



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2012

MARKS: 200

TIME: 3 hours

This question paper consists of 16 pages, 5 answer sheets and 1 formula sheet.

REQUIREMENTS:

1. Drawing instruments
2. A non-programmable pocket calculator
3. ANSWER BOOK

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX questions.
2. Answer ALL the questions.
3. Answer each question as a whole; do NOT separate subquestions.
4. Start EACH question on a NEW page.
5. Do NOT write in the margin of the ANSWER BOOK.
6. Sketches may be used to illustrate your answers.
7. ALL calculations and written answers must be done in the ANSWER BOOK or on the attached ANSWER SHEETS.
8. Use the mark allocation as a guide to the length of your answers.
9. Drawings and sketches must be done in pencil, fully dimensioned and neatly finished off with descriptive titles and notes to conform to the SANS/SABS Code of Practice for Building Drawing Practice.
10. For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
11. Use your discretion where dimensions and/or details have been omitted.
12. Answer QUESTIONS 1.3, 3.4, 4.3, 6.1 and 6.2 on the attached ANSWER SHEETS using drawing instruments where necessary.
13. Write your CENTRE NUMBER and EXAMINATION NUMBER on every ANSWER SHEET and hand them in with your ANSWER BOOK, whether you have used them or not.
14. Drawings in the question paper are NOT to scale due to electronic transfer.

QUESTION 1: CONSTRUCTION PROCESSES

- 1.1 Choose a description from COLUMN B that matches the term in COLUMN A. Write only the letter (A–H) next to the question number (1.1.1–1.1.5) in your ANSWER BOOK, for example 1.1.7 J.

COLUMN A		COLUMN B
1.1.1	Gang nail	A a temporary working platform
1.1.2	King post	B a length of material used to conceal the gap between the wall and the ceiling
1.1.3	Cornice	C slope/angle/fall of the roof
1.1.4	Ridge capping	D a flat plate with many spikes used in roof truss construction
1.1.5	Pitch	E used to absorb the sound of wind
		F vertical distance between two consecutive treads of a staircase
		G used to cover the gap between the roof covering at the highest point of the roof
		H longest vertical member that determines the height of the roof truss

(5)

- 1.2 Show, by using freehand sketches, the difference between the following types of concrete slabs: (Show the walls and slabs.)

1.2.1 Simple supported concrete slab (2)

1.2.2 Cantilever concrete slab (2)

- 1.3 FIGURE 1.3 on ANSWER SHEET 1.3 shows an incomplete gauged segmental arch with construction lines. The incomplete courses of surrounding brickwork are also shown.

1.3.1 Complete the gauged segmental arch by drawing the voussoirs (bricks). (3)

1.3.2 Label the key voussoir (brick). (1)

1.3.3 Draw the surrounding brickwork in stretcher bond on the right-hand side of the arch within the given courses. (1)

1.3.4 Indicate and label the rise on your drawing. (1)

- 1.3.5 Indicate and label the span on your drawing. (1)
- 1.3.6 Indicate and label the intrados on your drawing. (1)
- 1.3.7 Indicate and label the extrados on your drawing. (1)

- 1.4 FIGURE 1.4 below shows the top view of a roof layout showing the roof trusses and the outer walls of an L-shaped building. Analyse the illustration and answer the questions that follow.

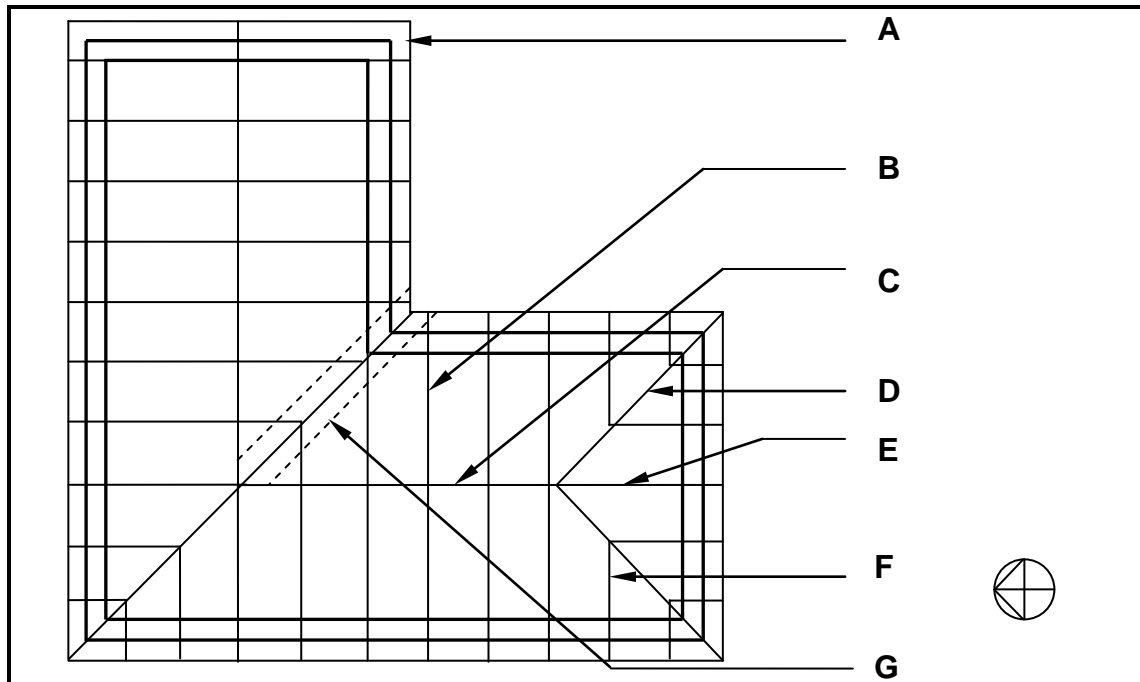


FIGURE 1.4

- 1.4.1 Identify component **A**. (1)
- 1.4.2 Name part **B**. (1)
- 1.4.3 Identify component **C**. (1)
- 1.4.4 Name the rafter at **D**. (1)
- 1.4.5 Name the truss at **E**. (1)
- 1.4.6 Name the rafter at **F**. (1)
- 1.4.7 Name part **G** where the TWO roof surfaces meet. (1)
- 1.4.8 What type of roof is used on the eastern side of the building? (1)
- 1.4.9 What is the maximum distance between truss centres when corrugated sheet metal or IBR sheeting is used as a roof covering? (1)

- 1.5 A plumber has to join two lengths of threaded galvanised water pipes.
- 1.5.1 What will the plumber use to ensure that the joint is watertight? (1)
- 1.5.2 Explain how the plumber will join the TWO pipes. (2)
- [30]**

Start this question on a NEW page.

QUESTION 2: ADVANCED CONSTRUCTION PROCESSES

- 2.1 FIGURE 2.1 below shows formwork supporting a concrete floor. Analyse the illustration and answer the questions that follow.

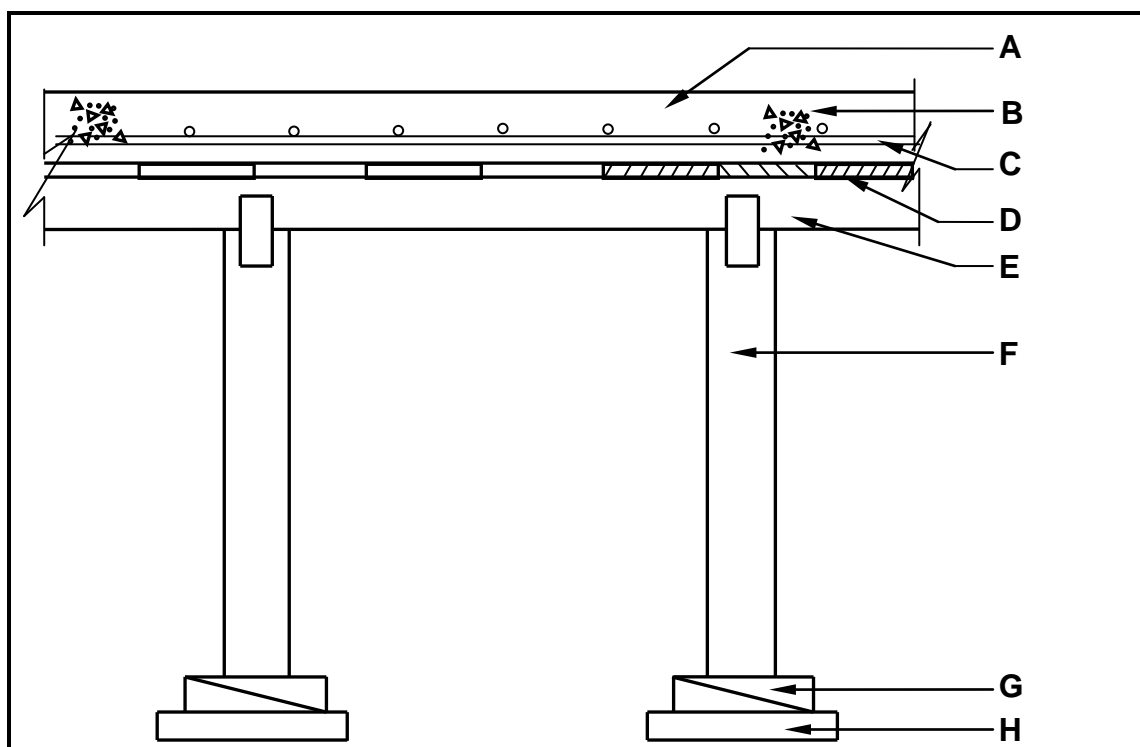


FIGURE 2.1

- 2.1.1 Identify components **A** to **H**. (8)
- 2.1.2 Explain why the reinforcement in the concrete floor is placed closer to the bottom of the floor. (2)
- 2.1.3 Explain the purpose of **G**. (1)
- 2.1.4 Explain the purpose of **H**. (1)

2.2 Reinforcement is used to strengthen concrete beams.

2.2.1 Explain the function of the main bars in a reinforced concrete beam. (2)

2.2.2 What would you use in a reinforced concrete beam to bind the main bars together and to help resist shear forces? (1)

2.3 Tabulate the differences between strip foundations and short bored piles according to the criteria in the table below. Redraw the table below in your ANSWER BOOK and tabulate your answers.

