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

	TERMINOLOGY		DESCRIPTION
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)

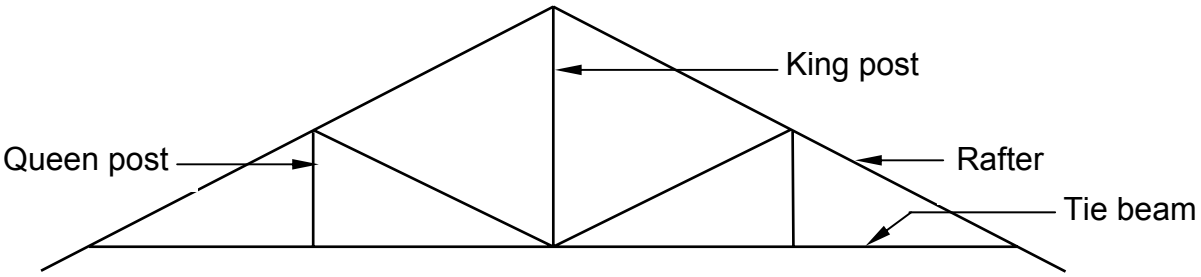
1.2

- 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.

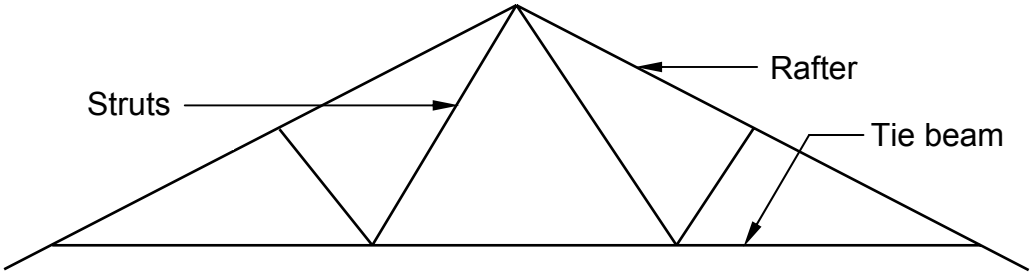
(4)

ANY FOUR OF THE ABOVE OR OTHER ACCEPTABLE ANSWERS

1.3.1
&
1.3.2



South African (Howe)



Fink (W)

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

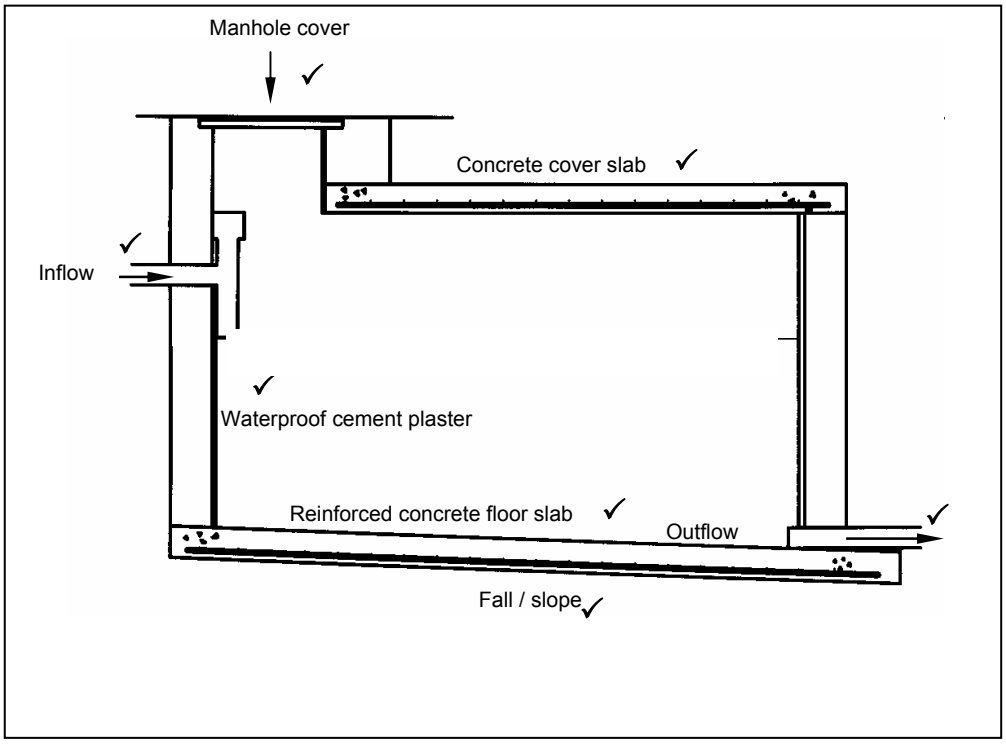


FIGURE 3.2

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

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

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

ADVANTAGES	DISADVANTAGES
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	**CAPILLARY JOINT**
Quicker to assemble✓	Cheaper ✓
Can be easily dismantled	Lighter than compression fittings

