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SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

CIVIL TECHNOLOGY: CONSTRUCTION

2023

MARKS: 200

TIME: 3 hours

This question paper consists of 13 pages and 7 answer sheets.

REQUIREMENTS:

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

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX questions.
2. Answer ALL the questions.
3. Read ALL the questions carefully.
4. Answer each question as a whole. Do NOT separate subsections of questions.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Start the answer to EACH question on a NEW page.
7. Do NOT write in the margins of the ANSWER BOOK.
8. You may use sketches to illustrate your answers.
9. Write ALL calculations and answers in the ANSWER BOOK or on the attached ANSWER SHEETS.
10. Use the mark allocation as a guide to the length of your answers.
11. Make drawings and sketches in pencil, fully dimensioned and neatly finished off with descriptive titles and notes to conform to the *SANS/SABS Code of Practice for Building Drawings*.
12. For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
13. Use your own discretion where dimensions and/or details have been omitted.
14. Answer QUESTIONS 2, 3.3, 3.4, 4.9, 5.7, 6.6 and 6.7 on the attached ANSWER SHEETS using drawing instruments, where necessary.
15. 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.
16. Drawings in the question paper are NOT to scale due to electronic transfer.
17. Google Images was used as the source of all photographs and pictures.
18. Write neatly and legibly.

QUESTION 1: OHS, MATERIALS, TOOLS, EQUIPMENT AND JOINING (GENERIC)

Start this question on a NEW page.

- 1.1 FIGURE 1.1 below shows a temporary platform that is currently not suitable for use in the building environment.

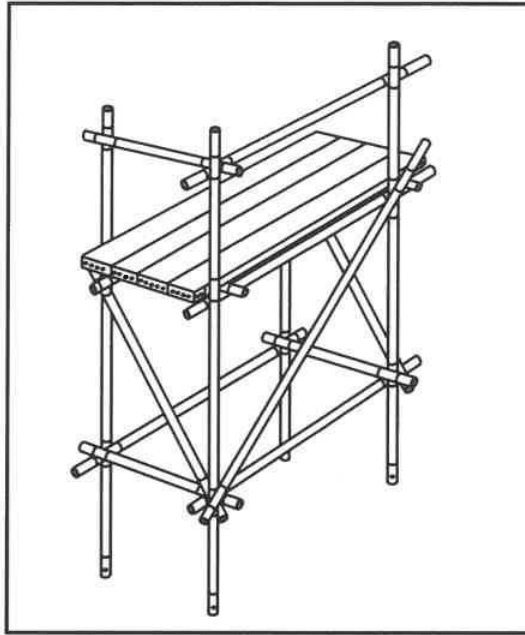


FIGURE 1.1

- 1.1.1 Identify THREE parts that have been omitted from the structure that will negatively impact on the safety of workers. (3)
- 1.1.2 Predict what could happen if the platform is used as shown in FIGURE 1.1. (2)
- 1.2 Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question numbers (1.2.1 to 1.2.5) in the ANSWER BOOK, e.g. 1.2.6 casement.
- 1.2.1 Oil-based paint can be applied to protect ferrous metal against (shrinkage/rust/bending). (1)
- 1.2.2 Galvanising is the process to cover iron or steel with a layer of (aluminium/lead/zinc). (1)
- 1.2.3 The strength of concrete can be increased by (adding lime/keeping it moist/drying it quickly). (1)
- 1.2.4 Electroplating is the process of coating (metal/lead/plastic) with a thin layer of another material. (1)
- 1.2.5 Powder coating is the process of applying a (plastic/aluminium/copper) finish in powder form. (1)

- 1.3 Explain why it is advisable to keep the height of the guard rails between 900 to 1 000 mm above the scaffold working platform. (1)
- 1.4 Describe ONE precaution that must be adhered to when storing a ladder. (1)
- 1.5 Workers and materials are in a builder's hoist. Describe ONE check that the operator needs to perform before the builder's hoist moves. (1)
- 1.6 Explain why the fire-fighting measures must be stated in the material safety data sheet of hazardous chemical substances. (1)
- 1.7 FIGURE 1.7 below shows joining fixtures.

