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NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY: CIVIL SERVICES

NOVEMBER 2023

MARKS: 200

TIME: 3 hours

This question paper consists of 14 pages and 4 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, 3.6, 5.4 and 6.8 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: OHSA, MATERIALS, TOOLS, EQUIPMENT AND JOINING (GENERIC)

Start this question on a NEW page.

- 1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.12) in the ANSWER BOOK, e.g. 1.1.13 D.

1.1.1 Electroplating is the process of ...

- A applying a plastic coating on metal using electrolysis.
- B coating a metal with another metal using electrolysis.
- C applying paint to a metal by means of magnetism.
- D applying liquid zinc to a metal using pressure.

(1)

1.1.2 The process of keeping freshly cast concrete damp will ...

- A provide concrete with more volume.
- B make concrete more watertight.
- C increase the risk of cracking concrete.
- D lead to poor bonding of concrete.

(1)

1.1.3 Why would you coat a metal with a layer of paint?

- A To resist extreme temperatures
- B To prevent corrosion
- C To prevent warping
- D Only A and B

(1)

1.1.4 The minimum size of a wooden scaffold plank:

- A 300 mm wide x 60 mm thick
- B 238 mm wide x 12 mm thick
- C 150 mm wide x 20 mm thick
- D 228 mm wide x 38 mm thick

(1)

1.1.5 When using a scaffold, it must be inspected to ensure that ...

- A the scaffold is not attached to the building.
- B the scaffold platform is supported every 4 m.
- C the scaffold is free from any defects.
- D All the above-mentioned

(1)

1.1.6 ... of scaffolds should be secured vertically.

- A Transoms
- B Diagonal braces
- C Standards
- D Base plates

(1)



- 1.1.7 The guard rail on a scaffold will ensure that ...
A a worker does not fall from the scaffold.
B tools do not fall from the scaffold.
C the scaffold is stable.
D the scaffold is braced. (1)
- 1.1.8 Toe boards must be at least 150 mm high from the level of the ...
A scaffold platform.
B guard rail.
C horizontal transoms.
D base plate. (1)
- 1.1.9 The employer must ensure that the rungs of wooden ladders are ...
A not painted.
B free from grease.
C not cracked.
D All the above-mentioned (1)
- 1.1.10 The material safety data sheet for hazardous chemicals must have the following information:
A Quantity in the container
B Cost of the chemicals
C Disposal considerations
D Manufacturing process (1)
- 1.1.11 Stairways must be installed at a minimum of ... degrees from the horizontal.
A 50
B 30
C 40
D 60 (1)
- 1.1.12 The purpose of the builder's hoist is to transport ...
A workers and materials.
B materials and heavy construction machines.
C equipment and heavy machines.
D materials and furniture. (1)

- 1.2 You have been tasked by a contractor to install a 20 kg gate to the pier of a boundary wall.
- 1.2.1 Name the joining fixture you will use to secure the gate to the pier. (1)
- 1.2.2 Motivate why you will use this joining fixture. (2)
- 1.2.3 Explain how you will install the gate by using the joining fixture in QUESTION 1.2.1, if the positions of the holes have been marked on the pier. (3)
- 1.3 Predict what will happen if a laser level is stored in extremely cold areas. (1)
- 1.4 How will you ensure the accuracy of a dumpy level? (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.

