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Basic Education
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NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY

FEBRUARY/MARCH 2016

MEMORANDUM

MARKS: 200

This memorandum consists of 16 pages.

QUESTION 1: CONSTRUCTION, SAFETY AND MATERIAL

- 1.1 1.1.1 • The person is using a table and chairs to reach the required height. ✓
• The person is not using the appropriate safety equipment. (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 1.1.2 The person can use a ladder or scaffolding to reach the required height. ✓ (1)

- 1.2 1.2.1 • When using a grinder the sparks can burn your face. ✓
• When using a grinder the sparks can damage your eyes.
• When painting the paint can splash in your eyes.
• When cutting or chiselling wood the wood splinters can get into your face. (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 1.2.2 • When working with cement you will inhale the dust and it can cause lung problems. ✓
• When sawing/sanding wood you will inhale the dust. (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 1.2.3 • You can get an injury when heavy objects fall on your feet. ✓
• You can get an injury when stepping onto nails, screws or any other sharp object.
• You won't have the insulation protection when coming in contact with electricity. (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 1.3 • Ensure that workers maintain a safe distance from material that is moving overhead ✓
• Seek help to move material that is too heavy to handle alone. ✓
• Ensure that there are enough workmen to carry heavy loads. ✓
• The material must be secured firmly.
• When material is being moved by a hoist a qualified person must operate the hoist. (3)

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.4

Quarter round/
Quadrant ✓

Skirting ✓

(2)

1.5

1.5.1

Channel-iron ✓

(1)

1.5.2

- The steel profile is grey ✓
- Prone to rust
- A good conductor of heat
- Malleable
- Doesn't bend easily
- Welds well
- Can easily be joined

(1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.6

- Stone is used to add bulk to the concrete. ✓
- Stone makes the mix more economical. ✓
- Using stone in concrete reduces the paste content and therefore makes the concrete more stable. ✓
- The quantity of stone also determines the strength of the concrete.
- Stone also reduces shrinkage and deformations.

(3)

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.7

- Beneath concrete floors. ✓
- Under window sills. ✓
- At roofs/under roof covering. ✓
- Under the wall of the super structure.

(3)

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.8

Damp proof course is used to prevent damp/moisture to enter a building. ✓

(1)

1.9

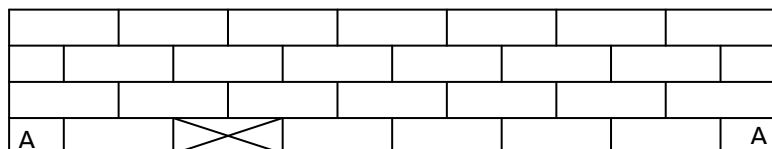
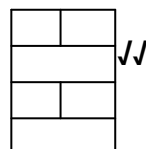
1.9.1

Stretcher bond

(1)

1.9.2

END VIEW



(2)

1.9.3

ASSESSMENT CRITERIA		MARK	CANDIDATE'S MARK
Stretcher course of main wall		2	
Stretcher course of T-junction		2	

(4)

- 1.10
- Clay/Slate tiles ✓
 - Galvanised corrugated iron sheets ✓
 - Galvanised IBR roof sheeting
 - Thatch roof
 - Cement fibre sheet

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 1.11
- Timber frames need regular maintenance. ✓
 - Timber is expensive since imported hardwood is scarce. ✓
 - Timber cannot be effectively burglar-proofed.
 - Timber is prone to attacks by insects and fungi.
 - Timber is not fire resistant.

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**[30]**

QUESTION 2: ADVANCED CONSTRUCTION AND EQUIPMENT

2.1 2.1.1 Portable electric planer ✓ (1)

2.1.2 This machine is mainly used to plane:
 • edges. ✓
 • ends. ✓
 • bevels.
 • rebates.
 • chamfers. (2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

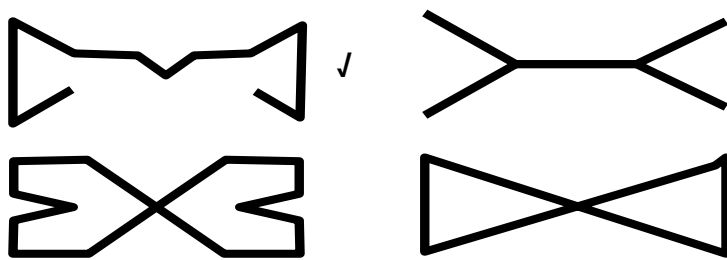
2.1.3 • It can remove more than 2 mm of wood at once. ✓
 • It planes more accurately.
 • It planes much faster than a hand plane. (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

