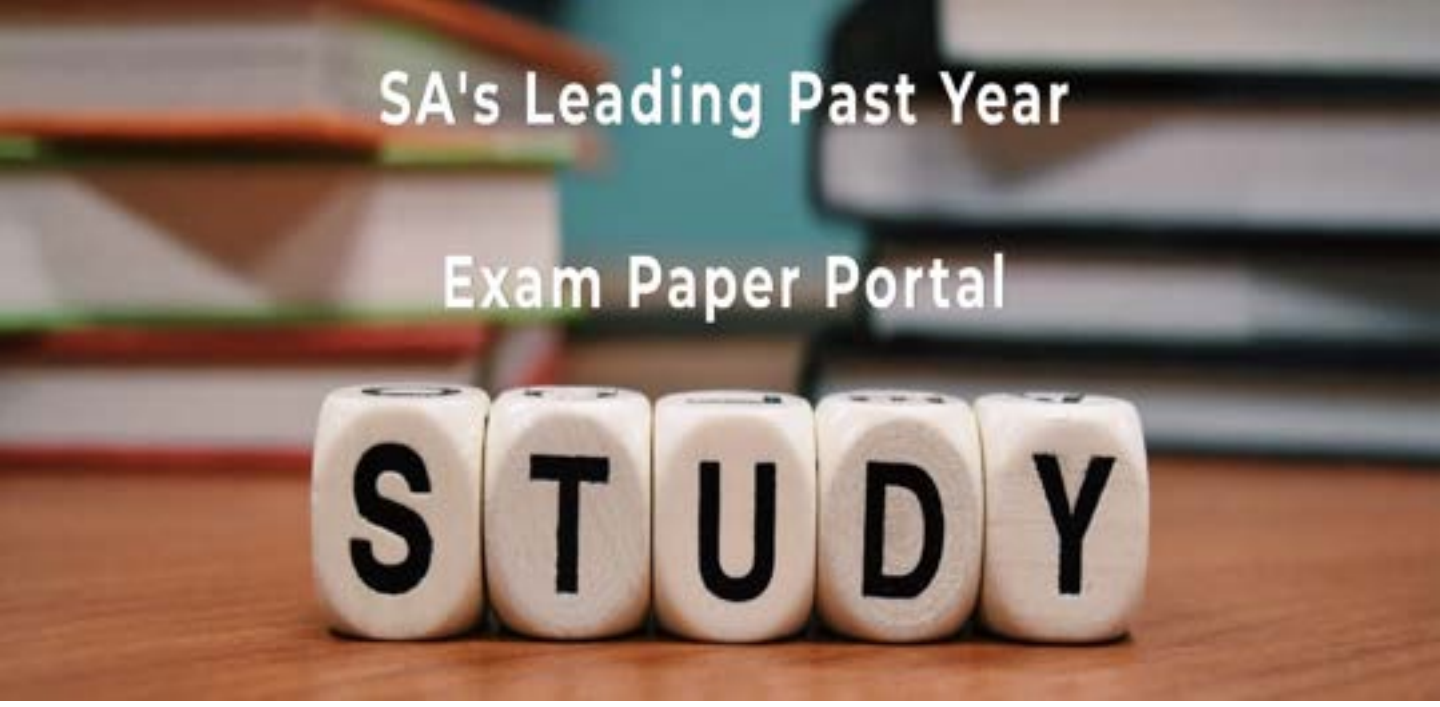

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GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2015

MEMORANDUM

MARKS: 200

This memorandum consists of 18 pages.

QUESTION 1: CONSTRUCTION, SAFETY AND MATERIALS

1.1
- Someone should have held the ladder. ✓
- Catch nets should be installed to prevent tools and materials from falling on people below. ✓
- The visitor should wear a hard hat.
- The worker should wear a tool belt.
- A scaffold could be built.
- Meeting to be moved to a safer area. (2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.2
- Always ensure that saw is sharp. ✓
- Use saws only for the purposes for which they were designed. ✓
- Safety rules for the saw must be strictly adhered to.
- Do not work with a saw with a loose or broken handle.
- Report all defects and damages immediately.
- Always keep your hands away or behind the cutting surface of the saw.
- Maintain the correct cutting direction.
- Do not bend the blades/points of saw when you are using them.
- Blunt saws require more force and may lead to unnecessary accidents.
- The work piece must be securely clamped to prevent it from moving. (2)
- Do not test the sharpness of the teeth with your fingers