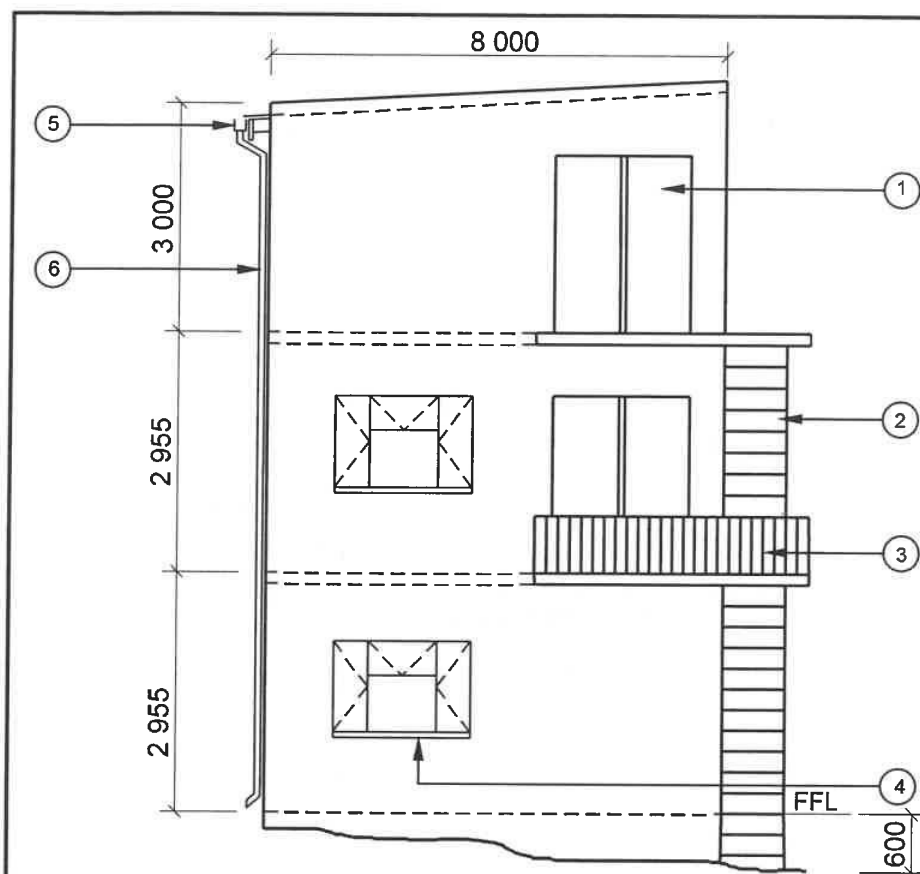


FIGURE A

NOTES:

Contractors must verify all dimensions and levels on site before commencing work.

Architects to be notified of any discrepancies immediately.

Emergency escape staircase to be made of mild steel.

Roof: Lean-to roof with parapet walls

Finishing of walls: Plaster and paint

No. 3 indicates the balusters to be made of aluminium.

Dimensions of balusters:
Ø 50 mm x 1 200 mm

Architect's signature

Client's signature

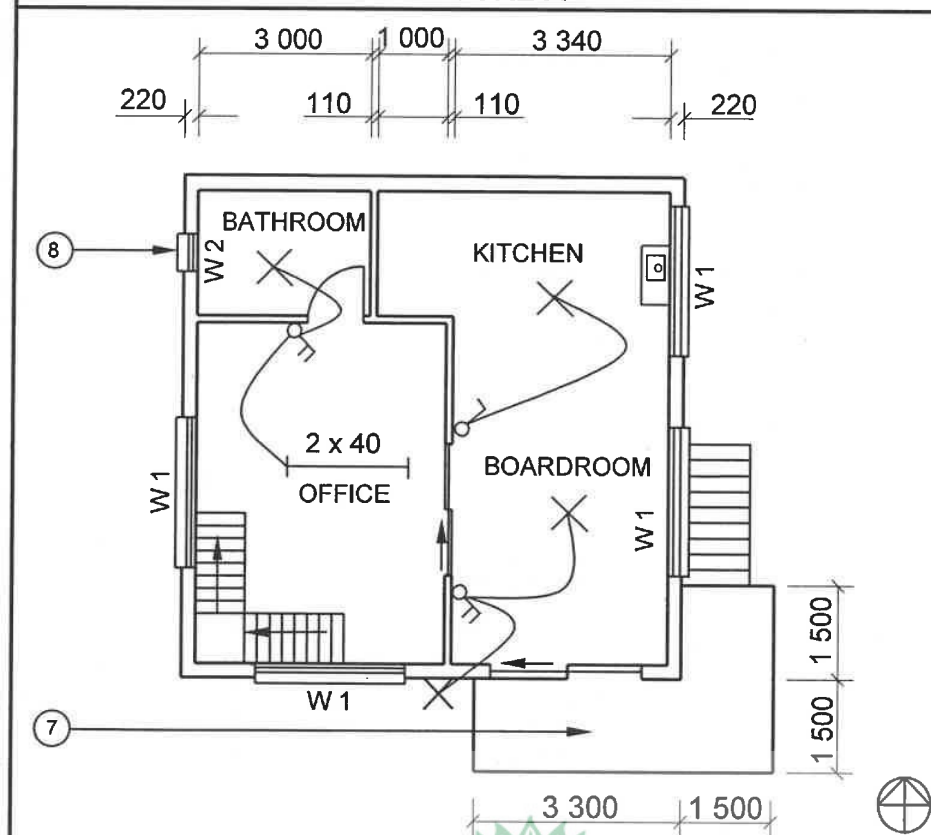


FIGURE B

REVISION 1	DATE: 18/04/2023	DRAWING OF INTERNAL STAIRCASES
PRINTED BY: FOX PRINTERS		DATE OF PRINT: 19/04/2023
DRAWING TITLE: 1 ST FLOOR AND SOUTH ELEVATION		
PROJECT: PROPOSED DWELLING OF MR NTOMBI ON PLOT 42, ISIDINGO STREET, ALBANY		
PROJECT NO.: GR 266-424		DRAWING NO.: 336P5
DATE: 12/04/2023	DRAWN: NP KOK	CHECKED: J BOK
ELEVATION AND FLOOR PLAN		SCALE 1 : 100
REFERENCE CODE QP 8 – 2023		
WINDOW SCHEDULE 		