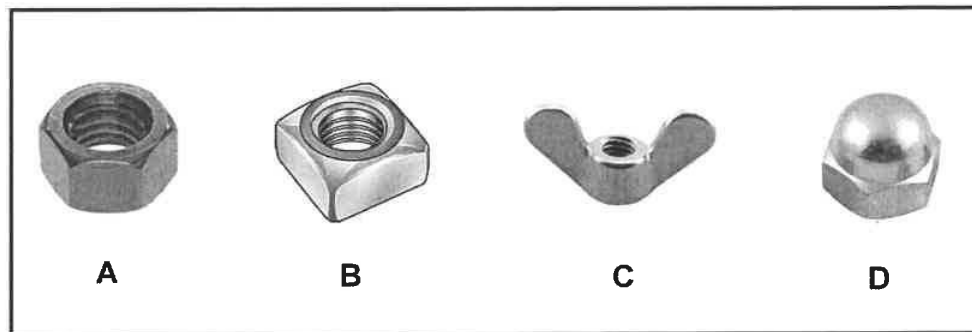


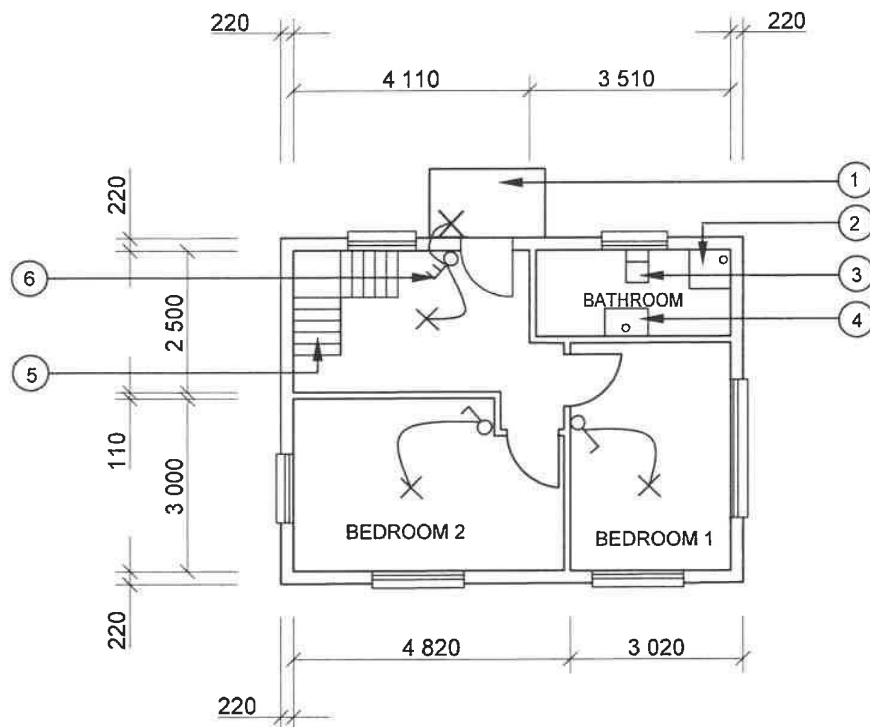
FIGURE 1.7

- Identify A to D. (4)
- 1.8 A new building is being erected. Name the tool that can be used to:
- 1.8.1 Check if the height of doors and windows is at the same level (1)
- 1.8.2 Measure levels and slopes (1)
- [20]**

QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)

Start this question on a NEW page.

FIGURE A and FIGURE B on the next page show drawings that appear on a building plan. Analyse the drawings and complete the table on ANSWER SHEET 2.

**FIGURE A****NOTES:**

Contractors must verify all dimensions and levels on site before commencing work.
Architects to be notified immediately of any discrepancies.