CRITERIA	STRIP FOUNDATION	SHORT BORED PILES
Preparation of foundation		
Concrete filling		

(4)

2.4 FIGURE 2.4 below shows different readings taken with a dumpy level. Use the given readings and calculate the following:

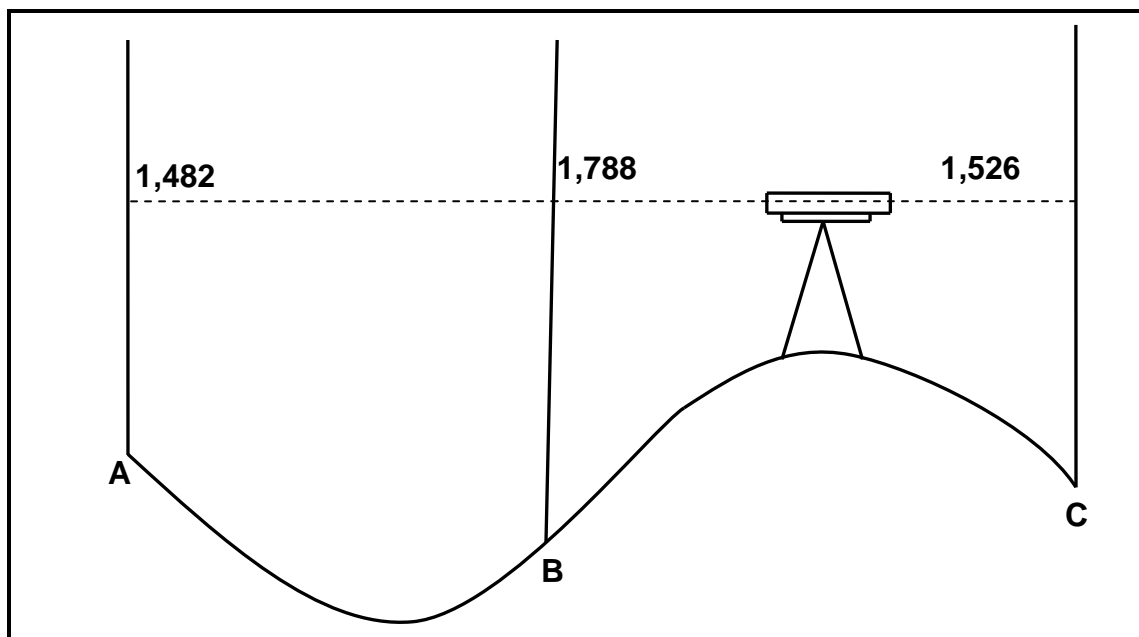


FIGURE 2.4

2.4.1 The difference in height between levelling staff **A** and levelling staff **B** (2)

2.4.2 The difference in height between levelling staff **B** and levelling staff **C** (2)

2.4.3 What is the reading at **B** called? (1)

2.4.4 Is there a rise or a fall from **B** to **C**? (1)

- 2.5 FIGURE 2.5 below shows an isometric view of a construction at the top of a dry-wall construction. Do NOT redraw the sketch. Use it as a hint to answer QUESTION 2.5.1.

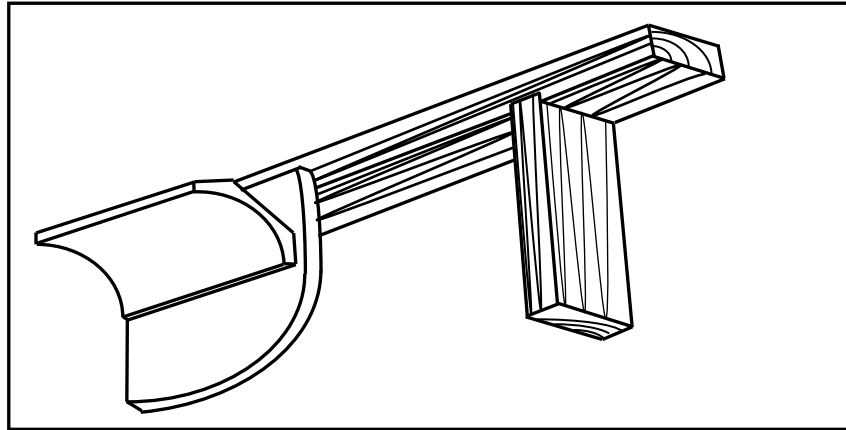


FIGURE 2.5

- 2.5.1 Use drawing instruments and draw a neat sketch of a vertical section through the top part of a dry-wall construction, showing how it is fixed to the ceiling and finished off.

Show the following details:

- Brandering (1)
- Ceiling board (1)
- Top rail of frame/Timber roof track (ceiling track) (1)
- Screw or nail to fix timber roof track to brandering (1)
- Timber strut (vertical) (1)
- Cladding (1)
- Cornice (1)

- 2.5.2 Show any THREE labels on your drawing. (3)

- 2.5.3 Name TWO materials that can be used for the cladding of dry walls. (2)

- 2.6 Describe TWO safety precautions you will take when using electric power tools. (2)

- 2.7 Safety signs are represented with circle, square and triangular shapes. Which shape is used to indicate general information? (1)

[40]

Start this question on a NEW page.

QUESTION 3: CIVIL SERVICES

3.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (3.1.1–3.1.5) in the ANSWER BOOK, for example 3.1.6 B.

- 3.1.1 The purpose of a vent pipe is to ...
- A clear obstructions.
 - B allow unpleasant odours coming from a sewerage system to escape.
 - C trap grease.
 - D direct the flow of waste water. (1)
- 3.1.2 The main purpose of a P trap is to ...
- A prevent foul gases from a sewerage system from entering the building.
 - B ensure that sanitary fitments are fitted level.
 - C join all sanitary fitments to each other.
 - D discharge waste materials into a gully. (1)
- 3.1.3 The recommended gradient (fall) of a sewer pipe for household purposes is ...
- A 1 : 100.
 - B 1 : 39.
 - C 1 : 40.
 - D 1 : 125. (1)
- 3.1.4 The effective operation of a solar panel is dependent on ...
- A wind.
 - B the moon.
 - C the sun.
 - D clouds. (1)
- 3.1.5 One way of saving electricity is to ...
- A keep all appliances switched on at all times.
 - B switch the geyser off when you are away from home for a long period of time.
 - C switch off the water supply to the geyser when it is not in use.
 - D keep all lights on throughout the night. (1)

3.2 Explain THREE advantages and THREE disadvantages of a shallow well-water supply system. Redraw the table below in your ANSWER BOOK and tabulate your answers.

ADVANTAGES	DISADVANTAGES

(6)