[40]

QUESTION 3: CONSTRUCTION ASSOCIATED WITH CIVIL SERVICES, OHSA AND QUANTITIES (SPECIFIC)

Start this question on a NEW page.

3.1 FIGURE 3.1 below shows safety equipment.

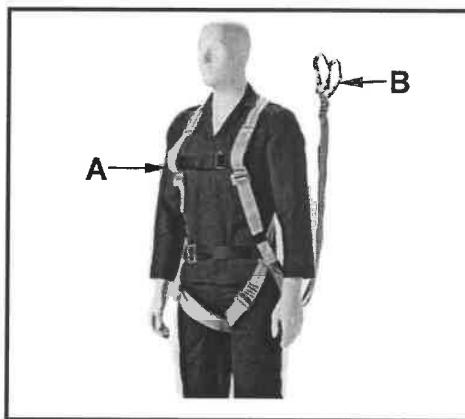


FIGURE 3.1

- 3.1.1 Identify **A** and **B**. (2)
- 3.1.2 To what should **B** be attached? (1)
- 3.1.3 Name ONE safety item that a worker must wear in order to prevent infections when working with raw sewage. (1)

3.2 FIGURE 3.2 below shows a drawing of a faulty installation of a manhole.

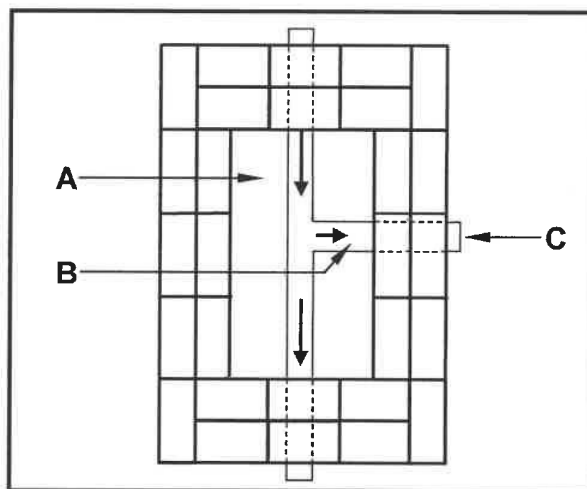


FIGURE 3.2

- 3.2.1 Identify **A** to **C**. (3)
- 3.2.2 Explain TWO faults that are illustrated in the installation of this manhole. (2)
- 3.2.3 Name a type of manhole that is NOT built with bricks. (1)
- 3.2.4 A manhole cover is removed for maintenance. Describe ONE safety precaution that needs to be applied to ensure the safety of pedestrians. (1)

- 3.3 FIGURE 3.3 below shows a drain pipe. Calculate the fall of pipe **A** with a diameter of 100 mm and a total length of 2 m.

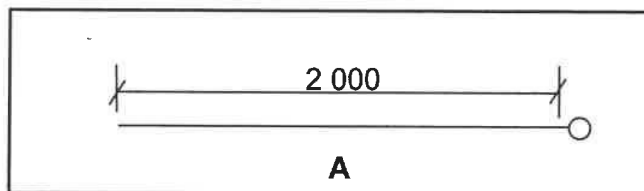


FIGURE 3.3

(4)

- 3.4 Describe the term *backfilling*.

(1)

- 3.5 Use the information in FIGURE 3.5 below and take off the quantities of materials needed as indicated in the table below. Write only the answer next to the question numbers (3.5.1 to 3.5.6) in the ANSWER BOOK, e.g. 3.5.7 Basin.