2.1.4 By using a generator on site this machine can still be used. ✓ (1)

2.2 2.2.1 • Measuring of heights ✓
 • Measuring of distances ✓
 • Measuring of angles (2)

2.2.2 • The telescopic level/dumpy level ✓
 • The tripod ✓
 • Telescopic staff ✓ (3)

2.3  (1)

ANY ONE OF THE ABOVE

2.4 When you build cavity walls. ✓ (1)

2.5 2.5.1 Pre-stressed concrete ribs/Concrete ribs/Ribs. ✓ (1)

2.5.2 • Ribbed bar ✓
 • Twisted rib bar
 • Square twisted bar
 • Round bar (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 2.5.3
- It acts as additional reinforcement. ✓
 - The steel mesh can be tied to the triangular reinforcing of the rib with binding wire.
 - Ensure effective binding between concrete and rib.
- (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 2.5.4 At rib and block floors. ✓ (1)

- 2.5.5
- Spraying with water
 - A patent sealer can be used
 - Concrete can be covered with wet sand
 - Concrete can be covered with hessian
 - Concrete can be covered with canvas
 - Concrete can be covered with other protective covering
- (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 2.5.6
- Flathead prop ✓
 - Drop head prop
 - Multi prop
 - Prop
- (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 2.6
- Shutter boards should be cleaned after use. ✓
 - All rests/residue of concrete should be removed. ✓
 - All holes should be plugged.
 - Release agents or emulsion oil should be applied to the shutter boards.
- (2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 2.7
- Shuttering (formwork) should be strong enough to carry the load of the wet concrete. ✓
 - It should be able to bear the mass of people and equipment working on it. ✓
 - Formwork material should be made of a material, which can easily be repaired in situ. ✓
 - It should be constructed in such a manner that it can be easily removed and erected.
 - It must be assembled accurately.
 - It must be sealed off to prevent unnecessary loss of concrete, which may lead to honeycombing.
 - It must be clean from dirt such as sawdust and excessive release agent.
- (3)

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 2.8 2.8.1 A – Shear bar ✓
 B – Stirrup/binders ✓
 C – Anchor bar ✓
 D – Main bar ✓ (4)
- 2.8.2 Spacers cover depth blocks/cover depth stand, are used to keep the bars away from shuttering boards (formwork). ✓ (1)
- 2.9 • Soleplates are used to create a level surface onto which the scaffold can be erected. ✓
 • It is used to prevent the scaffolding from sinking into the ground.
 • It spreads the load of the scaffold, materials and workmen evenly onto the ground. (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 2.10 2.10.1 The weep-hole must be inserted above the horizontal damp-proof course of the external part of the wall. ✓ (1)
- 2.10.2 Allow water penetrating the outside wall to drain out of the building. ✓ (1)
- 2.10.3 • The cavity ensures that no water will penetrate the inner wall. ✓
 • The cavity provides insulation against heat. ✓
 • The cavity provides insulation against cold.
 • The cavity provides insulation against sound. (2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 2.10.4 Weak concrete mixture ✓ (1)
- 2.10.5 $110 + 50 + 110 \checkmark = 270 \checkmark$ (2)
- 2.11 Waterproof gypsum board/fibre cement board/marine plywood ✓ (1)
- 2.12 Normal/Strip foundations are used. ✓ (1)
- 2.13 Centre ✓ (1)
- 2.14 Intrados ✓ (1)

[40]