3.3 FIGURE 3.3 below shows part of a sewerage system. Analyse the illustration and answer the questions that follow.

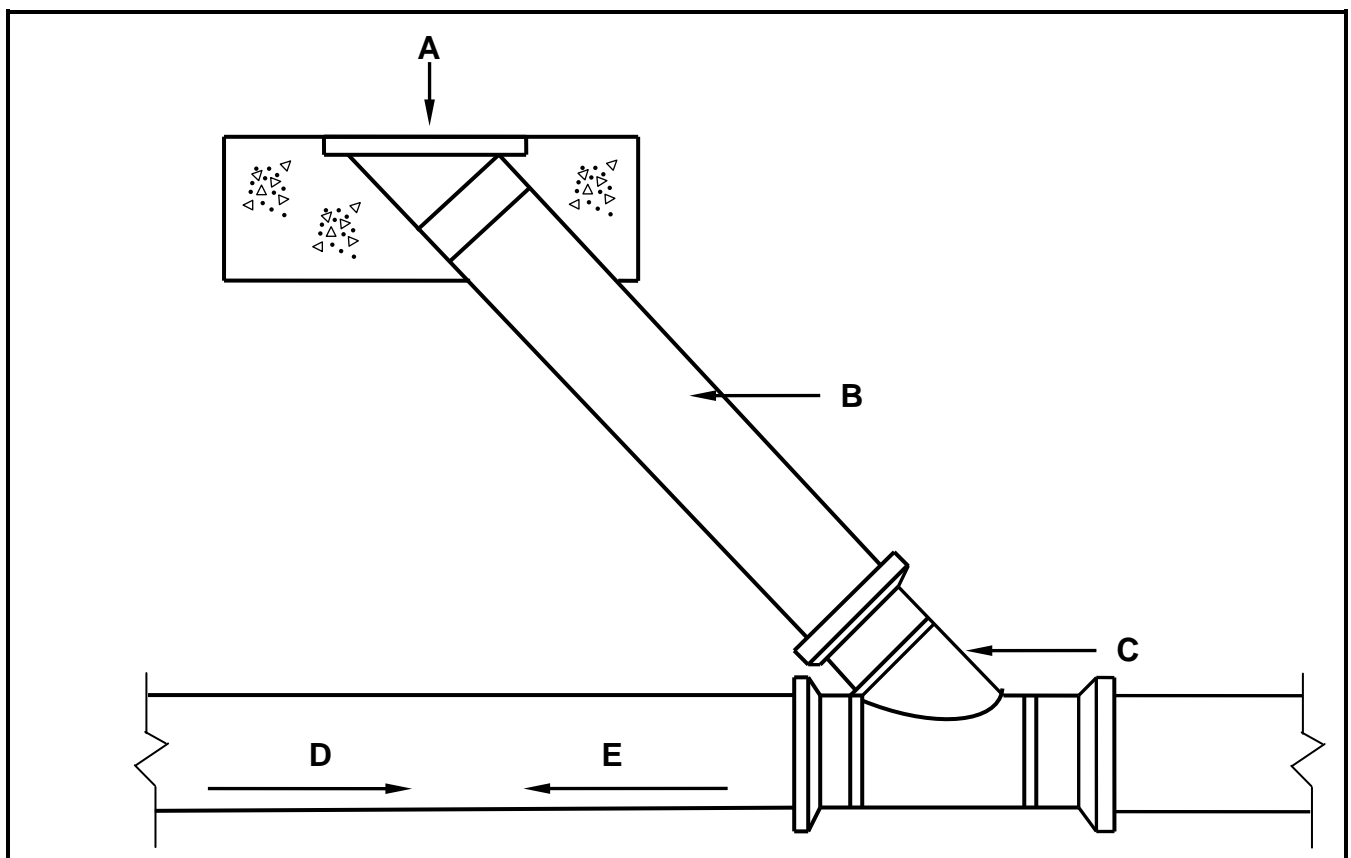


FIGURE 3.3

- 3.3.1 Identify components **A**, **B** and **C**. (3)
- 3.3.2 Determine the direction of flow of sewage (**D** or **E**). (1)
- 3.3.3 Explain why **B** is at an angle with the main pipe. (1)
- 3.3.4 Explain the purpose of component **A**. (1)
- 3.3.5 Discuss TWO advantages of installing component **A** in a sewerage system instead of installing a manhole. (2)

- 3.4 FIGURE 3.4 on ANSWER SHEET 3.4 shows a line diagram of the plan view of a house. Draw the following electrical drawing symbols on ANSWER SHEET 3.4:
- 3.4.1 A power socket in the garage at **A** (1)
 - 3.4.2 A single-tube fluorescent light at **B** (1)
 - 3.4.3 A three-lever switch at the entrance of the garage at **C** (1)
 - 3.4.4 A wall light at the entrance of the garage at **D** (1)
 - 3.4.5 A light in the TV room at **E** (1)
 - 3.4.6 A single-lever switch for the light in the TV room at **F** (1)
 - 3.4.7 A distribution board in the kitchen (1)
- 3.5 In the absence of a municipal waterborne sewerage system, name TWO other methods that can be used to dispose of sewage and explain the difference between the TWO methods. (4)
- [30]**

Start this question on a NEW page.

QUESTION 4: MATERIALS AND QUANTITIES

- 4.1 Indicate whether the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number (4.1.1–4.1.6) in the ANSWER BOOK.
- 4.1.1 Mild steel is a metal that cannot be recycled. (1)
 - 4.1.2 Copper is an example of a non-ferrous metal. (1)
 - 4.1.3 Timber that has to be used outdoors must be painted or varnished to be durable. (1)
 - 4.1.4 Rolled glass consists of a polymer sheet between two layers of glass. (1)
 - 4.1.5 Safety glass must be used for all glazed sliding doors. (1)
 - 4.1.6 Bolts and nuts can be used to join members of a steel roof truss. (1)
- 4.2 You are given TWO options for preserving timber. One is submersion and the other one the full-cell process.
- Give ONE advantage of:
- 4.2.1 Submersion (1)
 - 4.2.2 The full-cell process (1)

4.3 FIGURE 4.3 shows the front elevation and vertical section of a part of a wall (superstructure only).

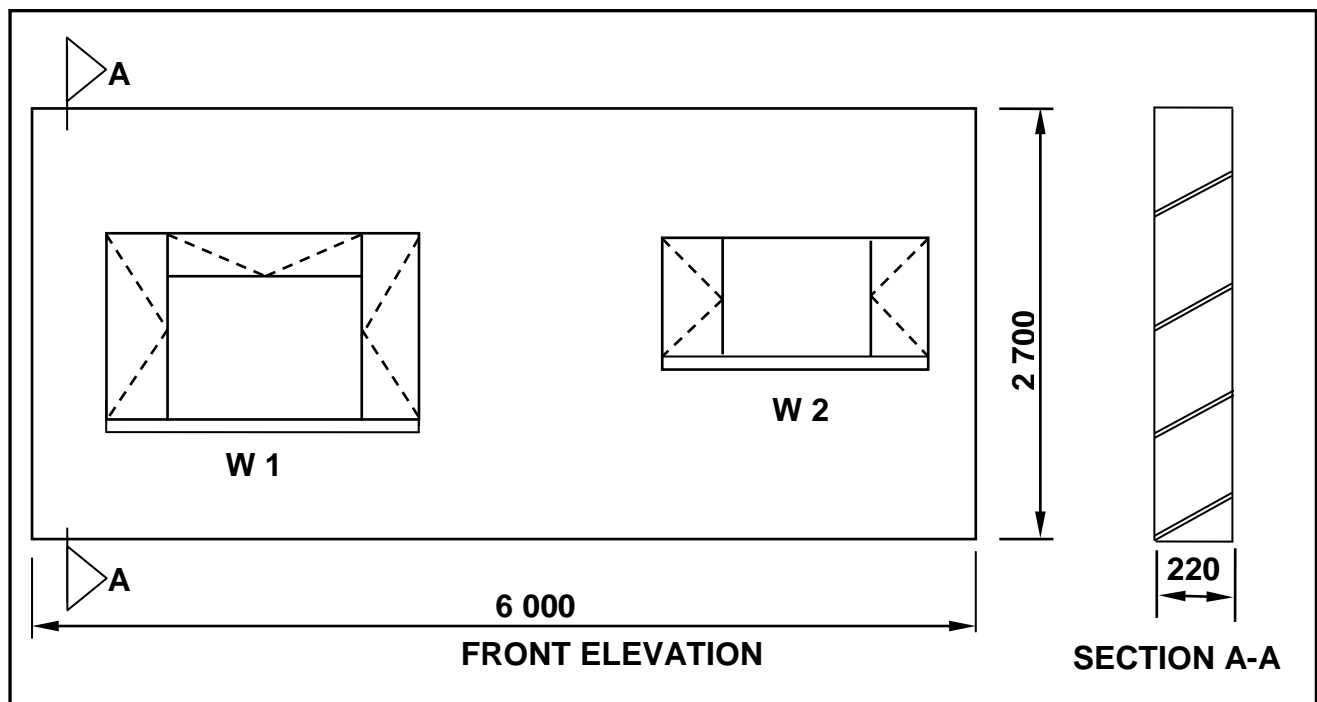


FIGURE 4.3

Specifications:

- 110 bricks were used to build one square metre of a 220 mm thick wall.
- Window 1 (W1) is 1 200 mm wide and 1 500 mm high.
- Window 2 (W2) is 1 200 mm wide and 600 mm high.

Use the specifications above and calculate the following on ANSWER SHEET 4.3:

- 4.3.1 The total area of the wall, including windows (before deductions) (4)
- 4.3.2 The area of window 1 (3)
- 4.3.3 The area of window 2 (3)
- 4.3.4 The total wall area, excluding windows (1)
- 4.3.5 The total number of bricks required to build the wall, including 5% wastage and breakages (6)

- 4.4 Complete the following sentences by using the words in the list below. Write only the word next to the question number (4.4.1–4.4.5) in the ANSWER BOOK.

breaking; forces; angle iron; copper; shock; galvanizing; corrosive

- 4.4.1 The strength of a material refers to its ability to resist forces being applied to it without ..., bending, splintering or changing shape. (1)
- 4.4.2 ... is a profile of steel that can be used for steel roof construction. (1)
- 4.4.3 An example of a material that will not corrode is ... (1)
- 4.4.4 One method of preventing metal from corroding is called ... (1)
- 4.4.5 The durability of a metal can refer to the metal's resistance to ... factors such as water, air, salts, and acids. (1)

[30]

Start this question on a NEW page.

QUESTION 5: APPLIED MECHANICS

- 5.1 FIGURE 5.1 below shows the space and shear-force diagrams of a beam with a span of 8 m with two point loads and a uniformly distributed load. Analyse the diagrams and answer the following questions.