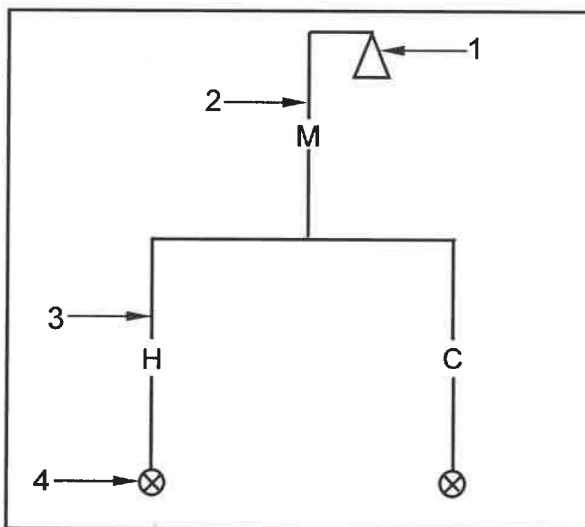


FIGURE 3.5

ITEM	NAMES OF PIPES/ SANITARY FITTINGS	MATERIAL	DIAMETER
1	shower rose	chrome	—
2	3.5.1	3.5.2	3.5.3
3	3.5.4	3.5.5	—
4	3.5.6	chrome	—

(6)

- 3.6 ANSWER SHEET 3.6 shows the top view of a one-brick L-shaped corner wall (quoin) built in stretcher bond. Project and draw the sectional front view on section **A-A**. The front view must have THREE brick courses.

(8)

[30]



QUESTION 4: COLD- AND HOT-WATER SUPPLY, TOOLS, EQUIPMENT AND MATERIALS (SPECIFIC)

Start this question on a NEW page.

4.1 Change the underlined words in the following to make the statements TRUE. Write the appropriate word(s) next to the question numbers (4.1.1 to 4.1.5) in the ANSWER BOOK.

4.1.1 A thermostat is a self-sacrificing rod that protects the geyser. (1)

4.1.2 The water meter redirects cool water, before it reaches the tap, to a rain-water tank. (1)

4.1.3 The vacuum breaker should be installed within 1 metre from the geyser. (1)

4.1.4 The temperature and pressure safety valve must be made of plastic or steel. (1)

4.1.5 The purpose of a drip tray of a geyser is to balance the pressure of the cold- and hot-water supply. (1)

4.2 FIGURE 4.2 below shows a tap.



FIGURE 4.2

4.2.1 Identify the tap. (1)

4.2.2 Explain the working principle of the tap. (2)

4.2.3 Draw an orthographic side view of an electronic tap. (3)

4.3 FIGURE 4.3 below shows a pipe coupling.



FIGURE 4.3

- 4.3.1 Identify the coupling. (1)
- 4.3.2 Name the type of pipe that this coupling is used for. (1)
- 4.3.3 Explain how you will use this coupling to fix a leaking pipe up to the tightening of the coupling. (4)
- 4.4 Name a machine that can be used to move water from a reservoir to an irrigation system. (1)
- 4.5 Explain TWO causes of a geyser dripping at the overflow. (2)
- 4.6 State ONE consequence of poorly installed hot-water pipes and loose jumpers in taps. (1)
- 4.7 Name the approved hot-water SANS symbols and give the abbreviation for EACH symbol.
- 4.7.1 (2)
- 4.7.2 (2)
- 4.7.3 (2)
- 4.8 Show, by means of a sketch, a T-waste junction 135° with an inspection eye. (5)

- 4.9 Choose a description from COLUMN B that matches the item in COLUMN A. Write only the letter (A–H) next to the question numbers (4.9.1 to 4.9.5) in the ANSWER BOOK, e.g. 4.9.6 J.

COLUMN A		COLUMN B	
4.9.1	90° bend with inspection eye	A	is connected to the outlet under a sink
4.9.2	P-trap	B	located above solar panels
4.9.3	Stopcock	C	used above ground where soil pipes have to change direction
4.9.4	Ball valve	D	to join the toilet pan and pipe
4.9.5	Bend 135° plain	E	used underground where soil pipes have to change direction
		F	regulates water levels in water-closet pans
		G	used to shut off water supply
		H	used to catch storm water

(5 x 1)

(5)

- 4.10 Differentiate between *dezincification* and *galvanic corrosion processes*.

(2)

- 4.11 Describe ONE way in which to prevent galvanic corrosion.

(1)

[40]

QUESTION 5: GRAPHICS AS MEANS OF COMMUNICATION, ROOF WORK AND STORM WATER (SPECIFIC)

Start this question on a NEW page.

- 5.1 FIGURE 5.1 below shows the incomplete installation of a rain-water system that channels water away from the roof of a building.