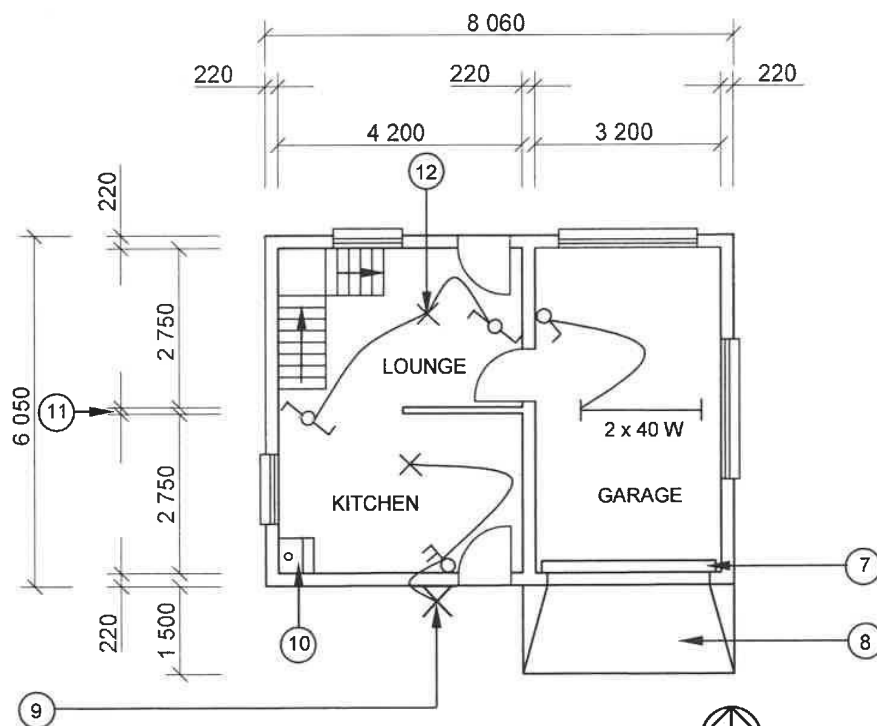
Wall thickness: External = 220 mm
Internal = 110 mm

Architect's signature

Client's signature

Concrete stairs according to the engineer's specifications.

The ramp is finished off with paving.

**FIGURE B**

REVISION 1	DATE: 26/03/2023	DRAWING OF STAIRCASE
REVISION 2	DATE: 28/03/2023	DRAWING OF LIGHT FITTINGS
PRINTED BY: XENO PRINTERS		DATE OF PRINT: 30/03/2023
DRAWING TITLE: FLOOR PLANS PLOT 48		
PROJECT: PROPOSED DWELLING ON PLOT 48, BENONI		
PROJECT NO.: GR 488-820		DRAWING NO.: 226P7
DATE: 24/08/2023	DRAWN: KB BAM	CHECKED: P KRIEL
FLOOR PLANS		SCALE 1 : 100
REFERENCE CODE: QP 8 – 2023		

[40]

QUESTION 3: ROOFS, STAIRCASES AND JOINING (SPECIFIC)

Start this question on a NEW page.

- 3.1 Differentiate, by means of a labelled freehand drawing, between a *tread* and *rise* of a staircase. (4)
- 3.2 Name TWO types of roof trusses that do NOT use tie beams. (2)
- 3.3 Use ANSWER SHEET 3.3 and complete the sketch to show how a roof truss is joined to a wall by using a hoop iron strap. Print any ONE label. (8)
- 3.4 Use ANSWER SHEET 3.4 and differentiate, according to scale 1 : 10, between the ridge construction of a *South African (Howe) roof truss* and the ridge construction of a *closed couple roof truss*. (16)
- The pitch of the roofs is 30°. [30]

QUESTION 4: EXCAVATIONS, FORMWORK, TOOLS, EQUIPMENT AND MATERIALS (SPECIFIC)

Start this question on a NEW page.

- 4.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–L) next to the question numbers (4.1.1 to 4.1.8) in the ANSWER BOOK, e.g. 4.1.9 M.