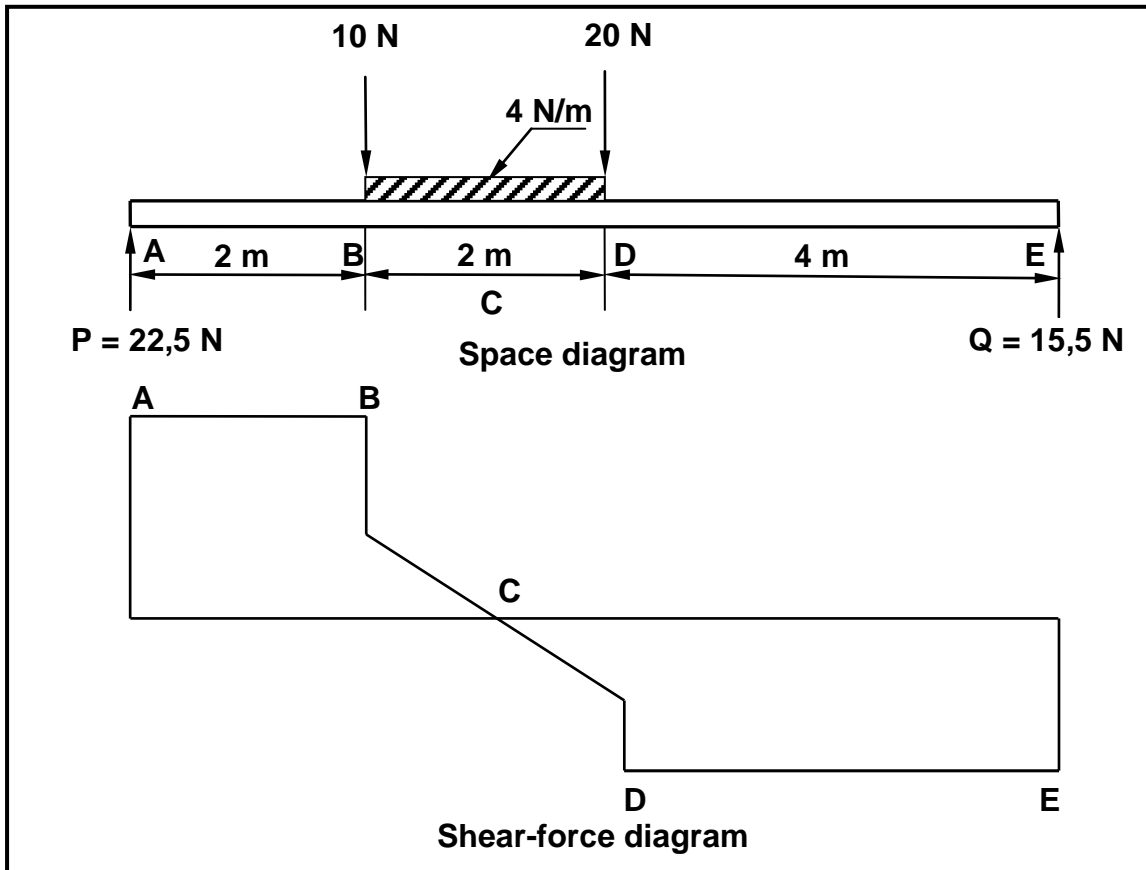


FIGURE 5.1

- 5.1.1 Convert the uniformly distributed load to a point load and write down the value of the converted point load. (1)
- 5.1.2 Deduce the value of the point load at **D** from the space diagram. (1)
- 5.1.3 Deduce the value of the uniformly distributed load at **D** from the space diagram. (1)
- 5.1.4 Determine the distance of the converted uniformly distributed load that is now a point load, to **P**. (2)
- 5.1.5 Prove by means of calculation that the beam is in equilibrium. (2)
- 5.1.6 Recommend a suitable scale for the shear-force diagram so that it will fit on a sheet of A4 paper with the space diagram. (1)
- 5.1.7 Deduce from the space diagram the value of the shear force at **A** (SF_A). (1)

- 5.1.8 Prove by means of calculation that the value of the shear force at **B** (SF_b) is equal to 12,5 N. (2)
- 5.1.9 Prove by means of calculation that the value of the shear force at **D** (SF_d) is -15,5 N. (2)
- 5.1.10 Prove by means of calculation that the value of the shear force at **E** (SF_e) is 0 N. (2)
- 5.1.11 Is there an error in the shear force diagram regarding the magnitude of the forces? Write only YES or NO. (1)

5.2 FIGURE 5.2 below shows a lamina.

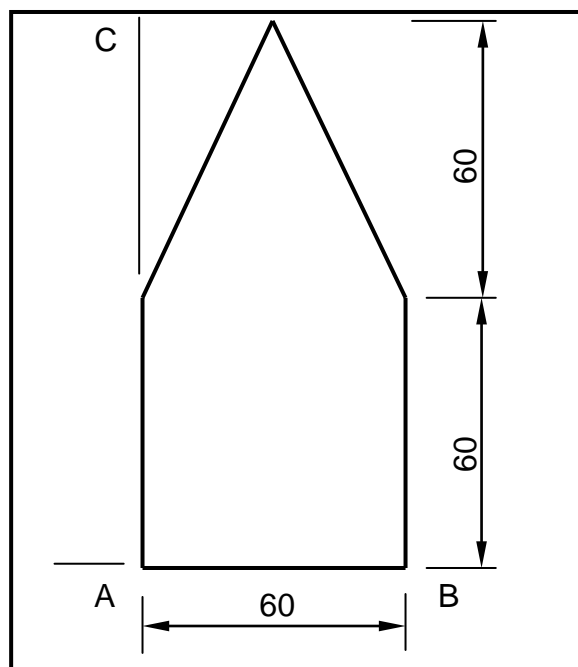


FIGURE 5.2

- 5.2.1 Calculate the position of the centroid of the lamina from **A–B**. (12)
- 5.2.2 Deduce from FIGURE 5.2 the position of the centroid from **A–C**.
Round off your answer to TWO decimal places. (2)

[30]

QUESTION 6: GRAPHIC COMMUNICATION

6.1 Use ANSWER SHEET 6.1 and draw to scale 1 : 20 the front elevation of a South African roof truss (Howe truss) of which all members are joined by using gang nails.

Use the following specifications:

- Pitch of truss: 30°
 - Length of the tie beam: 4 metres (4 000 mm)
 - All timber for roof truss: 114 mm x 38 mm
 - Eaves overhang: 300 mm
- (13)

Show any TWO labels on your drawing. (2)

6.2 FIGURE 6.2 below shows a line diagram of a floor plan of a Civil Technology workshop.

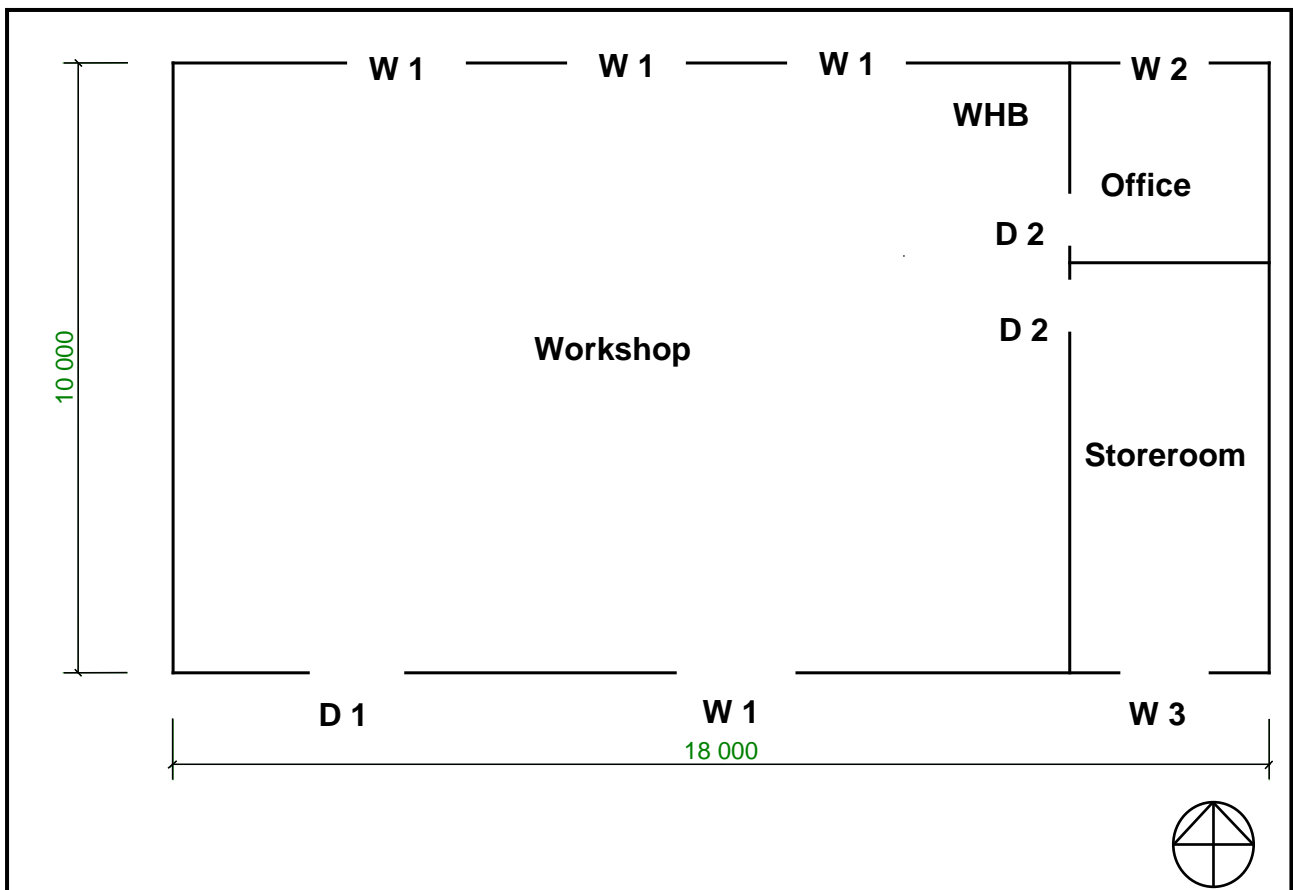


FIGURE 6.2

6.2.1 Draw the floor plan of the workshop to scale 1 : 100 on ANSWER SHEET 6.2.

6.2.2 Draw the windows and doors on the floor plan in the spaces as indicated on the line diagram.

Specifications:

Measurements of workshop:

- Use measurements as shown on the line diagram.
- Inside measurements of office are 3 000 mm x 3 000 mm.
- External walls are 220 mm thick.
- Internal walls are 110 mm thick.