ANY TWO OF THE ABOVE

1.3
- Trenches that are excavated must be protected with a fence. ✓
- Red warning lights or warning signs should be placed at intervals and must be clearly visible to warn the public of the danger. (1)

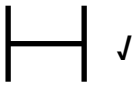
ANY ONE OF THE ABOVE

1.4
- Spray painting. ✓
- Spray painting is a better option because plastics commonly have very smooth surfaces, so spray painting is a better option. ✓
- Is easy to apply.
- It is quicker. (2)

ANY TWO OF THE ABOVE

1.5

I-beam



H-beam

(2)

THREE DIMENSIONAL DRAWINGS CAN ALSO BE ACCEPTED

1.6 Admixtures are used to:

- change the property of the concrete mix. ✓
- increase the workability.
- increase or reduce the setting time.
- increase the strength.
- increases the durability.
- reducing cost.
- reduce water content.
- improve pump ability
- shorten curing time.
- change the temperature range.
- change the colour of concrete. (1)

ANY ONE OF THE ABOVE

1.7

- Plasticisers ✓
- Accelerators
- Retarders
- Air entrainers/entrapment admixtures
- Corrosion inhibitors
- Damp proofing
- Water-reducing admixtures
- Anti-washout admixtures
- Bonding admixtures
- Colouring admixtures/oxides (1)

ANY ONE OF THE ABOVE

1.8

- Not fire resistant and therefore it must be treated/burns easily. ✓
- It is more expensive than ordinary roof coverings/insurance is more expensive. ✓
- A lot of maintenance is required/easily damaged.
- Thatch is an organic material and can rot easily.
- The thatch at the ridge capping needs to be re-thatched regularly.
- Durability is more or less between 25 and 30 years if properly maintain.
- Ideal breeding place for Insects and dust (2)

ANY TWO OF THE ABOVE

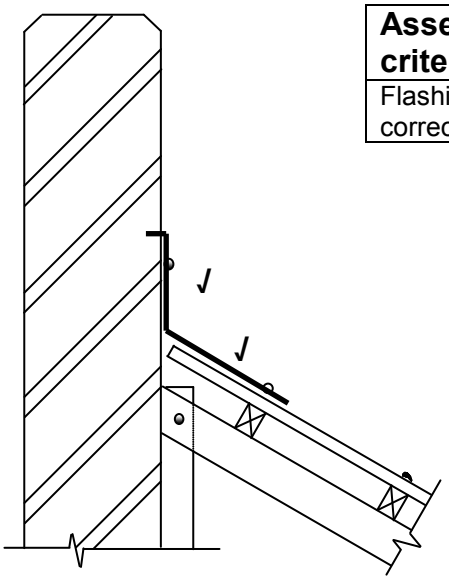
1.9

- Corrugated iron sheeting/galvanised sheeting ✓
- IBR sheeting ✓
- Concrete/clay roof tiles/tiles
- Slate
- Fibre cement sheeting
- Fibre glass sheeting
- Transparent IBR sheeting
- Perspex sheeting

(2)

ANY TWO OF THE ABOVE

1.10 1.10.1



Assessment criteria	Mark	Candidate's mark
Flashing correctly drawn	2	

(2)

1.10.2
- Waterproofing membrane with a sealing compound ✓
- Bituminous felt
- Plastic
- Copper sheet
- Galvanised sheet metal
- Lead sheet
- Aluminium sheet

(1)

ANY ONE OF THE ABOVE

1.10.3
- It is to seal off the gap between the wall and the roof. ✓
- To prevent rain from entering the roof.
- To prevent unwanted elements from entering the ceiling.

(1)

ANY ONE OF THE ABOVE

1.11 1.11.1 English bond ✓ (1)

1.11.2
- The English bond can only be built as a single brick wide wall.✓
- One course will be a stretcher course followed by a header course.
- The second and second-last bricks will a queen closer in the header course. ✓
- If the course in a quoin on the front elevation is a stretcher course then the same course around the corner will be a course of headers.
- It is one of the strongest bond.