(2)

OR ANY OTHER ACCEPTABLE ANSWERS

[30]

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

4.1

	A	B	C	D	
4.1.1	1/	9,11		Area of building	
		6,11✓	55,66 m² ✓		(2)
4.1.2					
				Inside length of long walls	
				= 9,110 – 0,440	
				= 8,67 m ✓	
	2/	8,67	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/	5,67	11,34 m✓	Total length of skirting for short walls	
				Total length of skirting required	
			16,44	= 16,44 + 11,34	
			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 0,075✓	3,69 m³ ✓	Volume of concrete for floor slab Therefore 3,69 m³ of concrete is needed for the floor slab	(2)
4.1.4	1/	3,69 R575,00✓	✓ 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 m x 6,11 m ✓
= 55,66 m² ✓ (2)

4.1.2 Inside measurements – long walls = 9 110 mm – 440mm
= 8 670 mm ✓
Length of skirting – long walls = 2(8 670 mm) – 900 mm
= 17 340 mm – 900 mm
= 16 440 mm ✓

Inside measurements – short walls = 6 110 mm – 440 mm
= 5 670 mm ✓
Length of skirting – short walls = 5 670 mm x 2
= 11 340 mm ✓

Total length of skirting = 16 440 mm + 11 340 mm
= 27 780 mm ✓ (5)

4.1.3 Volume of concrete for floor slab = length x breadth x depth
= 8, 67 m x 5,67 m x 0,075 mm ✓
= 3,69 m^3 ✓ (2)

4.1.4 Cost of concrete slab = 3,69 m³ x R575,00 ✓
= R2 121,75✓ (2)

4.2 4.2.1 False ✓ (1)

4.2.2 True ✓ (1)

4.2.3 False ✓ (1)

4.2.4 False ✓ (1)

4.2.5 False ✓ (1)

4.2.6 True ✓ (1)

4.2.7 True ✓ (1)

4.3 4.3.1
- Particle board (chipboard) ✓
- Compressed fibre board (supawood) ✓
- Plywood
- Laminated board/melamine chip board

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS

4.3.2

BOARD PRODUCTS	**SOLID TIMBER**
Available in large sheets ✓	Available in narrow widths ✓
More stable than solid timber	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)

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

✓ ✓ ✓ ✓

$= \frac{(5\,000 \times 115) + (1\,350 \times 60)}{6\,350}$ ✓

$= \frac{575\,000 + 81\,000}{6\,350}$

$= \frac{656\,000 \text{ mm}^3}{6\,350 \text{ mm}^2}$ ✓

= 103,31 mm ✓✓

OR

Take moments about B left side

✓ ✓ ✓ ✓ ✓

6 350 mm² x X = (5 000 x 115) + (1 350 x 60)

= 575 000 + 81 000

$= \frac{656\,000 \text{ mm}^3}{6\,350 \text{ mm}^2}$ ✓

= 103,31 mm ✓✓

OR

	AREA (A)	X	Area of Y (Ay)
Rectangle	5 000 ✓	$\frac{L}{2} = \frac{50}{2} = 25 + 90 = 115$ ✓	575 000 mm²
Triangle	+ 1 350 ✓	$\frac{b}{3} = \frac{90}{3} = 30$ From right angle 90 – 30 = 60 ✓ From A – A	+ 81 000 mm²
Σ	6 350✓		656 000 mm³

$\frac{\Sigma Ax}{\Sigma A}$

$= \frac{656\,000 \text{ mm}^3}{6\,350 \text{ mm}^2}$ ✓

= 103,31 mm ✓✓ (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 RR = (3 kN x 0 m) + (4 kN x 1 m) + (5 kN x 3 m) + (4 kN x 4 m) ✓

= 0 kNm + 4 kNm + 15 kNm +16 kNm ✓

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

RR = 7 kN ✓✓ (6)
[30]