QUESTION 3: CIVIL SERVICES

- 3.1 3.1.1 B ✓ (1)
- 3.1.2 E ✓ (1)
- 3.1.3 D ✓ (1)
- 3.1.4 C ✓ (1)
- 3.1.5 A ✓ (1)
- 3.2
 - PVC pipe ✓
 - Copper pipe ✓
 - Galvanized pipe ✓ (3)
- 3.3 3.3.1 It is to provide water to the tap. ✓ (1)
- 3.3.2 Cap **B** is removable to provide access to the inside of the pipe. ✓ (1)
- 3.3.3 Waste water pipe/PVC pipe/Galvanised pipe ✓ (1)
- 3.3.4 40 mm/50 mm ✓ (1)
- 3.3.5 It is used to anchor the pipe to the wall. ✓ (1)
- 3.3.6 It is used to guide the wastewater directly into the gully. ✓ (1)
- 3.3.7 100 mm interior/110 mm exterior ✓ (1)
- 3.3.8
 - The purpose is to form a water seal/water trap/water lock. ✓
 - To prevent bad odours and gasses from the sewer entering back into the building. (1)
- ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**
- 3.3.9 P – trap ✓ (1)
- 3.4 3.4.1 Wash tub ✓ (1)
- 3.4.2 Sewer line/drain pipes ✓ (1)
- 3.4.3 Safety valve ✓ (1)
- 3.4.4 Storm water drain pipes ✓ (1)
- 3.5
 - It contains chemicals that are poisonous to the bacteria in the tank. ✓
 - The tank will fill up quickly and block the system. ✓ (2)

3.6	A – Stopcock ✓	(1)
	B – Pressure control valve ✓	(1)
	C – Vacuum breaker ✓	(1)
	D – Drain cock/Cold water inlet ✓	(1)
	E – Drip tray ✓	(1)
	F – Safety valve/Hot water outlet ✓	(1)
	G – Hot water cylinder/Geyser ✓	(1)
		[30]

QUESTION 4: QUANTITIES, MATERIALS AND JOINING

- 4.1 4.1.1 1 130 mm ✓ (1)
- 4.1.2 150 mm ✓ (1)
- 4.1.3 114 mm ✓ (1)
- 4.1.4 Window stile ✓ (1)
- 4.1.5 44 mm ✓ (1)
- 4.1.6 54 mm ✓ (1)
- 4.1.7 4 ✓ (1)
- 4.2 4.2.1 B ✓ (1)
- 4.2.2 A ✓ (1)
- 4.2.3 D ✓ (1)
- 4.2.4 C ✓ (1)
- 4.2.5 D ✓ (1)
- 4.3
 - Galvanising hoop iron is used to tie down or attach roof trusses to the brickwork. ✓
 - To fix wall plates to walls.
 - For cross bracing of roof trusses.
 - To secure timber frames to brick work.
 - To join existing brickwork to new brickwork (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

- 4.4 Steel nails ✓ (1)
- 4.5
 - Rawl bolts ✓
 - Chemical fasteners in conjunction with threaded rods and nuts
 - Sleeve anchors can be used. (1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

4.6

4.6.1

A	B	C	D
			Internal measurement of:
			Long walls = $\frac{10\,040}{J} - \frac{2}{220} J$
			= $\frac{9\,600}{J}$
			Short walls = $\frac{5\,240}{J} - \frac{2}{220} J$
			= $\frac{4\,800}{J}$

(6)

4.6.2

A	B	C	D
1/	9,6 J		Internal area of room:
	$\times \frac{4,8}{J}$	46,08 m ² J	Inside length = 9 600 mm
			Inside width = 4 800 mm
			Area is 46,08 m ²

(3)

4.6.3

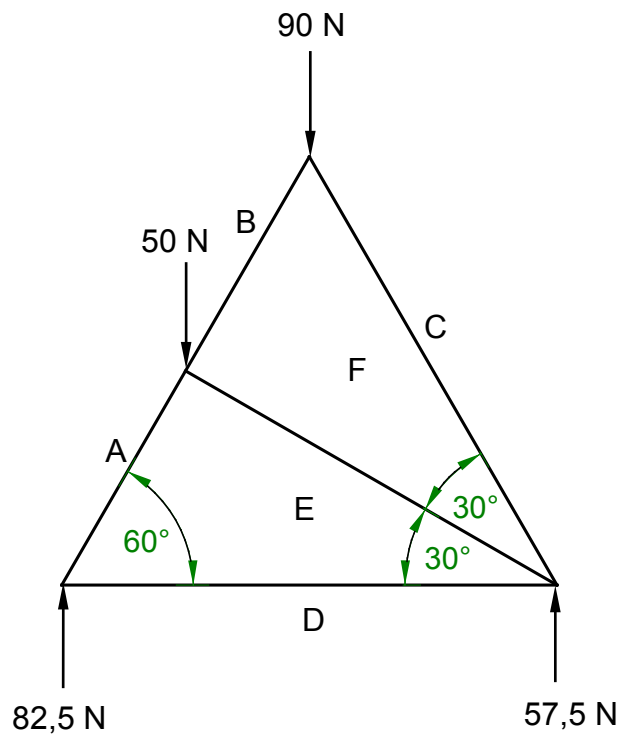
A	B	C	D
1/	0,6 J		Area of one tile:
	$\times \frac{0,6}{J}$	0,36 m ² J	Size of one tile = 600 mm x 600 mm
			Area is 0,36 m ²
			Total no. of tiles = $\frac{\text{Internal area of room}}{\text{Area of one tile}}$
			= $\frac{46,08}{0,36} J J$
			= 128 tiles are needed J