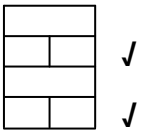
(2)

1.11.3
- The wall can be painted ✓
- The wall can be tiled
- The wall can be cladded (wood/stone/brick)

(1)

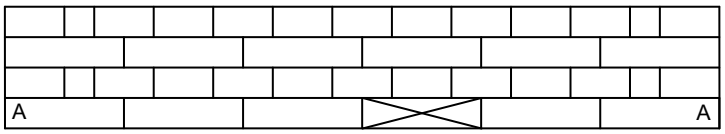
ANY ONE OF THE ABOVE

1.11.4 End view



✓

✓

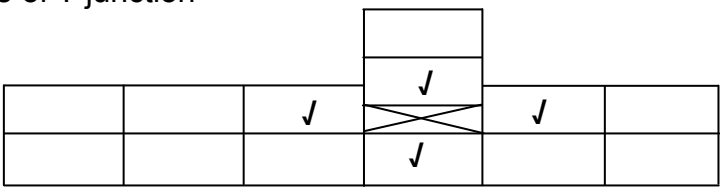


(2)

1.11.5

ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Stretcher course	2	
Queen closer	1	
Header course	1	
TOTAL:	**4**	

Plan course of T junction



(4)

1.12
- Cement fibre ceiling board ✓
- Match board ceilings
- Sheet metal ceilings
- Knotty pine ceiling
- Gypsum board/Rhino board
- Plastic ceilings.
- Polystyrene ceilings
- Styrofoam

(1)

ANY ONE OF THE ABOVE

[30]

QUESTION 2: ADVANCED CONSTRUCTION AND EQUIPMENT

2.1 2.1.1 Electric mitre saw ✓ (1)

2.1.2
- The mitre saw can be used to make accurate cross cuts at different angles. ✓
- The mitre saw can be used to cut angles or compound angles on roof truss members
- The mitre saw can be used to saw mitres of skirtings. (1)

ANY ONE OF THE ABOVE

2.1.3
- The mitre saw enables precision cutting. ✓
- It will save time. ✓ (2)

2.2
- Start by filling the pipe with water. Bring the water level in the transparent pipe in line with the first level. ✓
- Take the other end of the pipe to the other position where the level must be transferred, maintaining the first level. Make a mark next to the water level at this point. ✓ (2)

2.3
- It will be used to provide electricity to all portable electrical equipment on the building site where no electricity is available. ✓
- To provide electricity for the site office. (1)

ANY ONE OF THE ABOVE

2.4 2.4.1 Concrete spacer/Spacer/cover depth block ✓ (1)

2.4.2
- It is used to keep reinforcement bars away from soil and sides of trenches or shuttering (formwork). ✓
- It is used to maintain cover depth of concrete/to keep reinforcement bars in position. (1)

ANY ONE OF THE ABOVE

2.5 2.5.1 Rib and block floor ✓ (1)

2.5.2
- It is cheaper. ✓
- It is lighter and easy to work with. ✓
- It is quicker to install.
- It has a lighter load on foundations.
- Easy to trim around edges. (2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

2.5.3
- It is more economical than in situ concrete floors. ✓
- Very little or no shuttering is required. ✓
- They provide superior sound and thermal insulation. ✓
- It can be erected a lot quicker than in situ slabs.
- Highly skilled labour is unnecessary.
- No heavy lifting equipment is required.
- It is easier to install conduits.
- The load of the building will be lighter on the foundation.

(3)

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

2.6 2.6.1
- Flat ✓
- Semi-circular ✓
- Circular
- Segmental arch

(2)

ANY TWO OF THE ABOVE

2.6.2 Key brick ✓ (1)

2.7 Slump test – Test the workability and consistency of the concrete mix. ✓
Cube test – Test the compressive strength of concrete. ✓ (2)

2.8 2.8.1 A - Anchor bar ✓
B - Shear bar ✓
C - Stirrup/Binder ✓
D - Main bars of column ✓ (4)