	WIDTH	HEIGHT
Window 1 (W1)	2 000 mm	1 200 mm
Window 2 (W2)	1 500 mm	900 mm
Window 3 (W3)	1 500 mm	600 mm
Door 1 (D1)	1 600 mm	2 000 mm
Door 2 (D2)	900 mm	2 000 mm

6.2.3 Draw the drawing symbol for a hand basin on the floor plan in the space as indicated on the line diagram.

6.2.4 Design and draw the top view of a hipped roof in dashed lines on the floor plan on ANSWER SHEET 6.2. The eaves overhang is 450 mm.

6.2.5 Show TWO dimensions on the eastern side of the workshop.

6.2.6 Insert the title and scale.

(25)
[40]

TOTAL: 200

ANSWER SHEET 1.3

CENTRE NUMBER:

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EXAMINATION NUMBER:

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QUESTION 1.3

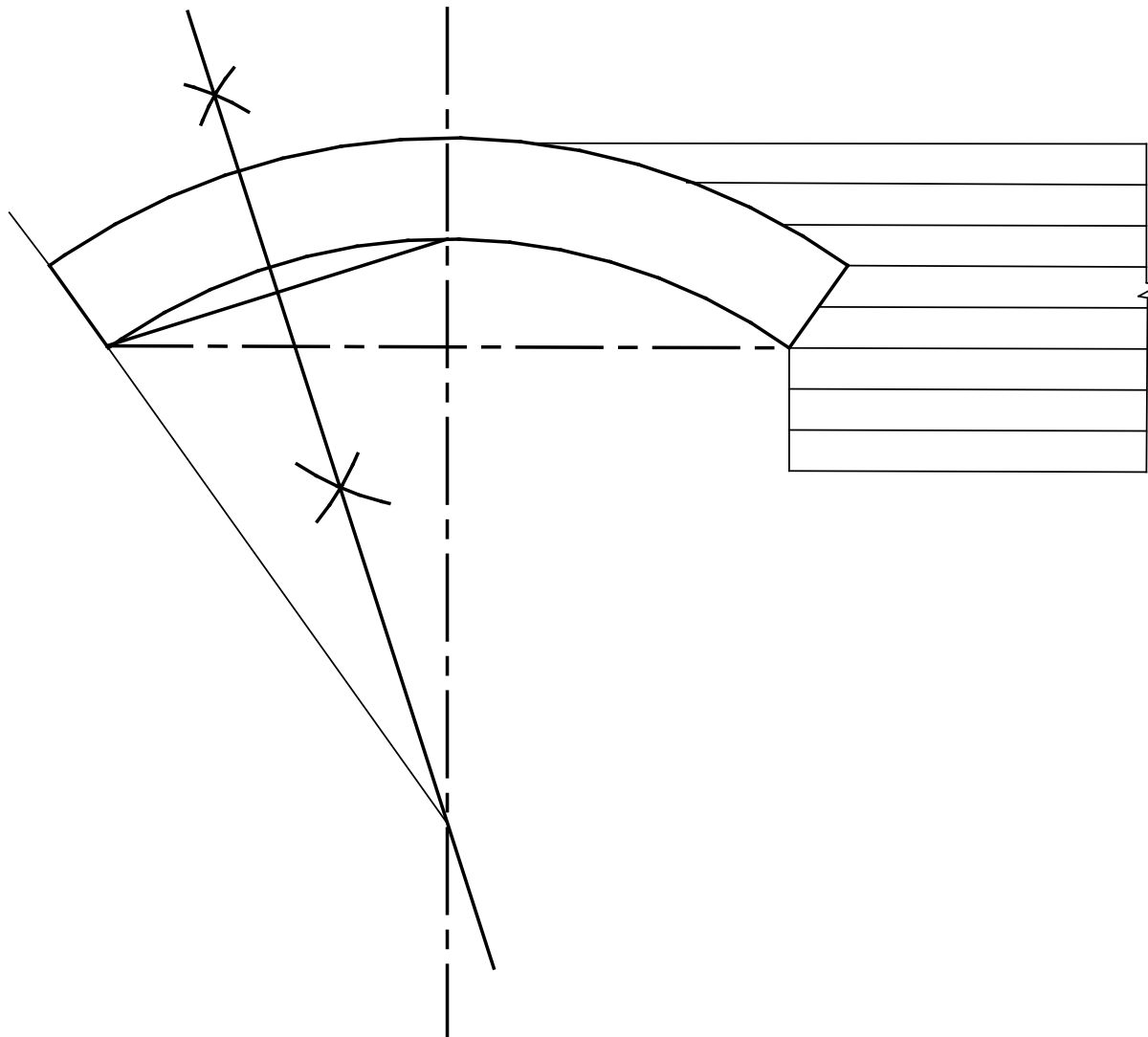
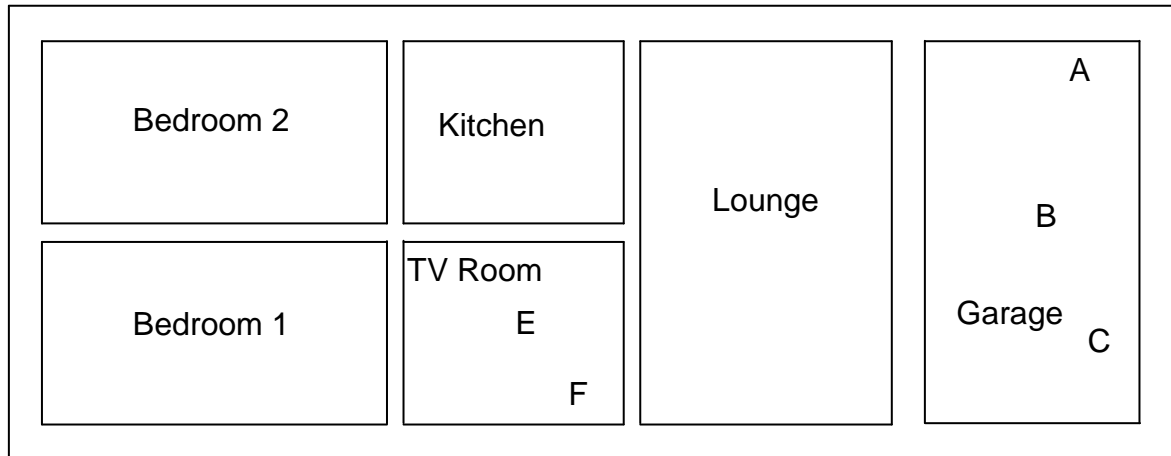


FIGURE 1.3

ASSESSMENT CRITERIA	MARKS	LEARNER'S MARK
Voussoirs	3	
Key voussoir	1	
Surrounding brickwork	1	
Rise (indicate and label)	1	
Span (indicate and label)	1	
Intrados (indicate and label)	1	
Extrados (indicate and label)	1	
Total	9	

ANSWER SHEET 3.4CENTRE NUMBER: EXAMINATION NUMBER: **QUESTION 3.4****FIGURE 3.4**

D

ANSWER SHEET 4.3

CENTRE NUMBER:

--	--	--	--	--	--	--	--	--	--

EXAMINATION NUMBER:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

QUESTION 4.3

A	B	C	D
			Area of wall before deductions
			Area of window 1
			Area of window 2
			Total area of wall excluding windows
			Number of bricks
			5% wastage and breakage
			Total number of bricks

ANSWER SHEET 6.1

CENTRE NUMBER:														
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EXAMINATION NUMBER:																				
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QUESTION 6.1

ASSESSMENT CRITERIA	MARKS	LEARNER'S MARK
Rafter	2	
King post	1	
Strut	2	
Queen post	2	
Tie beam	1	
Neatness	2	
Application of scale	3	
Any TWO labels	2	
Total	15	

FORMULA SHEET

IMPORTANT ABBREVIATIONS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTIONS	SYMBOL	DESCRIPTION
G	Centre of gravity	h	Height	d	Diameter
C	Centroid	b	Breadth/Width	r	Radius
L	Length	s	Side	A	Area
π	Pi = $\frac{22}{7} = 3,142$	\emptyset	Diameter	V	Volume

FORMULAE

AREA OF	FORMULA (in words)	FORMULA (in symbols)	FORMULA FOR THE POSITION OF CENTROIDS	
			X-axis	Y-axis
Square	side x side	s x s	$\frac{s}{2}$	$\frac{s}{2}$
Rectangle	length x breadth	l x b	$\frac{l}{2}$	$\frac{b}{2}$
Right-angled triangle	$\frac{1}{2}$ x base x height	$\frac{1}{2}b \times h$	$\frac{b}{3}$	$\frac{h}{3}$
Equilateral triangle/ Pyramid	$\frac{1}{2}$ x base x height	$\frac{1}{2}b \times h$	$\frac{b}{2}$	$\frac{h}{3}$
Circle	π x radius x radius	πr^2	Centroid is in the centre	
Circle	π x diameter x diameter divided by 4	$\frac{\pi d^2}{4}$		
Semi-circle	π x radius x radius divided by 2	$\frac{\pi r^2}{2}$	Centroid is 0,424r on the centre line	

$$\text{Position of centroid} = \frac{(A1 \times d) \pm (A2 \times d)}{\text{Total area}}$$

OR

$$X = \frac{\sum Ay}{\sum A}$$



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GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2012

MEMORANDUM

MARKS: 200

This memorandum consists of 15 pages.