COLUMN A		COLUMN B	
4.1.1	Soffit board	A	spaced approximately 1 m apart
4.1.2	Cleat	B	applied to inside of formwork to ease the striking
4.1.3	Tie	C	member that keeps the sides of formwork in place
4.1.4	Brace/Strut	D	used to level the formwork
4.1.5	Fixing plate	E	not adaptable or available in specific sizes
4.1.6	Props	F	an anchor that prevents the bottom of the cleats from moving
4.1.7	Folding wedges	G	diagonal member of formwork
4.1.8	Releasing oil/Form oil	H	for a concrete beam it can be placed 4 m apart
		I	prevents the top of shutter board sides from deforming
		J	close-fitting along seams and joints
		K	base of formwork that carries the load of wet concrete
		L	applied to the outside of the formwork for striking

(8 x 1) (8)

- 4.2 Name ONE property of EACH of the following:

- 4.2.1 Galvanised sheet metal (1)
- 4.2.2 Low-carbon steel (1)
- 4.2.3 High-carbon steel (1)

- 4.3 Name THREE methods of fixing cladding to a wall. (3)
- 4.4 FIGURE 4.4 below shows the outcome of a test carried out on concrete.

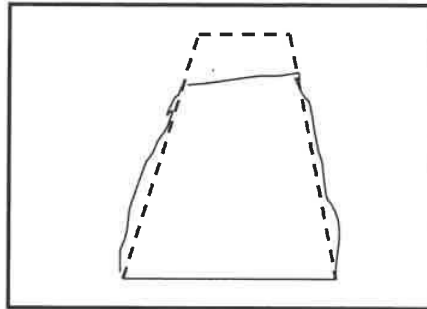


FIGURE 4.4

- 4.4.1 Name the type of test that was carried out on the concrete. (1)
- 4.4.2 Identify the outcome of the test. (1)
- 4.4.3 Explain the reason for the outcome. (1)
- 4.5 Name THREE services that should be located before excavations start. (3)
- 4.6 Predict what would happen if heavy rain occurs during the excavation of a trench. (2)
- 4.7 Explain why a worker is not allowed to work alone in an excavation. (1)

- 4.8 FIGURE 4.8 below shows a construction machine that is used when laying paving.



FIGURE 4.8

- 4.8.1 Identify this machine. (1)
- 4.8.2 Describe how you should operate this construction machine without injuring yourself. (2)
- 4.9 FIGURE 4.9 on ANSWER SHEET 4.9 shows an incomplete drawing of the formwork for a concrete beam with a concrete floor slab on the LEFT SIDE. (14)
- Use ANSWER SHEET 4.9 and draw the completed formwork for the beam and floor slab. [40]

QUESTION 5: PLASTER AND SCREED, BRICKWORK AND GRAPHICS AS MEANS OF COMMUNICATION (SPECIFIC)

Start this question on a NEW page.

- 5.1 Recommend the ratio that will be used to obtain a smooth plaster finish for interior walls, using one bag of cement. (2)
- 5.2 In chronological order, explain the first THREE steps to prepare a concrete floor to receive the screed. (3)
- 5.3 Explain the term *monolithic screed*. (1)
- 5.4 Explain how you will plaster the stop end of a wall in chronological order. (4)
- 5.5 State TWO advantages of a gauged arch. (2)
- 5.6 Draw in the ANSWER BOOK a neat sketch showing half of a wooden turning piece for a semi-circular arch with open laggings. (4)
- 5.7 ANSWER SHEET 5.7 shows the outlines of two consecutive brick courses of a one-and-a-half-brick pier built in English bond.
- Use ANSWER SHEET 5.7 and complete the pictorial views of the consecutive brick courses. (14)
- [30]**

QUESTION 6: REINFORCEMENT IN CONCRETE, FOUNDATIONS, CONCRETE FLOORS AND QUANTITIES (SPECIFIC)

Start this question on a NEW page.

6.1 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 numbers (6.1.1 to 6.1.5) in the ANSWER BOOK, e.g. 6.1.6 D.

6.1.1 Pre-cast piling can be used in ...

- A stable ground.
 - B constantly wet areas.
 - C dry areas.
 - D None of the above-mentioned
- (1)

6.1.2 The equipment for the installation of piles can be mounted on ...

- A trucks.
 - B cranes.
 - C pick-up trucks.
 - D A and B only
- (1)

6.1.3 A ... hammer can be used to drive a pre-cast concrete pile into the ground.

- A drop
 - B club
 - C claw
 - D sledge
- (1)

6.1.4 A pile foundation is used to ...

- A float on the ground as one concrete unit.
 - B support light loads.
 - C distribute the load across to more stable ground.
 - D construct the foundation in a series of steps.
- (1)

6.1.5 ... is not a category of pile foundations.