2.8.2 Ribbed bars create a better bond with the concrete due to the rough surface of the bar. ✓ (1)

OR ANY OTHER ACCEPTABLE ANSWER

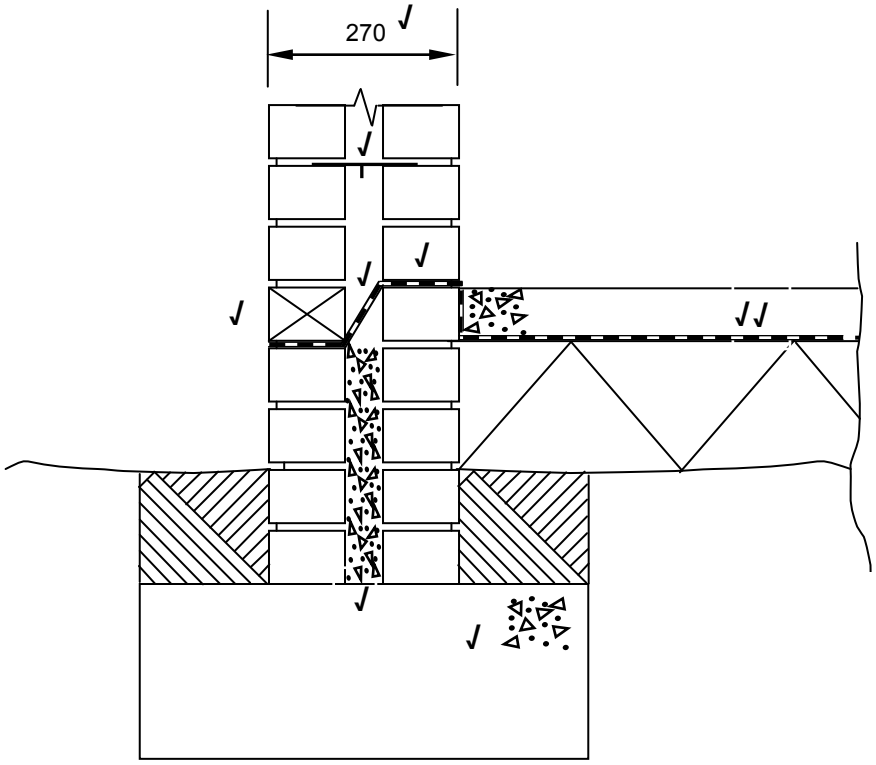
2.9 2.9.1 A – Landing / Floor ✓ (1)

2.9.2 B – Between 75 mm and 200 mm. ✓ (1)

2.9.3 C – Tread/Going ✓ (1)

2.9.4 D - String ✓ (1)

2.10



ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Symbol for concrete foundation and concrete floor	1	
Damp-proof course between walls and cavity	2	
Damp-proofing under concrete floor	2	
Weep hole	1	
Concrete in cavity wall	1	
Wall tie	1	
Dimension of total width of wall	1	
TOTAL:	**9**	

(9)

2.11 Pile foundations/raft foundations ✓ (1)

2.12 Dry wall ✓ (1)

[40]

QUESTION 3: CIVIL SERVICES

3.1 3.1.1 C/B ✓ (1)

3.1.2 A ✓ (1)

3.1.3 E ✓ (1)

3.1.4 B ✓ (1)

3.1.5 D ✓ (1)

3.1.6 G ✓ (1)

3.1.7 F ✓ (1)

3.2 3.2.1 If there is no gully and the sewerage system is blocked sewage will flow out through the bath outlet/shower outlet/water closet into the house. ✓ (1)

3.2.2 If there is a blockage in the sewerage system there will be no access to remove the blockage. ✓ (1)

3.3
- By using an electric geyser. ✓
- By using a gas geyser. ✓
- By using a solar geyser.
- By using fire to heat the water.
- Electricity
- Gas
- Wood/fire/donkey
- Heat pump

(2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.4
- Wind pump/mill✓
- Hand pump
- A submersible pump
- Motorised/solar pump

(1)

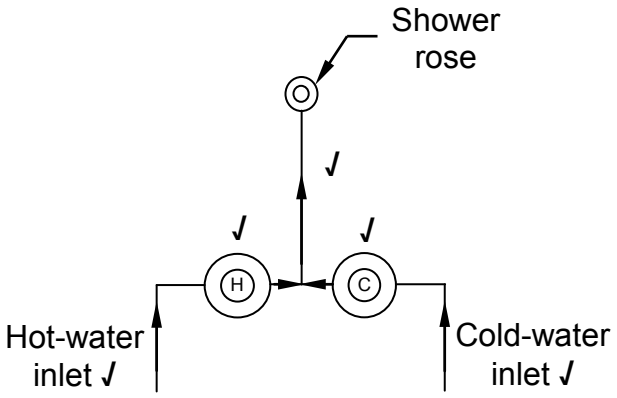
ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.5
- Shallow wells ✓
- Sea water (desalination)
- Rain water
- Dams
- Rivers
- Lakes
- Tanks/reservoirs/purchased water
- Recycled water

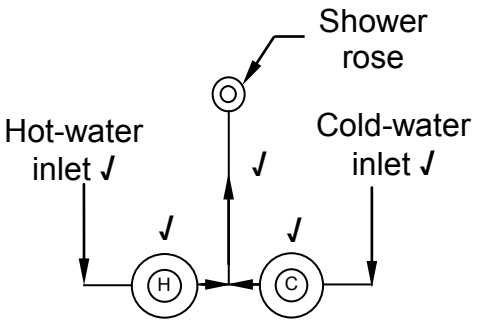
(1)

