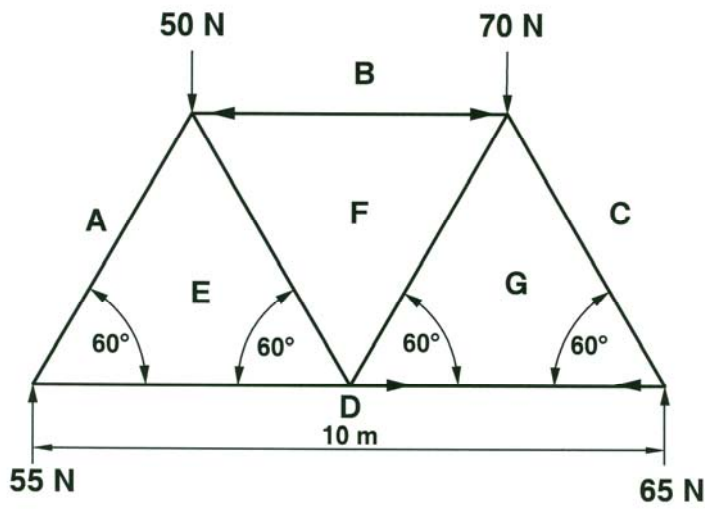


DESCRIPTION	MARKS
Wall thickness measurement	1
Wall penetration measurement	1
Wall drawn and labelled	1
Concrete floor drawn and labelled	1
Reinforcing mesh drawn and labelled	2
Minimum concrete cover shown and labelled	1
Floor thickness measurement	1
Concrete symbol	1
Scale (Accuracy of drawing)	1
<b>Total</b>	<b>10</b>

(10)

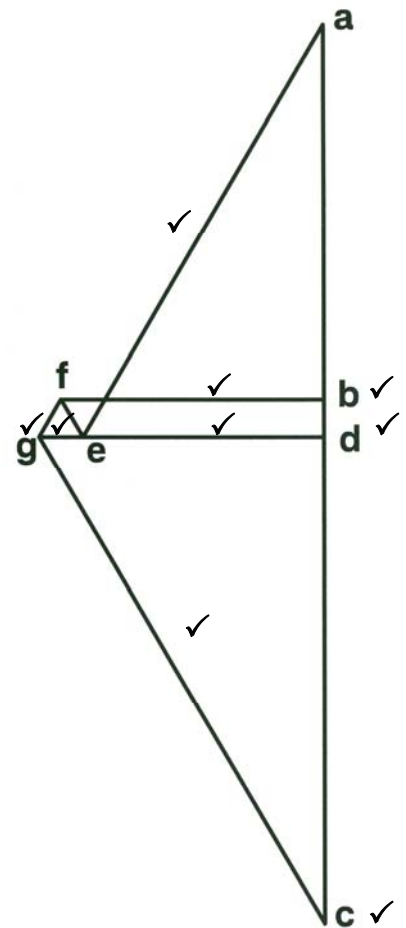
**QUESTION 5.2**

**ANSWER SHEET 5.2**



Space diagram

(1)



Force diagram  
Scale 1 mm = 1N

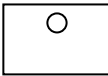
(9)

(4)

MEMBER	NATURE	MAGNITUDE
BF	Strut ✓	34,6 N
CG	Strut	75 N ✓
DG	Tie ✓	37,5 N
DE	Tie	31,7 N ✓

Allow a tolerance of 1 N on either side.