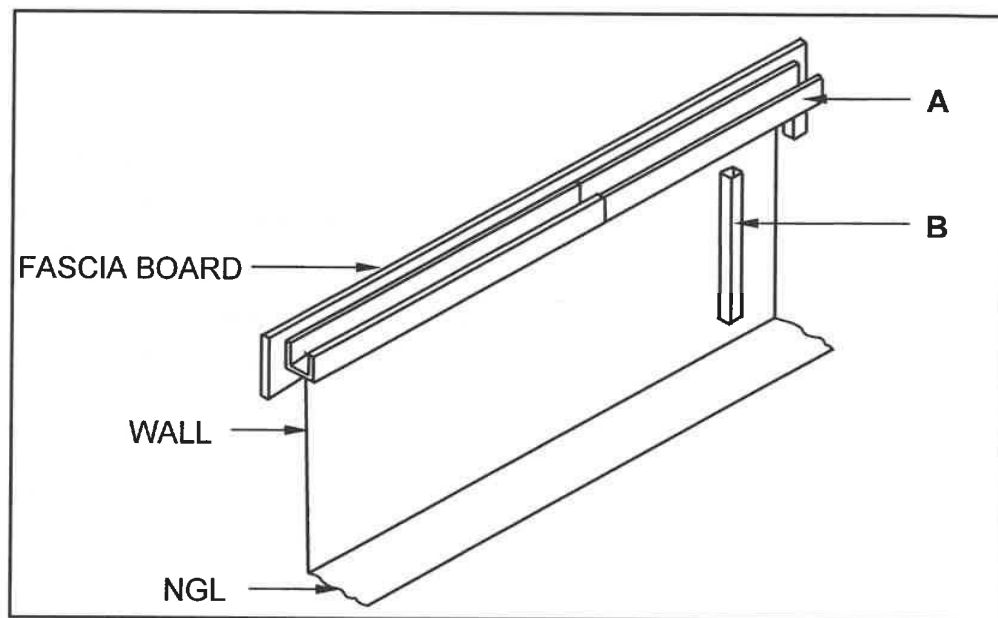


FIGURE 5.1

- 5.1.1 What is used to close the end at **A**? (1)
- 5.1.2 Name the component that should be used to attach **B** to the wall. (1)
- 5.1.3 Name the pipe that connects **A** to **B**. (1)
- 5.2 Describe the process of installing galvanised mild steel brackets to the fascia board of a roof. (5)
- 5.3 A concrete shoe can be placed underneath a down pipe to channel water away from a house. Show, by means of a neat pictorial sketch, a pre-fabricated concrete shoe. (4)
- 5.4 ANSWER SHEET 5.4 shows a drawing of a frustum of a cone for a lamp shade. Use the drawing and information on ANSWER SHEET 5.4 and draw the development of the frustum of the cone. Show ALL construction lines and start the drawing at point **A**. (18)

[30]

QUESTION 6: SEWERAGE, SANITARY FITTINGS AND JOINING (SPECIFIC)

Start this question on a NEW page.

- 6.1 Describe the process of joining a capillary elbow to a copper pipe with solder. (4)
- 6.2 Name TWO uses of a spring toggle fixer. (2)
- 6.3 Describe TWO characteristics of cast-iron pipes in terms of its strength and corrosion. (2)
- 6.4 FIGURE 6.4 below shows the diagram of a test being conducted on a sewer pipeline.