- A Pre-cast concrete piles
 - B Long-bored piles
 - C Driven in-situ piles
 - D Steel-tube caisson piles
- (1)

- 6.2 Draw in your ANSWER BOOK a neat freehand sketch of the concrete plug of an enlarged base when installing driven in-situ piles.

Indicate the symbol for concrete in the enlarged base. (5)

- 6.3 Name the different components that a rib and block floor consists of. (4)

- 6.4 Predict what could happen if the temporary props are removed a day after the concrete has been cast on the rib and block floor. (1)

- 6.5 Reinforcement is indicated on construction drawings with a code.

Explain the meaning of these sections in the following code: 4 R 20 03 250

6.5.1 4 (1)

6.5.2 20 (1)

6.5.3 250 (1)

- 6.6 FIGURE 6.6 on ANSWER SHEET 6.6 shows the outline of three sides of an L-shaped concrete column.

Use ANSWER SHEET 6.6 and draw a neat sectional view of the L-shaped reinforced concrete column with 8 main bars, stirrups and minimum concrete cover.

Print any TWO labels and indicate the minimum concrete cover. (12)

- 6.7 FIGURE 6.7 below shows the floor plan of a building with a window and a door.

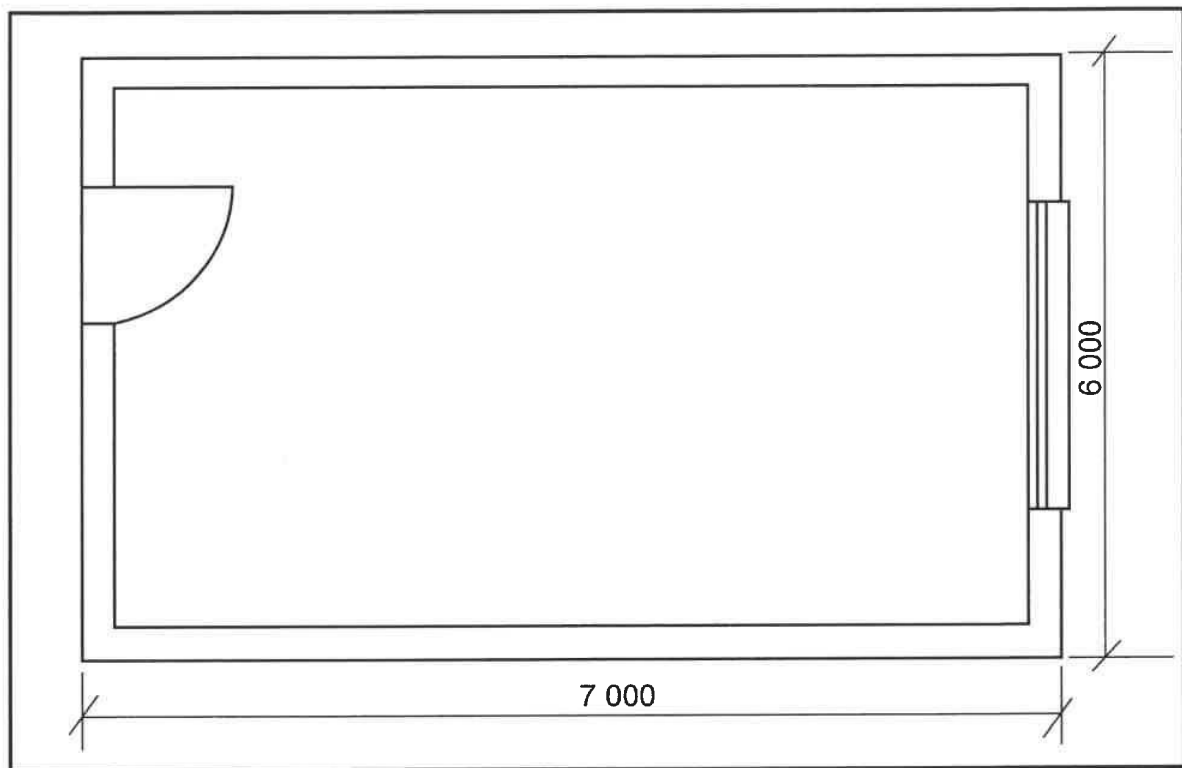


FIGURE 6.7

Use the following specifications:

- The blinding layer is 40 mm thick
- The wall thickness is 220 mm

Use the dimension paper on ANSWER SHEET 6.7 and calculate the volume of the blinding layer. Round off your answers to TWO decimals.

(9)

NOTE: Marks will be awarded for the correct use of the dimension paper.

(1)

[40]

TOTAL: 200

CENTRE NUMBER:

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EXAMINATION NUMBER:

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ANSWER SHEET 2

NO.	QUESTIONS	ANSWERS	MARKS
1	Name the FIGURE that represents the first floor. Give ONE reason for your answer.		2
2	Deduce from the building plan the number of windows in the building.		1
3	Identify number 1.		1
4	Identify number 2.		1
5	Identify number 6.		1
6	Identify number 8.		1
7	Identify number 9.		1
8	Identify number 10.		1
9	Identify the number that indicates the garage door.		1
10	Deduce from the building plan the omitted dimension of number 11.		1
11	Deduce from the building plan the material that must be used for number 5.		1

CENTRE NUMBER:

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12	Give the abbreviations for the following: • Number 3 • Number 4	Number 3: Number 4:	2
13	Describe the purpose of a two-way switch.		2
14	Recommend an appropriate floor covering for the kitchen.		1
15	Who was responsible for the checking of the drawing?		1
16	Deduce ONE fault in the bathroom in FIGURE A.		1
17	Name an alternative light source that can be used during load shedding for a dwelling.		1
18	State what was done during revision 1 and revision 2 of the house plan.	Revision 1: Revision 2:	2
19	Name the finish for the ramp as prescribed by the architect.		1
20	Draw the symbol for a damp-proof membrane.	<table border="1" style="width: 150px; height: 40px; margin: auto;"></table>	2
21	Draw the symbol for finished wood.	<table border="1" style="width: 150px; height: 40px; margin: auto;"></table>	2
22	Draw the symbol for hardcore filling.	<table border="1" style="width: 150px; height: 40px; margin: auto;"></table>	2

CENTRE NUMBER:

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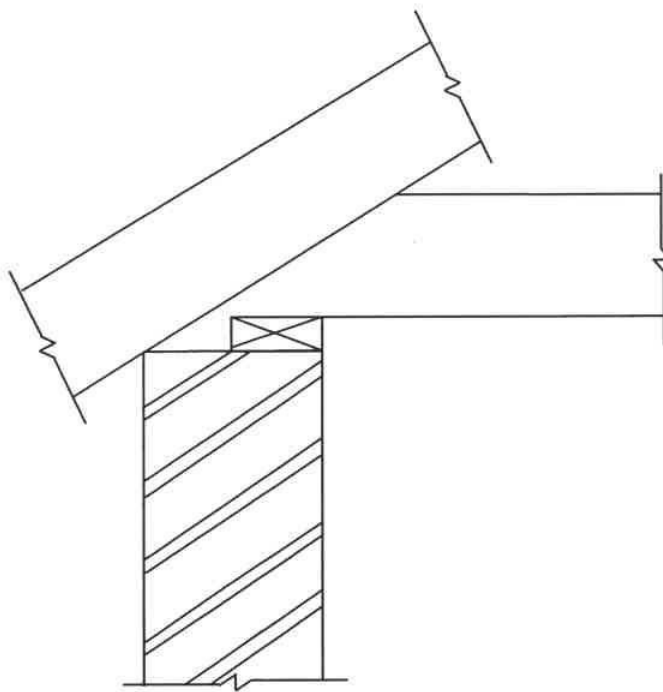
23	Prove, by means of a control test, that the total horizontal dimensions on the top and bottom of the plan in FIGURE A are the same.		8
24	Calculate the area of the floor plan in FIGURE B. Show ALL the calculations. Give your answer in m ² . Round off your answers to TWO decimal places.		3
		TOTAL:	40