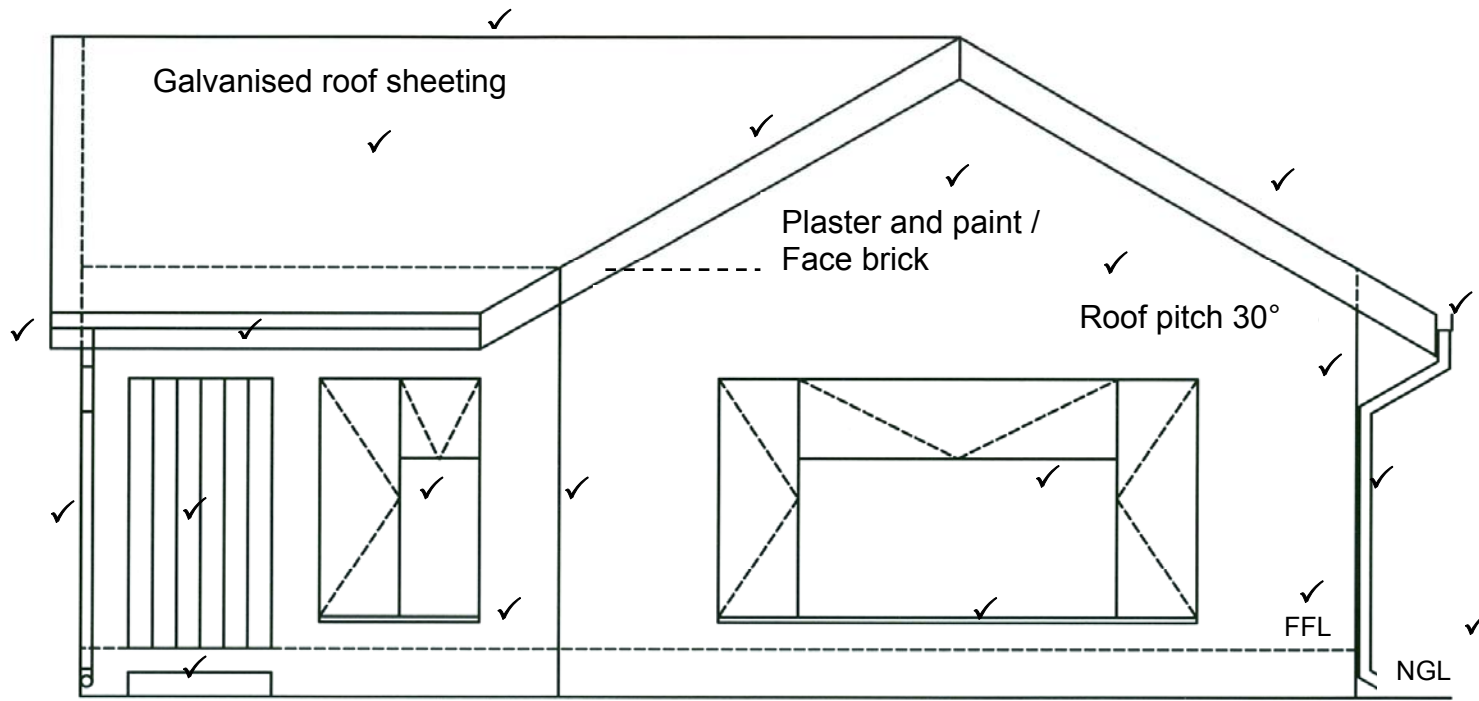
**QUESTION 6.1****ANSWER SHEET 6.1**

<b>No.</b>	<b>QUESTIONS</b>	<b>ANSWERS</b>	<b>MARKS</b>
1	What is the scale of the drawing?	1 : 100	1
2	Identify number 1.	Ridge capping	1
3	Identify number 2.	Roof sheeting	1
4	Identify number 3.	Purlin	1
5	Identify number 4.	King post	1
6	Identify number 5.	Beam filling	1
7	What colour is used to indicate new brickwork on a drawing?	Red	1
8	Identify number 6.	Gutter	1
9	Identify number 7.	Window	1
10	Identify number 8.	Window sill	1
11	Identify number 9.	Screed/Topping	1
12	Identify number 10.	Rainwater downpipe	1
13	Identify number 11.	Strip foundation	1
14	Identify number 12.	Natural ground level	1
15	Draw freehand the symbol for a wash hand basin.		1

(15)

**QUESTION 6.2**

**ANSWER SHEET 6.2**



**SOUTH ELEVATION**  
**SCALE 1 : 100**

Accuracy and neatness ✓

(25)



<b>CORRECTNESS AND ACCURACY OF:</b>	
Roof construction	3
Fascia boards	1
Gutters	2
Down pipe	2
Windows	2
Door	1
Step	1
Wall	2
Window sills	2
<b>TOTAL</b>	<b>16</b>
<b>LABELS</b>	
Finished floor level	1
Natural ground level	1
Wall finishing	1
Roof pitch	1
Roof covering	1
Scale (print)	1
South elevation (print)	1
<b>Total</b>	<b>7</b>
Accuracy/Neatness	2
<b>TOTAL</b>	<b>25</b>

Use a mask to mark this drawing.

**Deduct 3 marks if wrong section was drawn.**

**[40]**