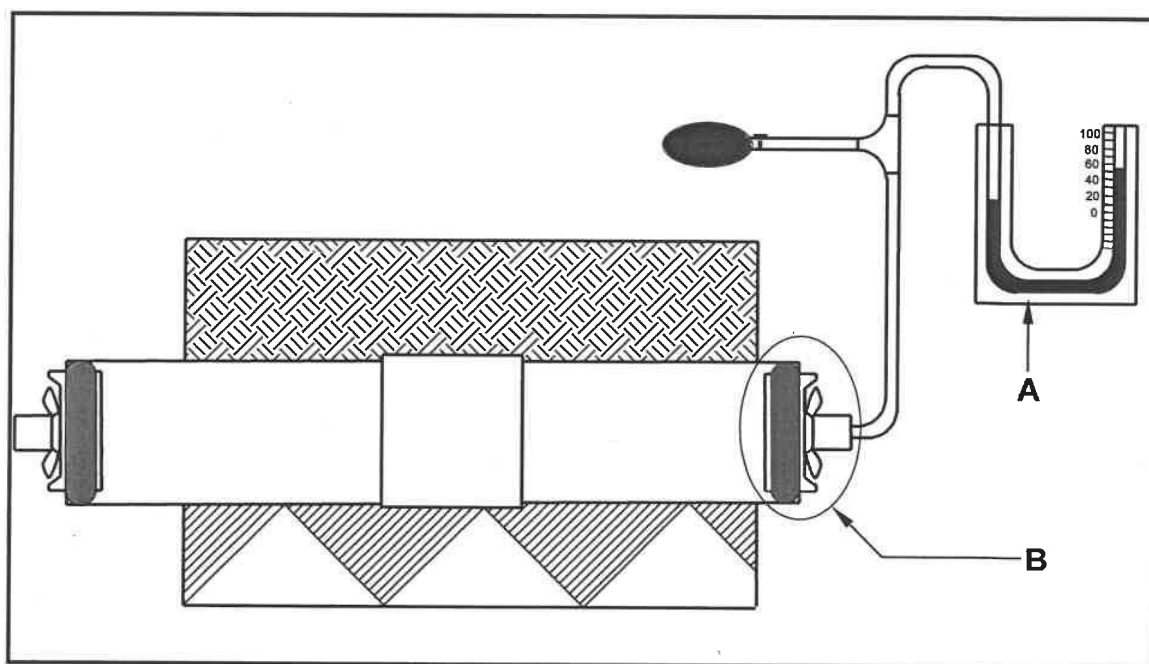


FIGURE 6.4

- 6.4.1 Name the type of test. (1)
- 6.4.2 Identify measuring device A. (1)
- 6.4.3 Identify the component in the encircled part B. (1)
- 6.4.4 Describe the first THREE steps of how you would conduct the test. (3)
- 6.4.5 Explain the result if the reading starts to drop. (1)
- 6.5 A manhole ramp should be constructed.
- 6.5.1 Explain ONE reason for constructing a manhole ramp. (1)
- 6.5.2 Describe TWO advantages of a manhole ramp. (2)

- 6.6 Differentiate by means of sketches between a P-trap and an S-trap for a gully filled with water. Indicate the water levels in your sketches. (6)
- 6.7 FIGURE 6.7 below shows the incomplete drainage plan of a building.