ANY ONE OF THE ABOVE

3.6



OR



(5)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE LAYOUT

3.7 3.7.1 Single-bowl sink ✓ (1)

3.7.2 Gully ✓ (1)

3.7.3 Water meter ✓ (1)

3.8
- By using roof gutters rainwater will be channelled to an exit point. ✓
- By using surface channels leading rainwater to exit point. ✓
- By using hard surfaces rain water will be channelled to exit point.
- By using grid-top manholes rain water will be channelled into the storm water pipe network. (2)

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

3.9 3.9.1 Conduits are chased into the wall. ✓ (1)

3.9.2
- A light switch/switch/isolator ✓ **OR**
- Socket outlet/switched socket outlet/power point/plug. (1)

3.9.3 C Socket outlet/Power point ✓ (1)

D Distribution board/box/Prepaid meter ✓ (1)

E Meter box ✓ (1)

3.9.4

- The kick pipe is used to protect the electrical cable from damage. ✓
- To enable the installation of the electrical cable to the meter box.
- Easy replacement of electrical cables.
- Electricity supply to the building.
- Safety/neatness

(1)

3.9.5

✓

(1)

[30]

QUESTION 4 QUANTITIES AND CALCULATIONS AND JOINING

4.1	4.1.1	2 ✓	(1)
	4.1.2	114 mm ✓	(1)
	4.1.3	44 mm ✓	(1)
	4.1.4	Muntin ✓	(1)
	4.1.5	810 mm ✓	(1)
	4.1.6	32 mm ✓	(1)
	4.1.7	230 mm ✓	(1)
4.2	4.2.1	C ✓	(1)
	4.2.2	B ✓	(1)
	4.2.3	D ✓	(1)
	4.2.4	A ✓	(1)
	4.2.5	D ✓	(1)
	4.2.6	D ✓	(1)
	4.2.7	A ✓	(1)
	4.2.8	A ✓	(1)

4.3.1

A	B	C	D
			Internal measurements of:
			Long walls = 5 240 ✓ – 2/220 mm ✓
			= 4 800 mm ✓
			Short walls = 4 040 ✓ – 2/220 mm ✓
			= 3 600 mm ✓
1/	4, 8 ✓		Internal area of the store room.
	3, 6 ✓	17, 28 m^2 ✓	
			Number of ceiling boards.
1/	2, 4 ✓		Area of one ceiling board (CB):
	0, 9 ✓	2, 16 m^2 ✓	One ceiling board is 2 400 mm x 900 mm
			Area is 2, 16 m^2
			$\text{Ceiling boards needed} = \frac{\text{Area of room}}{\text{Area of CB}}$
			$= \frac{17,28}{2,16}$ ✓✓
			= 8 Ceiling boards are needed ✓

(6)

4.3.2 (3)

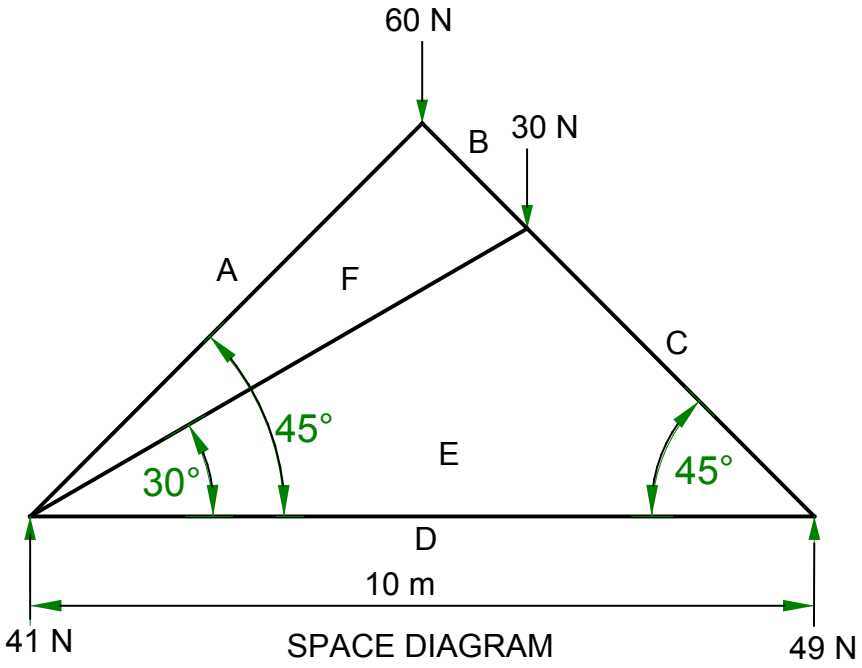
4.3.3 (6)