CENTRE NUMBER:

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EXAMINATION NUMBER:

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ANSWER SHEET 3.3

ASSESSMENT CRITERIA	MARK	CM
Correctness of joining	1	
Members	5	
Any ONE label	1	
TOTAL:	7	

CENTRE NUMBER:

[illegible]

ANSWER SHEET 3.4

[illegible]

RIDGE CONSTRUCTION OF A SA (HOWE) ROOF TRUSS

ASSESSMENT CRITERIA	MARK	CM
Correctness of ridge construction of roof	1	
Members	6	
Application of scale	1	
TOTAL:	8	

[illegible]

RIDGE CONSTRUCTION OF A CLOSED COUPLE ROOF TRUSS

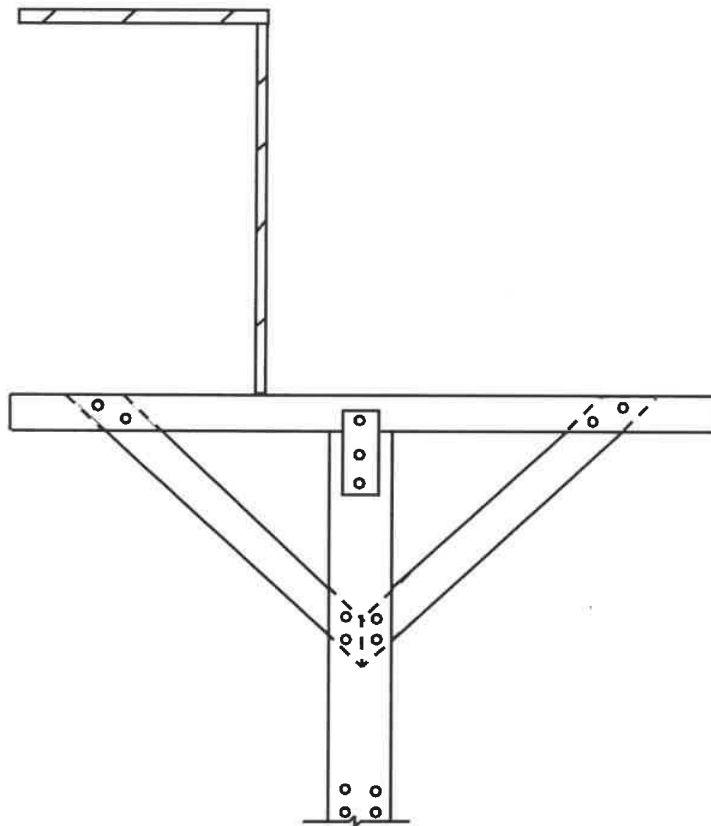
ASSESSMENT CRITERIA	MARK	CM
Correctness of ridge construction of roof	1	
Members	6	
Application of scale	1	
TOTAL:	8	

CENTRE NUMBER:

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EXAMINATION NUMBER:

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ANSWER SHEET 4.9**FIGURE 4.9**