(6)
[30]

QUESTION 5: APPLIED MECHANICS

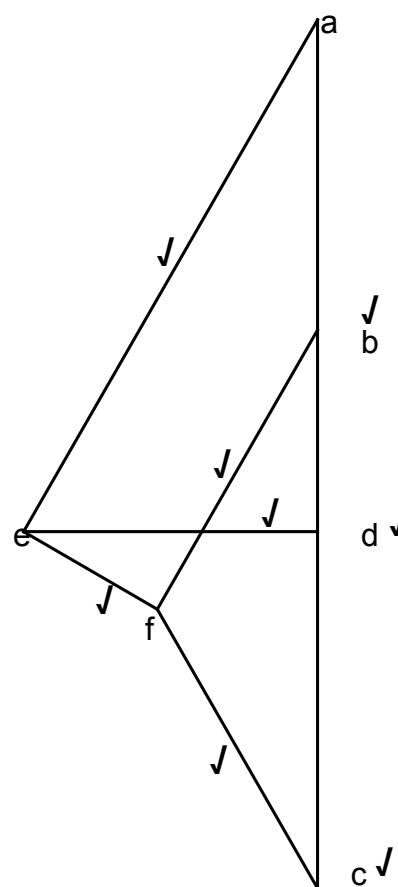
- | | | | |
|-----|-------|---|-----|
| 5.1 | 5.1.1 | $90 \text{ mm} \times 30 \text{ mm} = 2\,700 \text{ mm}^2 \checkmark$ | (1) |
| | 5.1.2 | $60 \text{ mm} \times 60 \text{ mm} = 3\,600 \text{ mm}^2$ OR $3\,150 \text{ mm}^2 \checkmark$ | (1) |
| | 5.1.3 | $15 \text{ mm} \times 30 \text{ mm} = 450 \text{ mm}^2 \checkmark$ | (1) |
| | 5.1.4 | $2\,700 \text{ mm} + 3\,600 \text{ mm} - 450 \text{ mm} = 5\,850 \text{ mm}^2 \checkmark$ | (1) |
| | 5.1.5 | $55 \text{ mm} \checkmark$ | (1) |
| | 5.1.6 | $45 \text{ mm} \checkmark$ | (1) |
| | 5.1.7 | $40 \text{ mm} \checkmark$ | (1) |
| | 5.1.8 | $45 \text{ mm} \checkmark$ | (1) |

5.2



SPACE DIAGRAM

5.2.1



(8)