[30]

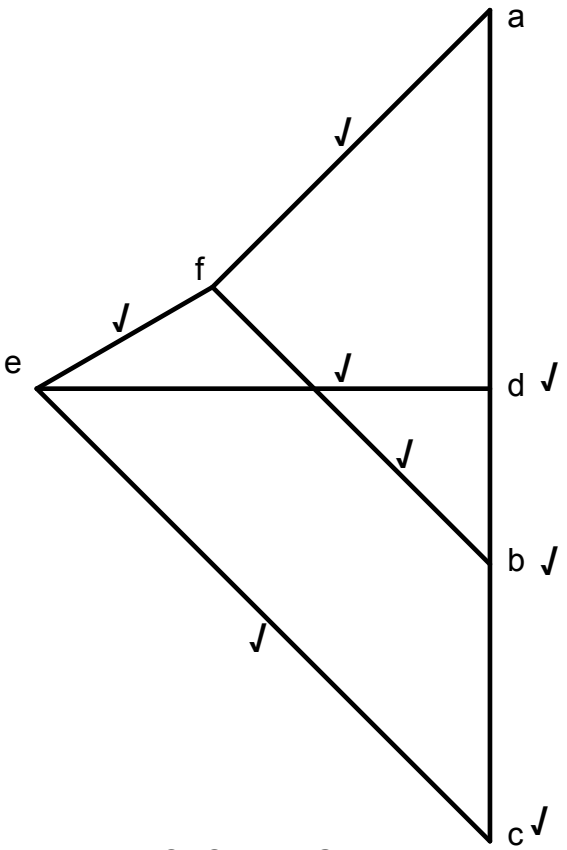
QUESTION 5: APPLIED MECHANICS

5.1	5.1.1	60 mm x 40 mm = 2 400 mm² ✓	(1)
	5.1.2	½ x 20 x 30 mm = 300 mm² ✓	(1)
	5.1.3	80 mm x 30 mm = 2 400 mm² ✓	(1)
	5.1.4	2 400 mm + 2 400 mm – 300 mm = 4 500 mm² ✓	(1)
	5.1.5	40 mm ✓	(1)
	5.1.6	60 mm ✓	(1)
	5.1.7	60 mm ✓	(1)
	5.1.8	40 mm ✓	(1)

5.2



SPACE DIAGRAM



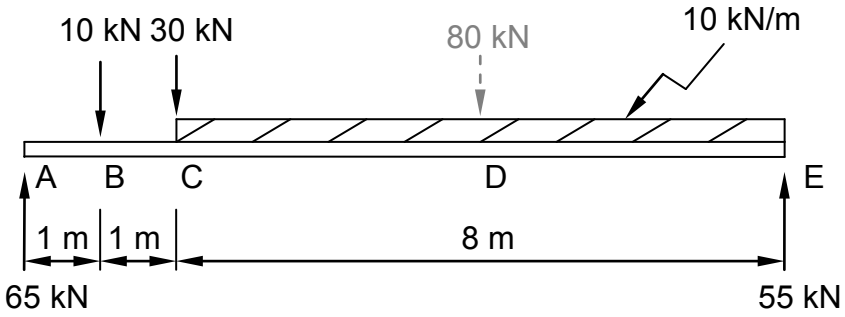
(8)