QUESTION 1: LO3 AS 1, 2, 4, 5, 7, 10

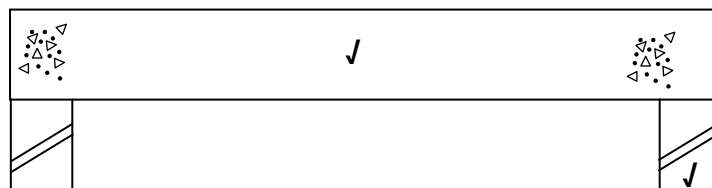
1.1

1.1.1	D	A flat plate with many spikes used in roof-truss construction ✓
1.1.2	H	Longest vertical member that determine the height of the roof truss ✓
1.1.3	B	A length of material used to conceal the gap between the wall and the ceiling ✓
1.1.4	G	Is used to cover the gap between the roof covering at the highest point of the roof ✓
1.1.5	C	Slope/angle/fall of the roof ✓

ONE '✓' FOR EACH CORRECT ANSWER. **Do not** penalise the candidate if he/she has written the description. (5)

1.2

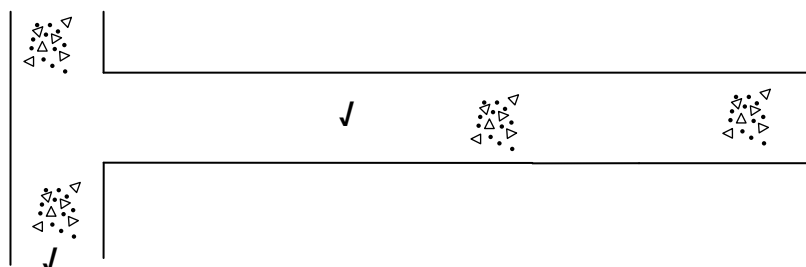
1.2.1



Simple supported slab

Note: If a candidate show columns as support, it will also be correct. (2)

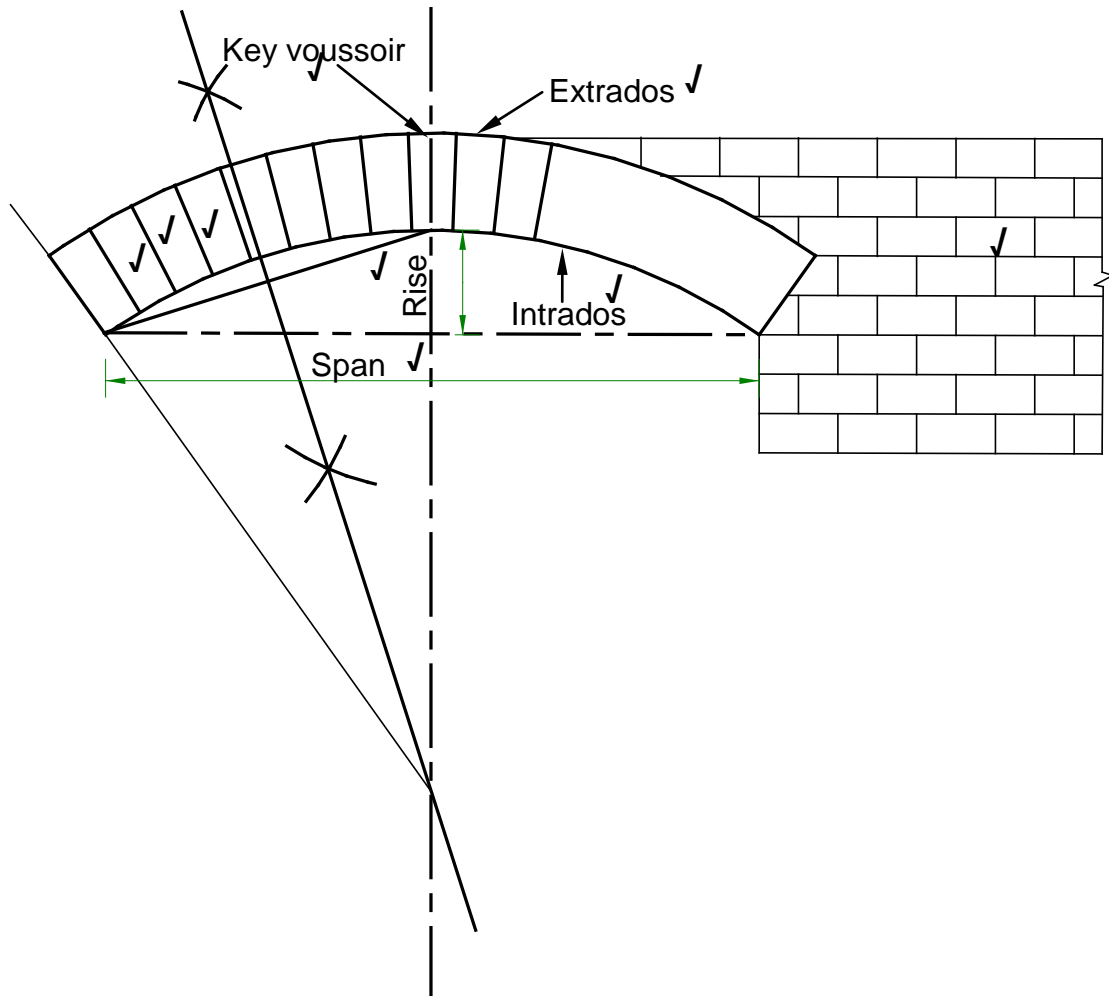
1.2.2



Cantilever slab

(2)

1.3



1 Mark to be given if voussoirs are vertical lines.

ASSESSMENT CRITERIA	MARKS	LEARNER'S MARK
Voussoirs	3	
Key voussoir label	1	
Brickwork	1	
Rise	1	
Span	1	
Intrados	1	
Extrados	1	
TOTAL	9	

(9)

1.4

- 1.4.1 A Eaves/Fascia/tilting batten/overhang ✓
- 1.4.2 B Rafter/Full truss ✓
- 1.4.3 C Ridge/ridge beam ✓
- 1.4.4 D Hip rafter ✓
- 1.4.5 E Half truss or common rafter ✓
- 1.4.6 F Jack rafter/Short rafter ✓
- 1.4.7 G Valley/valley gutter ✓

(7)

- 1.4.8 Gable roof ✓ (1)
- 1.4.9 1 400 mm or 1 350 mm ✓ (1)
- 1.5
- 1.5.1 Hemp or TFT tape (Teflon tape)/thread tape/yarn ✓ (1)
OR ANY OTHER ACCEPTABLE ANSWER (silicone not accepted)
- 1.5.2 Cover the threaded part of pipes with teflon tape or hemp in a clockwise direction. ✓
Screw in a straight socket (fitting) to the thread on one pipe using two monkey wrenches. ✓
Screw in the second pipe (threaded part) into the other side of the straight socket (fitting) using two monkey wrenches.
Tighten properly.
ANY TWO OF THE ABOVE (2)
- [30]**

QUESTION 2: LO3 AS3, 4, 5, 7

2.1

- 2.1.1 A Floor slab ✓
B concrete (symbol for concrete) ✓
C Reinforcing mesh/main bars ✓
D Shutter board/soffit board ✓
E Bearer/Joist ✓
F Prop/post/pole ✓
G Wedges ✓
H Sole plate ✓ (8)
- 2.1.2 Concrete is weak in tensile strength and the most ✓ tension in the floor slab will occur at the bottom due to bending and the reinforcing will serve no purpose when placed on the top. ✓ (2)
- 2.1.3 G – To assist with the alignment of formwork; ✓
to secure the prop in position;
to ease dismantling
ANY ONE OF THE ABOVE (1)
- 2.1.4 H – To prevent props from sagging; ✓
to distribute the load to the load-bearing surface
ANY ONE OF THE ABOVE (1)

2.2

- 2.2.1 Main bars – to act against the tensile forces. ✓✓ (2)
- 2.2.2 Stirrups/Binders ✓ (1)

2.3

CRITERIA	STRIP FOUNDATION	SHORT BORED PILES
Preparation of foundation	Trenches are dug by workers using shovels and picks or mechanical diggers ✓	Pile holes are drilled into the earth with an auger type bit or drill ✓
Concrete filling	Concrete is poured by hand using a wheelbarrow or by ready-mix ✓	Concrete is forced into the hole by gravitational forces ✓

(4)

2.4

- 2.4.1 $1,788 \text{ m} - 1,482 \text{ m} \checkmark$ or $1,482 \text{ m} - 1,788 \text{ m}$
 $= 0,306 \text{ m} \checkmark$ $= -0,306 \text{ m}$ (2)

- 2.4.2 1,788 m – 1,526 m or 1,526 m – 1,788 m ✓
 = 0,262 m or – 0,262 m ✓ (2)
- 2.4.3 Intermediate sight ✓ (1)
- 2.4.4 Rise ✓ (1)