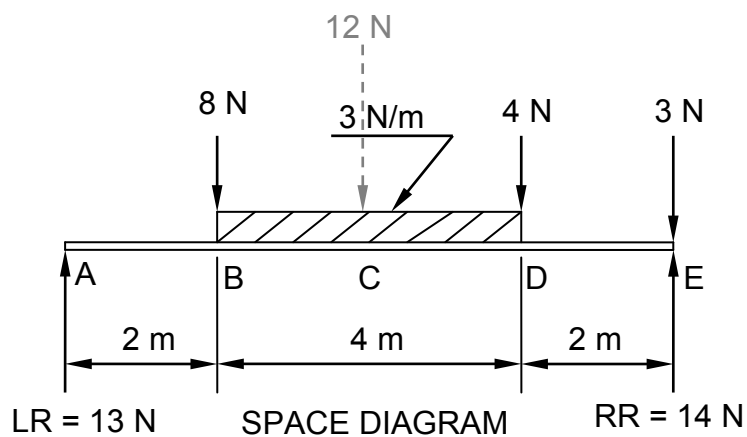
5.2.2

MEMBER	NATURE	MAGNITUDE
AE	Strut ✓	95,2 N ✓
DE	Tie ✓	47,6 N ✓

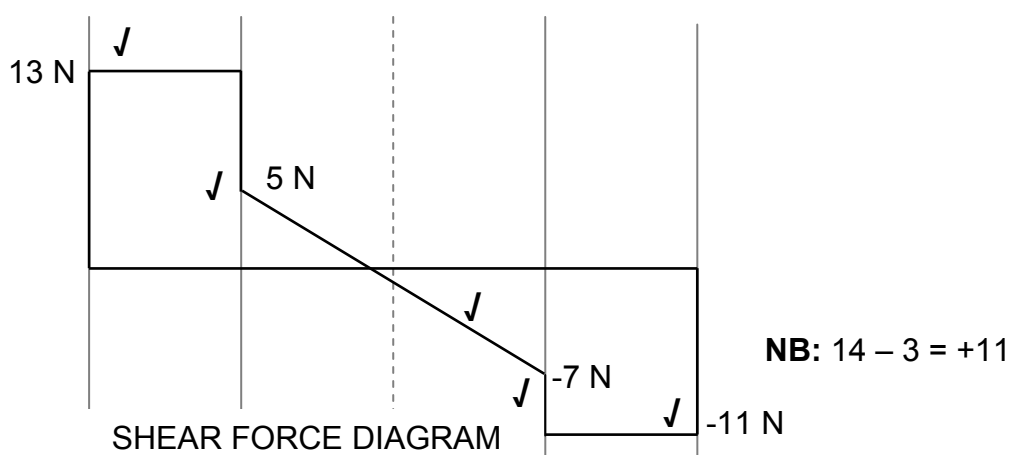
VECTOR DIAGRAM

NOT ACCORDING TO SCALE
USE A MASK TO MARK THIS QUESTION
 Tolerance of 1 N to either side

(4)

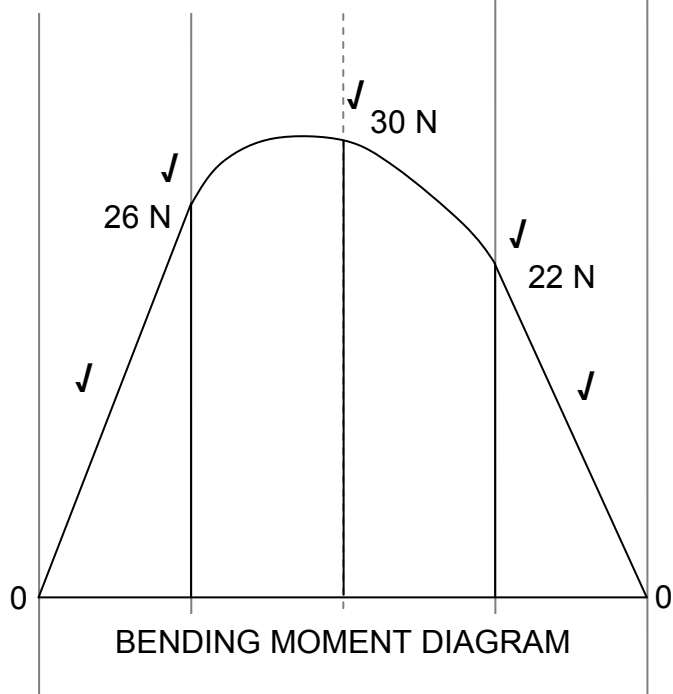


5.3.1

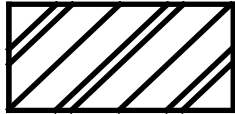
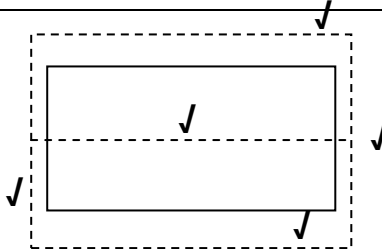


(5)

5.3.2

(5)
[30]