VECTOR DIAGRAM
NOT ACCORDING TO SCALE
USE A MASK TO MARK THIS QUESTION

MEMBER	NATURE	MAGNITUDE
AF	Strut ✓	42,4 N ✓
CE	Strut ✓	69,2 N ✓

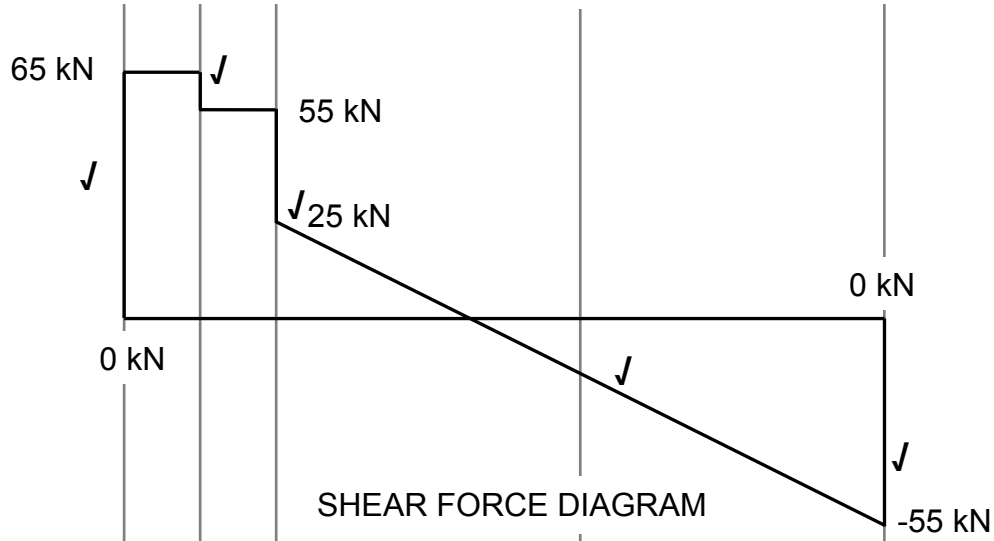
(4)

Tolerance of 1 N to either side



SPACE DIAGRAM

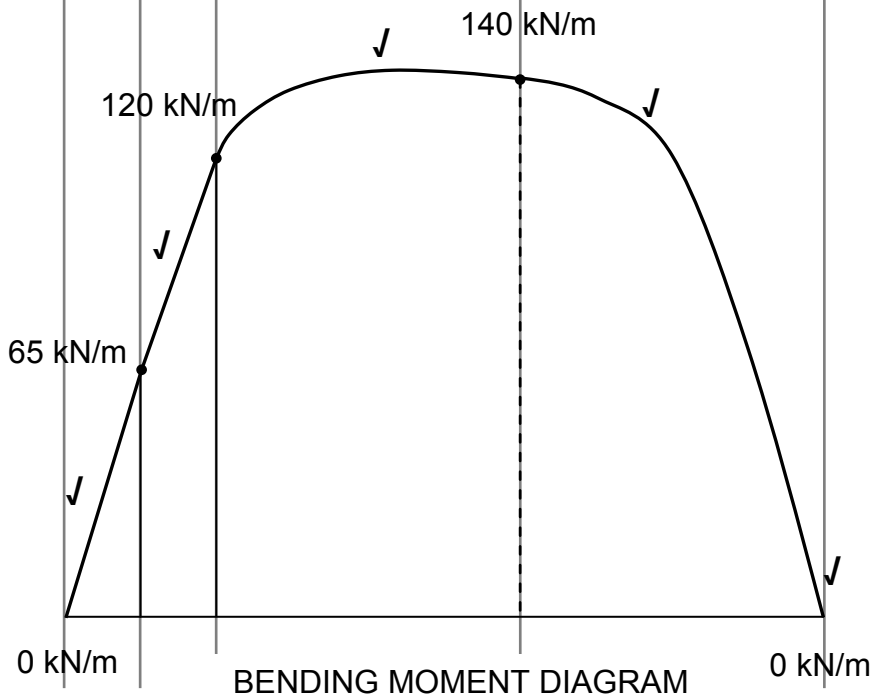
5.3.1



SHEAR FORCE DIAGRAM

(5)

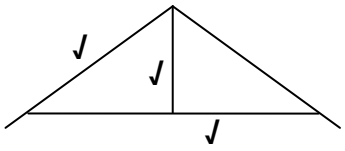
5.3.2



BENDING MOMENT DIAGRAM

(5)
[30]