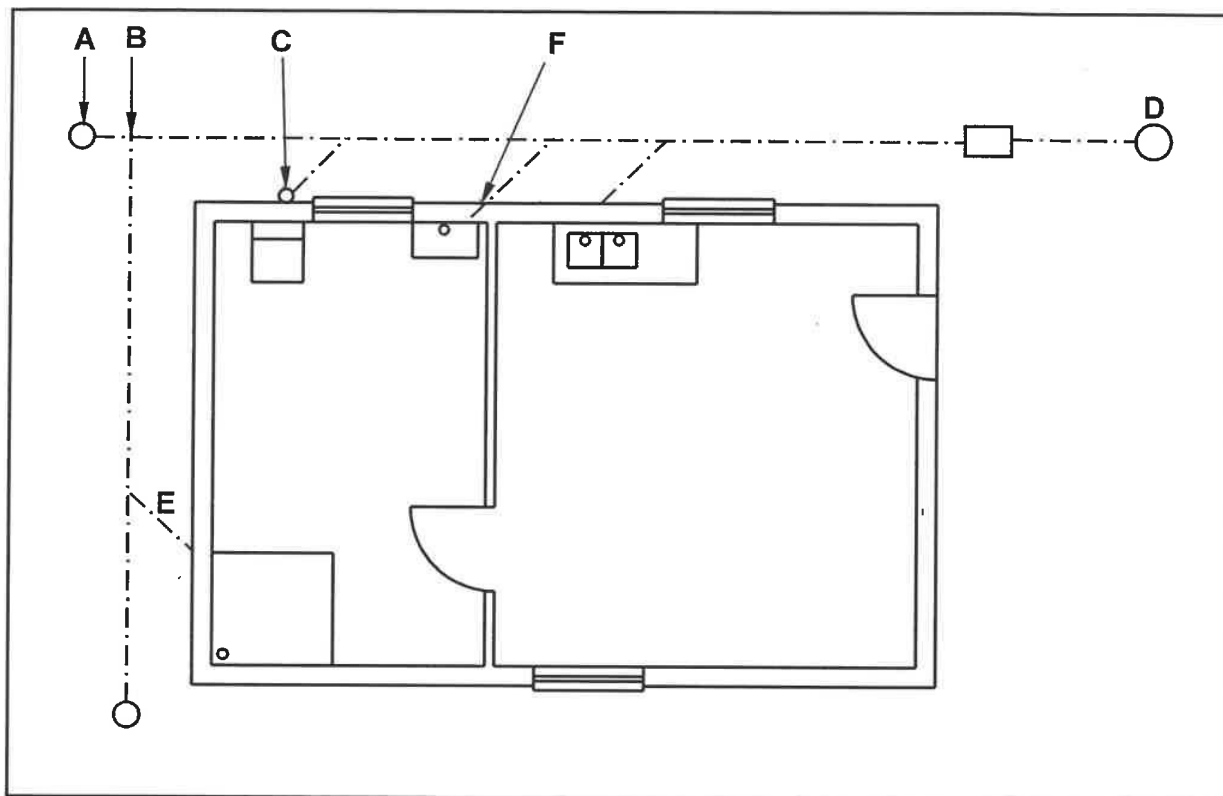


FIGURE 6.7

- 6.7.1 Write down the abbreviation of component A. (1)
- 6.7.2 Explain how you would correct the connection at B of the drainage plan. (1)
- 6.7.3 Identify component C. (1)
- 6.7.4 Name the component that must be installed at D to receive water from the manhole. (1)
- 6.7.5 Name the prescribed angle for the pipe at E. (1)
- 6.7.6 Describe the fault at F. (1)
- 6.8 ANSWER SHEET 6.8 shows the incomplete drawing of a vacuum tank. Use ANSWER SHEET 6.8 and draw the completed sectional view of the vacuum tank with the draw-off valve. Print any TWO labels. (10)
- [40]

TOTAL: 200

CENTRE NUMBER:

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EXAMINATION NUMBER:

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ANSWER SHEET 2

NO.	QUESTIONS	ANSWERS	MARKS
1	Give ONE reason why FIGURE B represents the first floor plan.		1
2	Name the SI unit that is used to indicate dimensions on building plans.		1
3	Identify number 1.		1
4	Identify the number indicating the emergency exit.		1
5	What is the purpose of number 3?		1
6	Identify number 4.		1
7	Identify number 5.		1
8	Identify number 6.		1
9	Identify number 7.		1
10	Deduce from the window schedule the dimensions of the window that is installed at number 8.		2
11	Who is the owner of the new dwelling?		1
12	Name the elevation where the sink is located.		1
13	Identify the safety error in FIGURE A.		1
14	Deduce from the building plan why it was not approved after the first submission.		1



CENTRE NUMBER:**EXAMINATION NUMBER:**

15	Name the material that must be used for the balusters.		1
16	Deduce from the notes column the type of roof illustrated in FIGURE A.		1
17	How many signatures must be indicated on this building plan?		1
18	What are the dimensions for the balusters as indicated by the architect?		2
19	Name the material that must be used for the final finishing of the outside wall.		1
20	Describe the end shape of the balusters.		1
21	How many hinged openings are indicated on Window 1 in the window schedule?		1
22	Draw the symbol for finished wood for the boardroom table.		2
23	Draw the electrical symbol for a three-pole one-way switch.		2
24	How many fluorescent tubes are indicated in the office?		1



CENTRE NUMBER:

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EXAMINATION NUMBER:

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25	Calculate the total height of the wall on the left side of the building from the finished floor level. Give your answer in metre.		4
26	Calculate the area of the exterior wall on the ground floor, that will consist of bricks, from the finished floor level to the top of the floor slab in the south elevation in FIGURE A. Show ALL calculations.		8
		TOTAL:	40

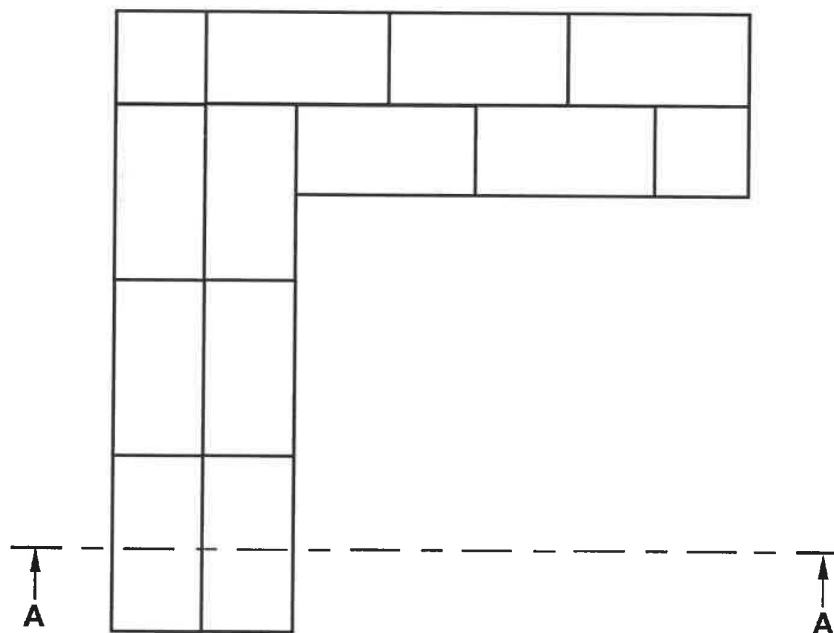


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ANSWER SHEET 3.6**FIGURE 3.6**