2.5.1
and
2.5.2

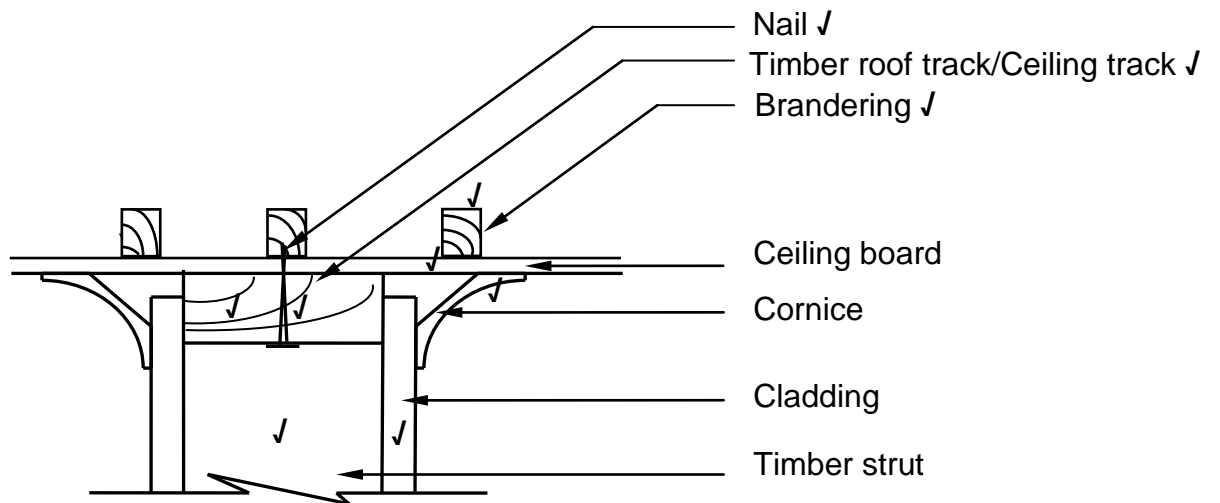


FIGURE 2.5

ASSESSMENT CRITERIA	MARKS
Brandering	1
Ceiling board	1
Top rail/Timber roof track/ceiling track	1
Nail/Screw	1
Timber strut vertical	1
Cladding	1
Cornice	1
Any three labels	3
Total	10

(10)

- 2.5.3 Gypsum board ✓
- Chipboard/Veneered board ✓
- Supawood/Medium-density fibre board
- Hardboard/Masonite
- Plywood
- Shutter board
- SA Pine

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

(2)

- 2.6 Check power tool cable for damage. ✓
Ensure that the power tool cable lies outside the working area. ✓
See that the power supply is properly earthed.
Don't work near water with power tool
Moving part, Must be kept away from the body.
Switch off power supply and disconnect the power tool when making adjustments.
Hold power tool securely and firmly when using it.
Remove all jewellery and loose clothing.
Use safety goggles to protect your eyes.
Report any defects immediately.

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (2)

- 2.7 Square shape ✓ (1)
[40]

QUESTION 3: LO 3 AS 5, 8

- 3.1 3.1.1 B ✓ (1)
- 3.1.2 A ✓ (1)
- 3.1.3 C ✓ (1)
- 3.1.4 C ✓ (1)
- 3.1.5 B ✓ (1)

3.2

ADVANTAGES	DISADVANTAGES
Easily accessible ✓ Cheap ✓ Water supply is reliable ✓	Contamination from surface pollution. ✓ Although relatively reliable, it can dry up. ✓ Children can fall into the primitively dug well. ✓ Obtaining water from a cranked windlass can be slow

ANY OTHER ACCEPTABLE ANSWER

(6)

- 3.3 3.3.1 A Rodding eye / cover ✓
- B Pipe (110 mm) ✓
- C Junction (45°) ✓ (3)
- 3.3.2 Direction D ✓ (1)
- 3.3.3 It is for cleaning purposes so that the cleaning rods can enter the sewer line ✓
For easy access to the main sewer pipe.
- ANY ONE OF THE ABOVE** (1)
- 3.3.4 Gives access to the drain pipes ✓
Prevents foul gasses from the sewerage system entering the atmosphere
Prevents rain water, dirt, dust entering the sewer line
For safety purposes
- ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (1)
- 3.3.5 Cheaper than installing a manhole ✓
Smaller and look neater than a manhole ✓
- ANY OTHER ACCEPTABLE ANSWER** (2)

3.4

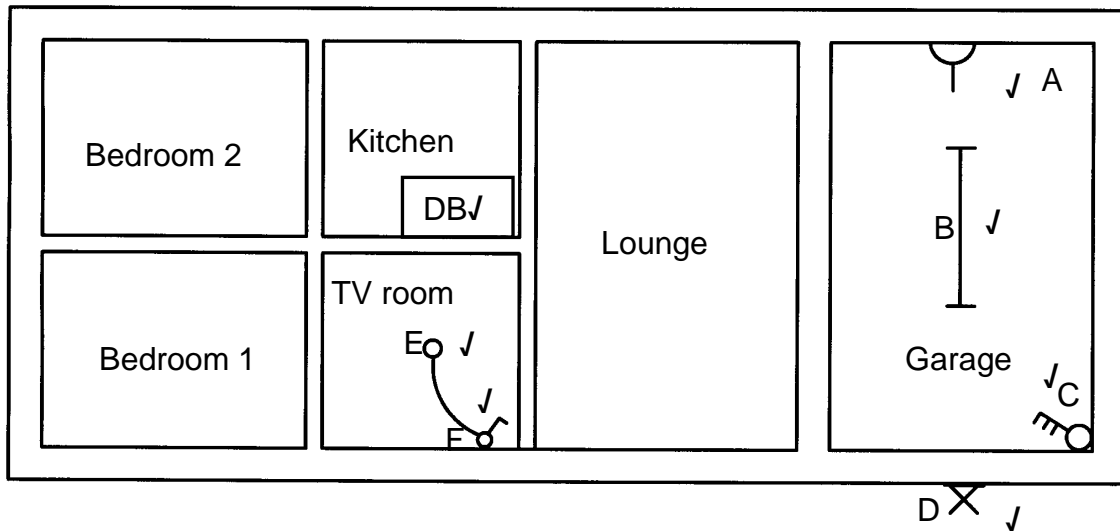


FIGURE 3.4

(7)

- 3.5
- Septic tank ✓ – Bacterial action dissolve sewage and excess fluids soak into the ground by means of a french drain ✓
 - Conservancy tank ✓ – Sewage stored in a tank and pumped out when nearing full capacity ✓
 - Pit toilet

ANY OTHER ACCEPTABLE ANSWER

(4)
[30]

4.3

A	B	C	D	
1/	6,0 m ✓	✓	Area of wall before deductions	
✓	<u>2,7 m</u> ✓	16,2 m ²	6 000 mm x 2 700 mm	(4)
1/	1,2 m ✓	✓	Area of window 1	
✓	<u>1,5 m</u>	1,8 m ²	1 200 mm x 1 500 mm	(3)
1/	1,2 m ✓	✓	Area of window 2	
✓	<u>0,6 m</u>	0,72 m ²	1 200 mm x 600 mm	(3)
			Total area of wall, excluding windows	
			16,2 m ² - 1,8 m ² - 0,72 m ²	
			= 13,68 m ² ✓	(1)
	✓		Number of bricks	
1/ ✓	13,68 m ²		110 bricks for 1 m ² of 220 mm wall	
	<u>110</u> ✓	1 504,8 ✓	1 505 bricks will be required	(4)
			5% wastage and breakages	
			1 505 bricks x 5%	
			75 or 76 bricks	
			Total number of bricks	
			1 505 bricks + 75 bricks ✓ or 1505 + 76	
			= 1 580 bricks ✓ = 1 581 bricks	
			or 1 505 x 1,05	
			= 1 580,25	
			= 1 580 bricks or 1 581 bricks	(2)

- 4.4 4.4.1 Breaking ✓ (1)
- 4.4.2 Angle iron ✓ (1)
- 4.4.3 Copper ✓ (1)
- 4.4.4 Galvanising ✓ (1)
- 4.4.5 Corrosive ✓ (1)
- [30]**

QUESTION 5: LO3 AS 5, 6

- 5.1.1 8 N ✓ (1)
- 5.1.2 20 N ✓ (1)
- 5.1.3 0 N ✓ (1)
- 5.1.4 3 m ✓✓ (2)
- 5.1.5 Upward forces = downward forces

$$22,5 \text{ N} + 15,5 \text{ N} = 10 \text{ N} + 8 \text{ N} + 20 \text{ N}$$

$$38 \text{ N} = 38 \text{ N}$$
 (2)
- 5.1.6 2 mm = 1 N ✓ (1)
- 5.1.7 SFa = 22,5 N ✓ (1)
- 5.1.8 SFb = $\overset{\checkmark}{22,5 \text{ N}} - \overset{\checkmark}{10 \text{ N}}$
= 12,5 N (Candidates must show steps) (2)
- 5.1.9 SFd = $22,5 \text{ N} - 10 \text{ N} - 8 \text{ N} - 20 \text{ N}$ ✓✓ or $12,5 - 8 - 20$
= -15,5 N = -15,5 N (2)
- 5.1.10 SFe = $22,5 \text{ N} - 10 \text{ N} - 8 \text{ N} - 20 \text{ N} + 15,5 \text{ N}$ ✓✓ or $-15,5 \text{ N} + 15,5$
= 0 N = 0 N (2)
- 5.1.11 Yes ✓ (1)

5.2

$$\begin{aligned}
 5.2.1 \quad \text{Area of figure A1} &= \frac{1}{2} b \times h \\
 &= \frac{1}{2} \times 60 \times 60 \\
 &= 30 \times 60 \\
 &= 1\,800 \text{ mm}^2 \\
 \\
 \text{Area of figure A2} &= l \times b \\
 &= 60 \times 60 \\
 &= 3\,600 \text{ mm}^2 \\
 \\
 \text{Total Area} &= 1\,800 \text{ mm}^2 + 3\,600 \text{ mm}^2 \\
 &= 5\,400 \text{ mm}^2 \\
 \\
 \text{Position of centroid from AB} &= \frac{(A_1 \times d) + (A_2 \times d)}{\text{Total area}} \\
 &= \frac{\begin{matrix} \text{JJ} & \text{JJ} & \text{JJ} & \text{JJ} \\ (1\,800 \times 80) + (3\,600 \times 30) \end{matrix} \text{ mm}^3}{5\,400 \text{ mm}^2 \text{ J}} \\
 &= \frac{144\,000 + 108\,000 \text{ mm}^3 \text{ J}}{5\,400 \text{ mm}^2} \\
 &= \frac{252\,000 \text{ mm}^3}{5\,400 \text{ mm}^2} \\
 &= 46,67 \text{ J mm J}
 \end{aligned}$$