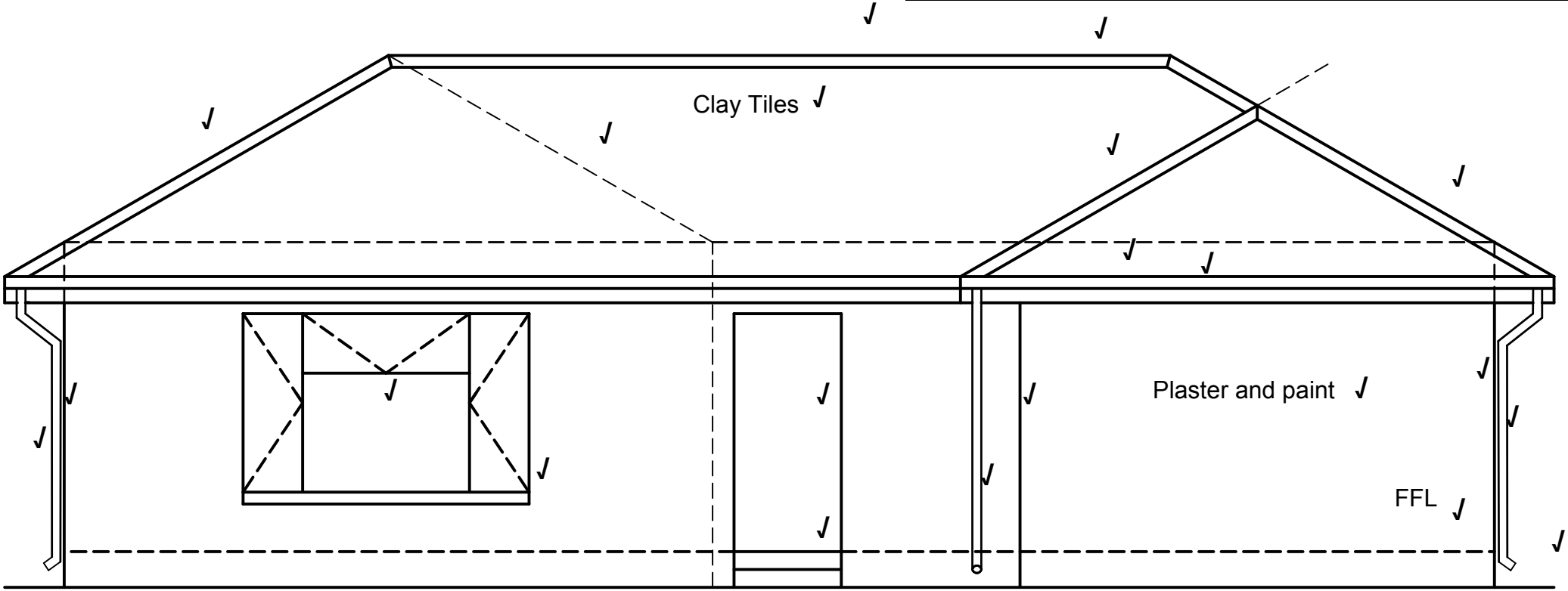
ANSWER SHEET 6.1

NO.	QUESTIONS	ANSWERS	MARKS
1	Identify the type of eave construction used in the drawing.	Closed eave/concealed eave	1
2	State the minimum pitch (slope) of number **1**.	5° to10°	1
3	State the standard dimension of number **2**.	114 mm x 38 mm	1
4	State the centre-to-centre spacing between the brandering of the ceiling construction.	300 mm/400 mm/ 450 mm **Any ONE of the above**	1
5	State the purpose of number **3**.	To cover the opening between the ceiling and the wall. To prevent unwanted elements entering the ceiling.	1
6	Draw the drawing symbol for number **4**.		1
7	State the width of the external wall indicated by number **5**, excluding plaster.	220 mm	1
8	Name the colour coding that should be used for number **6**.	Yellow	1
9	As a draughtsperson, recommend a type of roof sheeting for number **7**.	Corrugated galvanised sheeting/IBR sheeting/Cement fibre sheet/Chromadeck/fibre glass **Or any other acceptable answer**	1
10	Name ONE material that can be used for number **8**.	Fibre cement, Knotty pine, chicken mesh and soffit laggings, soffit board, slats **Any ONE of the above**	1
11	Identify number **9**.	Quarter round mould/ Quadrant	1
12	What is the standard dimension of number **10**?	114 mm x 38 mm	1
13	Draw a neat freehand line diagram of a kingpost roof truss.		3
		TOTAL:	**15**

QUESTION 6: GRAPHICS AND COMMUNICATION

ANSWER SHEET 6.2

ASSESSMENT CRITERIA	MARKS	LM	ASSESSMENT CRITERIA	MARKS	LM
External walls	3		Ridge capping	1	
NGL (correctly indicated)	1		Determine roof height	1	
FFL (correctly indicated)	1		Any two labels	2	
Window	1		Application of scale One or two incorrect = 3 Three or four incorrect = 2 More than five incorrect = 1 No measurement correct = 0	3	
Window sill	1				
Door opening	1				
Step	1				
Fascia board	1				
Rain-water down pipes	3				
Roof (correctly drawn)	4				
Gutter	1		**TOTAL:**	**25**	



NOT TO SCALE: USE A MASK TO MARK THIS QUESTION

Application of scale

TOTAL: [40] 200