ASSESSMENT CRITERIA		
NO.	MARK	CANDIDATE'S MARK
1	2	
2	2	
3	2	
4	1	
5	1	
TOTAL:	8	

CENTRE NUMBER:

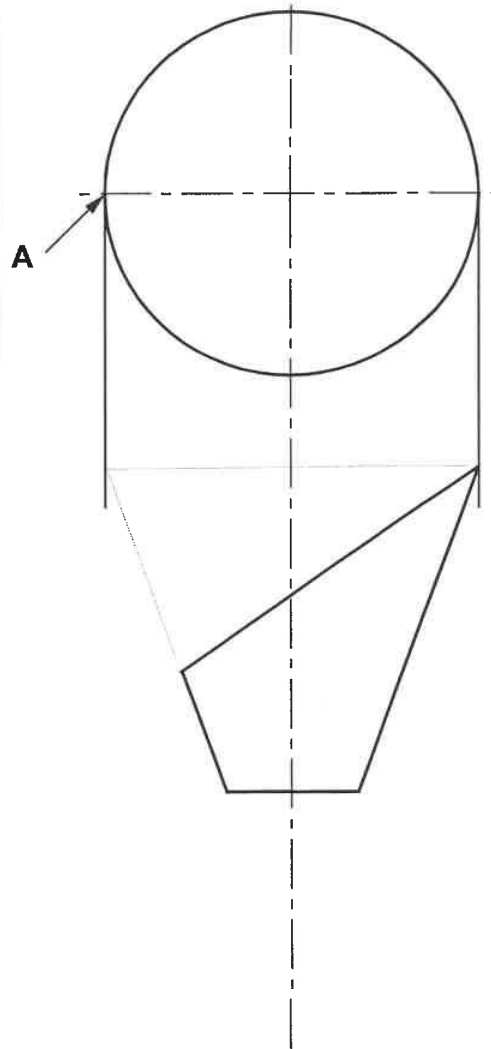
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EXAMINATION NUMBER:

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ANSWER SHEET 5.4

ASSESSMENT CRITERIA		
NO.	MARK	CANDIDATE'S MARK
1	2	
2	2	
3	1	
4	3	
5	7	
6	1	
7	2	
TOTAL:	18	

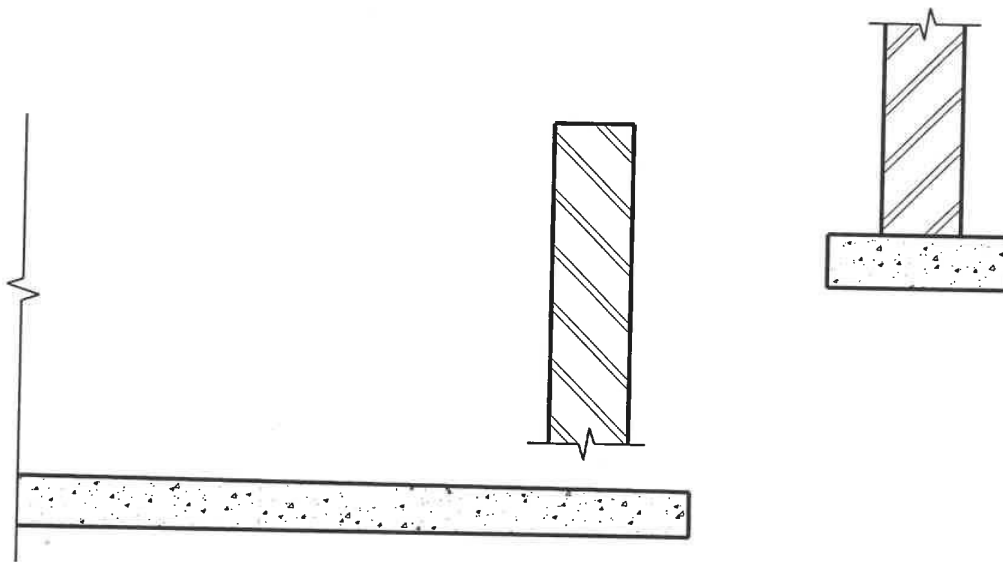


DBE/November 2023

CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 6.8



ASSESSMENT CRITERIA		
NO.	MARK	CANDIDATE'S MARK
1	1	
2	1	
3	2	
4	1	
5	2	
6	1	
7	2	
TOTAL:	10	