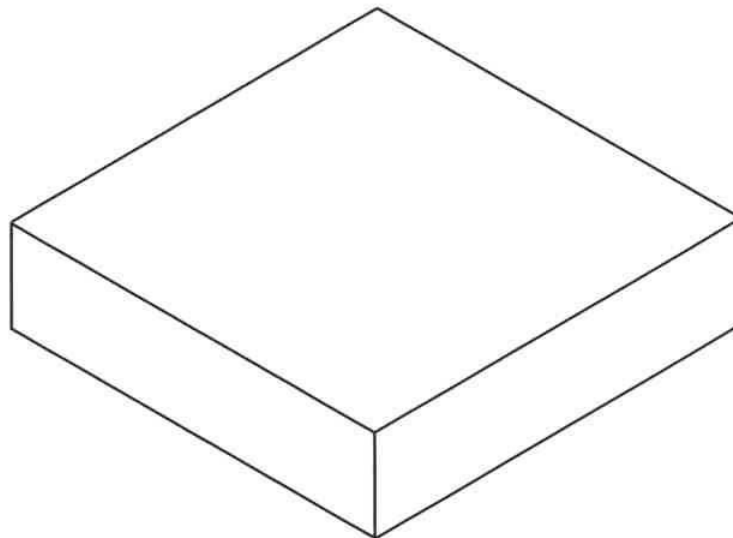
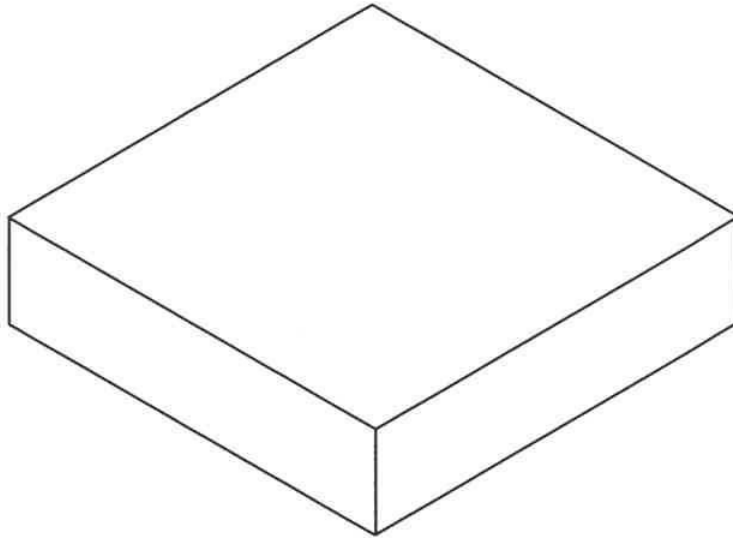
ASSESSMENT CRITERIA	MARK	CM
Correctness of formwork	2	
Members	12	
TOTAL:	14	

CENTRE NUMBER:

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EXAMINATION NUMBER:

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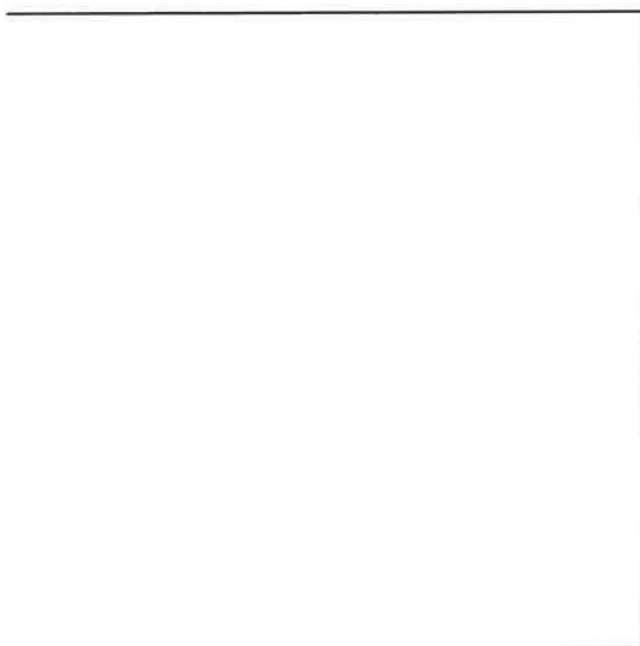
ANSWER SHEET 5.7

ASSESSMENT CRITERIA	MARK	CM
Correctness of courses	2	
First course	6	
Second course	6	
TOTAL:	14	



CENTRE NUMBER:									
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EXAMINATION NUMBER:															
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ANSWER SHEET 6.6

ASSESSMENT CRITERIA	MARK	CM
Correctness of L-shaped column	2	
Completed column and members	8	
Any TWO labels	2	
TOTAL:	12	

CENTRE NUMBER:							
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[illegible]

ANSWER SHEET 6.7

DIMENSION PAPER

[illegible]