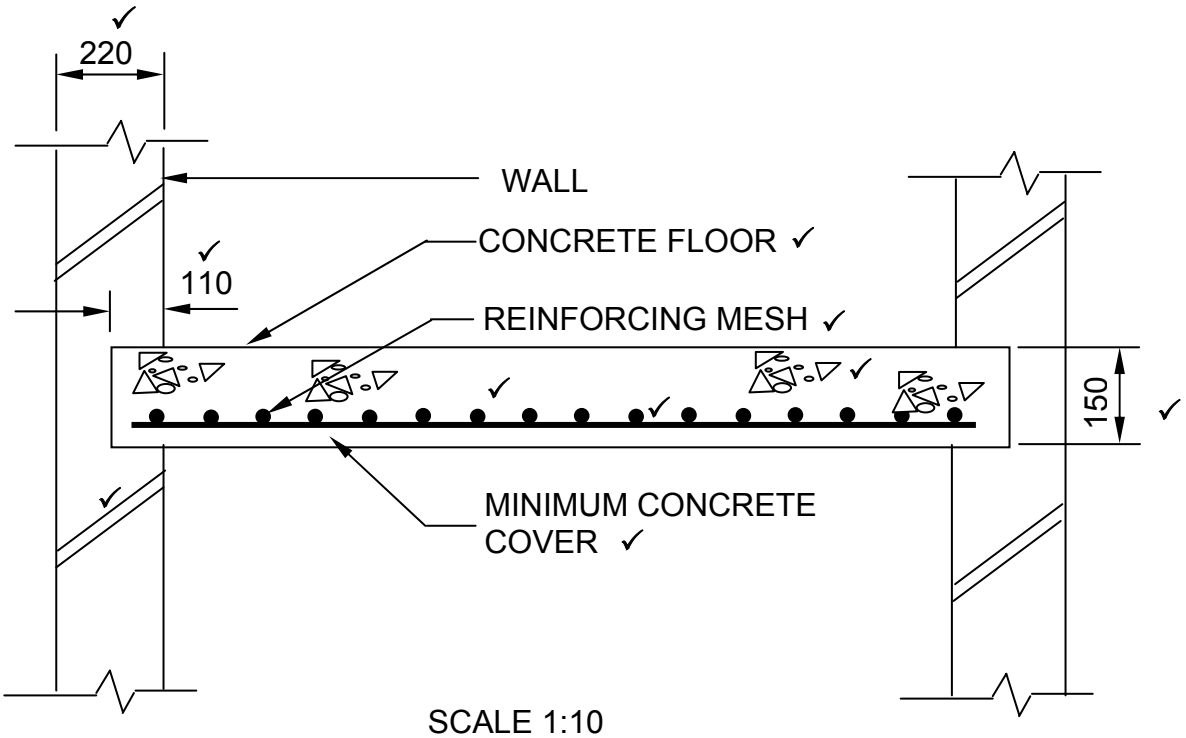
QUESTION 6 LO 6 AS 4, 5, 7, 8

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



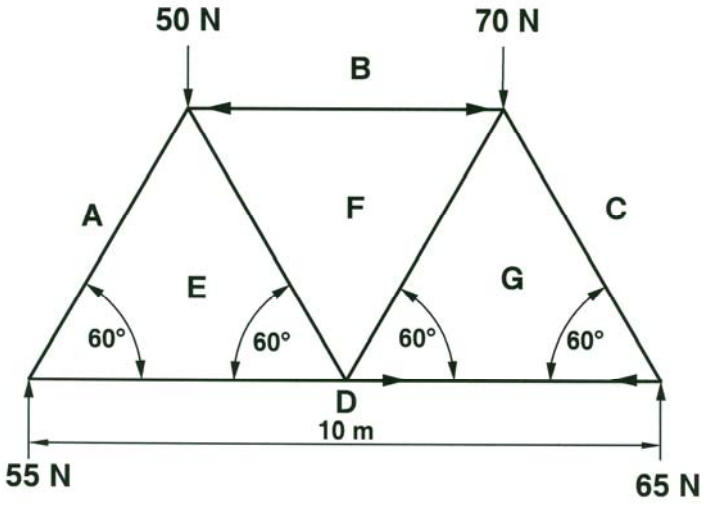
SCALE 1:10

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
Total	**10**

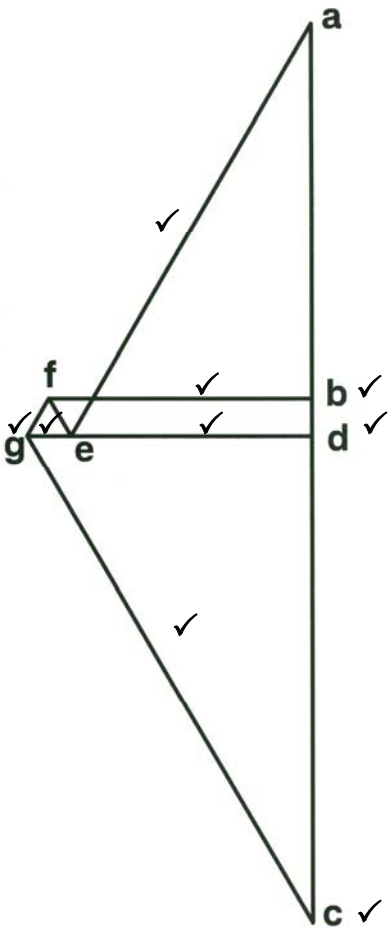
(10)

QUESTION 5.2

ANSWER SHEET 5.2



Space diagram (1)



Force diagram (9)
Scale 1 mm = 1N