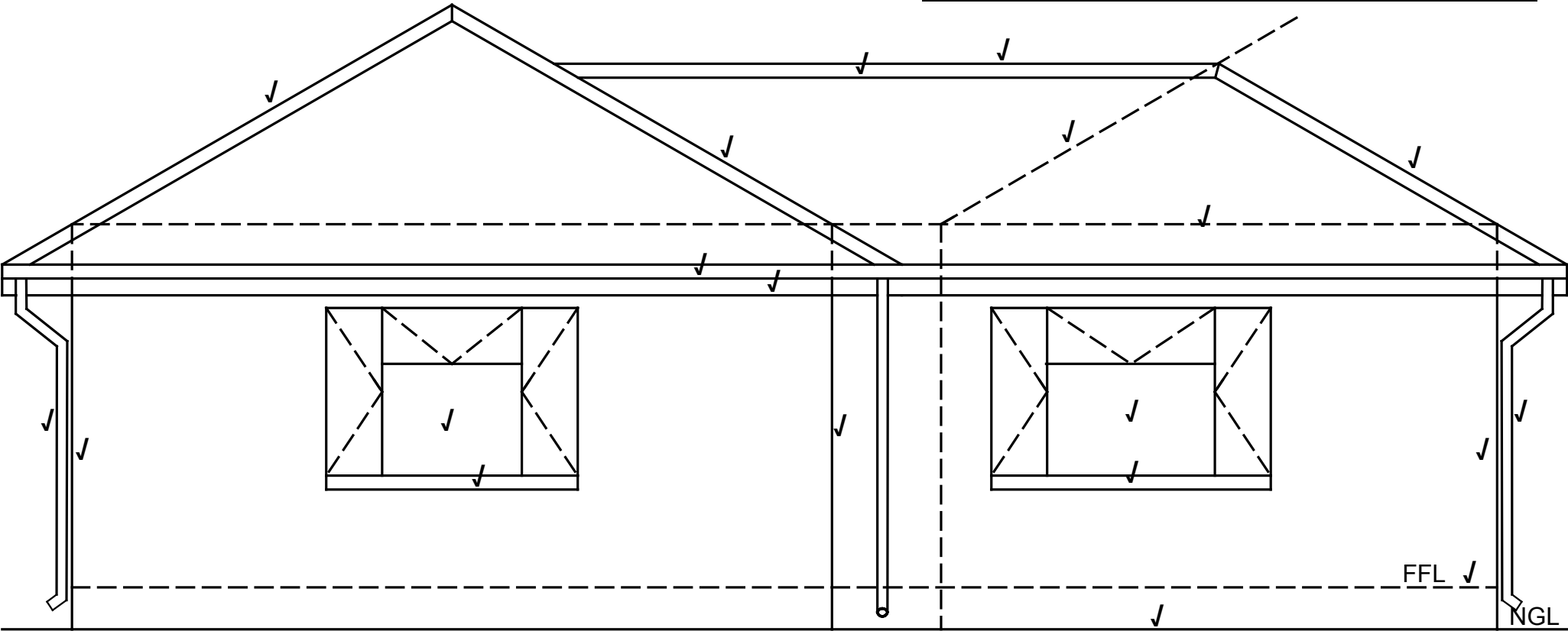
ANSWER SHEET 6.1

NO.	QUESTIONS	ANSWERS	MARKS
1	Identify the type of eave construction used in the drawing.	Open/exposed eave	1
2	State the minimum pitch (slope) of number 1.	10°	1
3	State the standard dimension of number 2.	114 mm x 38 mm	1
4	Draw the drawing symbol for number 3.		1
5	Name the colour coding for number 3.	Red	1
6	Explain the purpose of number 4.	It is used to spread the load of the roof evenly onto the supporting walls of the building.	1
7	State the standard dimension of number 5.	50 mm x 76 mm	1
8	State the centre-to-centre spacing for number 5.	900 mm to 1 200 mm	1
9	As a draughtsman, recommend a suitable roof truss for a building with a span of 4 metres.	King post roof truss, SA (Howe) roof truss, W-roof truss, Couple roof	1
10	State the width of the wall indicated by number 6.	110 mm	1
11	Draw the top view of the layout of a gable roof for the proposed building indicated in the answer column.		5
		TOTAL	15

QUESTION 6: GRAPHICS AND COMMUNICATION

ANSWER SHEET 6.2

ASSESSMENT CRITERIA	MARKS	LM	ASSESSMENT CRITERIA	MARKS	LM
Placement of external walls	3		Ridge capping	1	
NGL (correctly indicated)	1		Determine roof height	2	
FFL (correctly indicated)	1		Print title and scale	2	
Windows	2		Application of scale One or two incorrect = 3 Three or four incorrect = 2 More than five incorrect = 1 No measurement correct = 0	3	
Window sills	2				
Fascia board	1				
Down pipes	2				
Roof (correctly drawn)	4				
Gutter	1		TOTAL	25	



NOT TO SCALE: USE A MASK TO MARK THIS QUESTION

West elevation ✓

Scale 1: 50 ✓

Application of scale ✓✓✓

TOTAL: [40]
200