OR

Take moments about A on Y-axis

$$\begin{aligned}
 5\,400 \text{ mm}^2 \times X &= \begin{matrix} \text{JJ} & \text{JJ} & \text{JJ} & \text{JJ} \\ (1\,800 \times 80) + (3\,600 \times 30) \end{matrix} \text{ mm}^3 \\
 5\,400 \text{ mm}^2 \times X &= 144\,000 + 108\,000 \text{ mm}^3 \\
 X &= \frac{252\,000 \text{ mm}^3 \text{ J}}{5\,400 \text{ mm}^2 \text{ J}} \\
 &= 46,67 \text{ J mm J}
 \end{aligned}$$

OR

Part	AREA (A)	X	AREA OF X Ax
Triangle	1 800 mm ² JJ	$\frac{h}{3} = \frac{60}{3} = 20 + 60 = 80 \text{ JJ}$	144 000 mm ³
Square	3 600 mm ² JJ	$\frac{S}{2} = \frac{60}{2} = 30 \text{ JJ}$	108 000 mm ³
Σ	5 400 mm ² J		252 000 mm ³ J

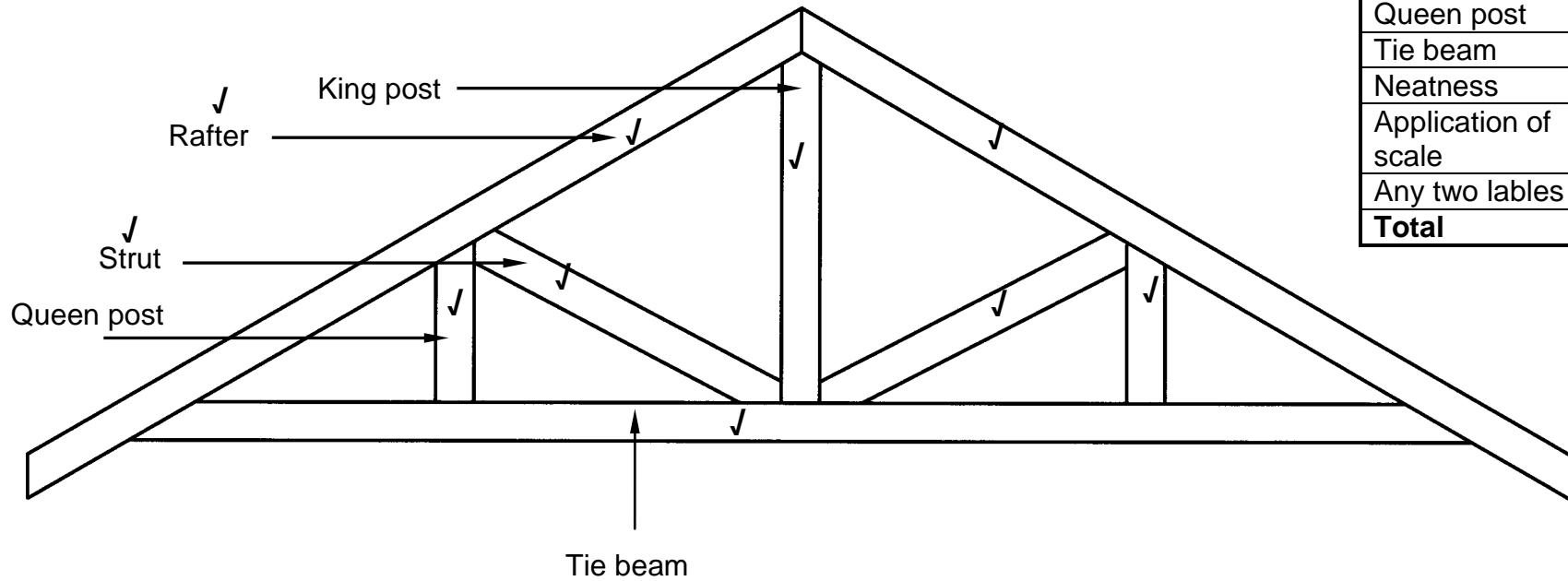
$$\begin{aligned}
 &\frac{\Sigma AX}{\Sigma A} \\
 &= \frac{252\,000 \text{ mm}^3}{5\,400 \text{ mm}^2} \\
 &= 46,67 \text{ J mm J}
 \end{aligned} \tag{12}$$

5.2.2 30 J mm J

(2)
[30]

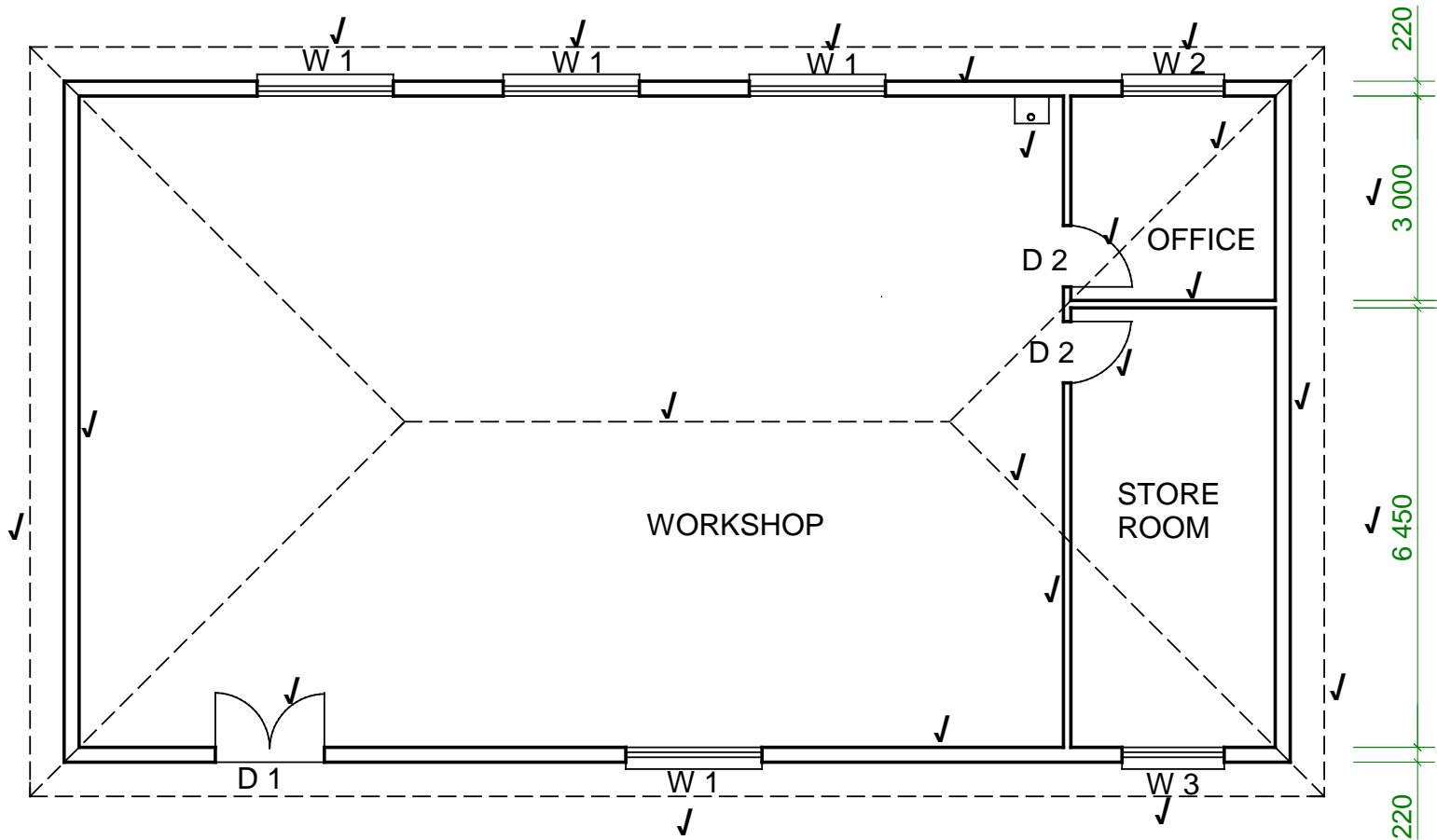
QUESTION 6: LO3 AS4, 5, 7, 8

ANSWER SHEET 6.1
QUESTION 6.1



Assessment criteria	Marks
Rafter	2
King post	1
Strut	2
Queen post	2
Tie beam	1
Neatness	2
Application of scale	3
Any two labels	2
Total	15

ANSWER SHEET 6.2
QUESTION 6.2



Assessment criteria	Marks
External walls	4
Internal walls	2
Windows	6
Doors	3
Roofline	4
WHB	1
Labelling	2
Any TWO dimensions	2
Neatness	1
Total	25

Door 1 can be a double door, sliding door or a roll up door

FLOOR PLAN ✓
SCALE 1 : 100 ✓

NOT TO SCALE