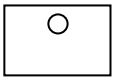
(4)

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

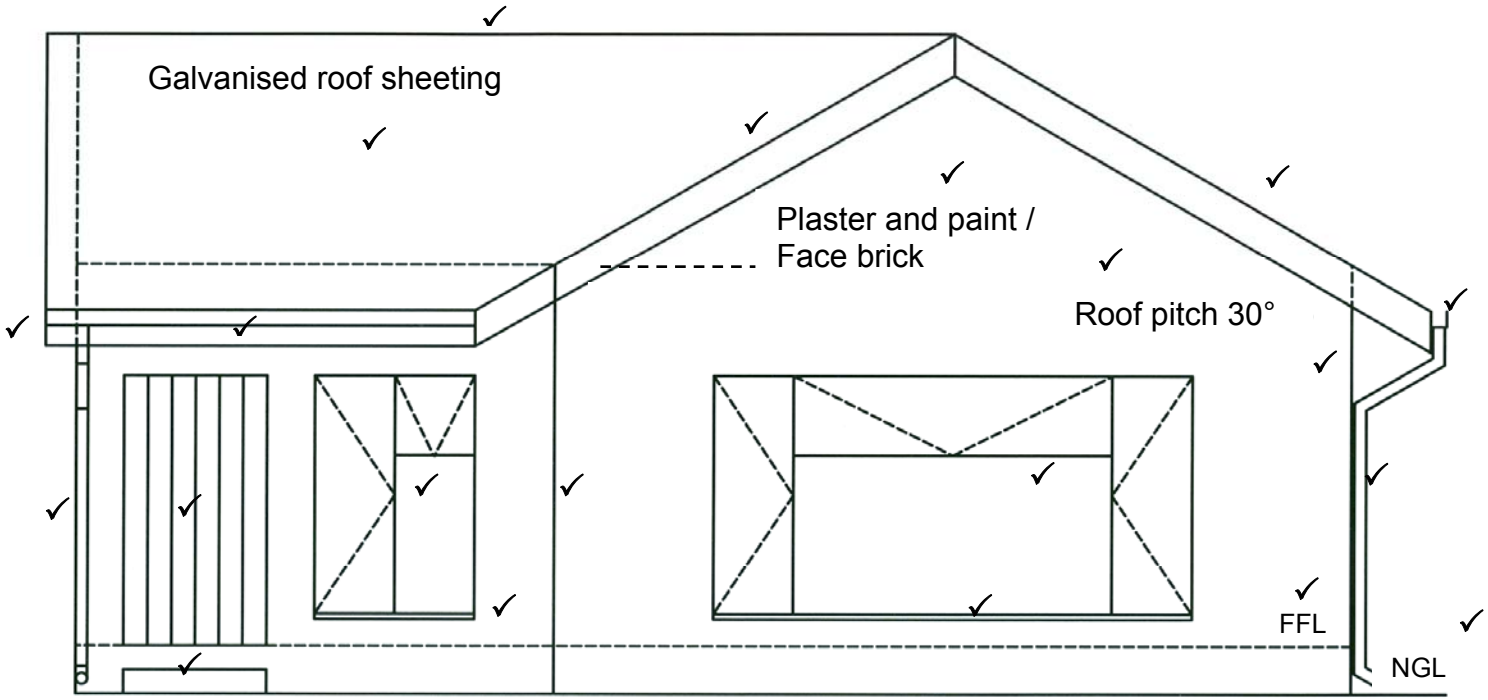
ANSWER SHEET 6.1

No.	QUESTIONS	ANSWERS	MARKS
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)

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

Use a mask to mark this drawing.

Deduct 3 marks if wrong section was drawn.

[40]