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SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

CIVIL TECHNOLOGY: CIVIL SERVICES

2023

MARKS: 200

TIME: 3 hours

This question paper consists of 14 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, 3.10, 4.9, 5.5, 6.3, 6.5 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&A, 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.

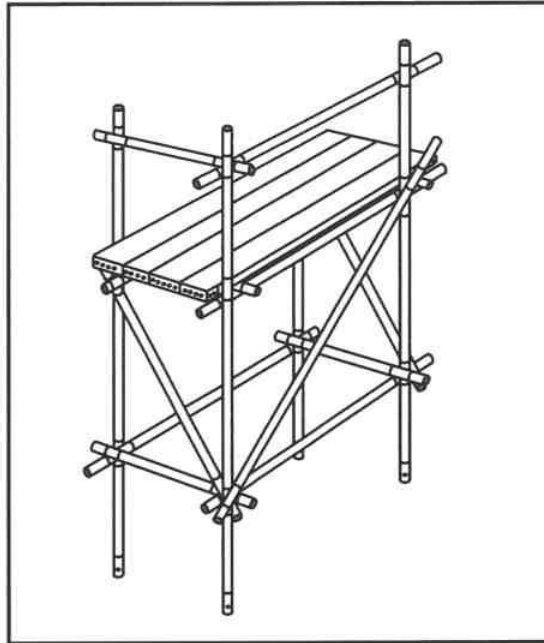


FIGURE 1.1

- 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.

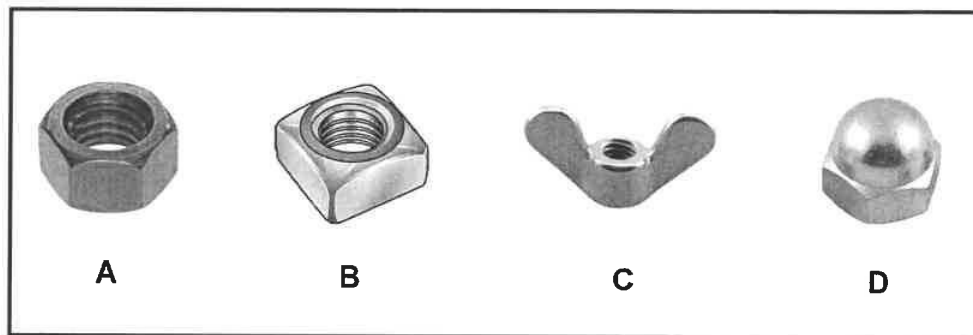


FIGURE 1.7

- 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.

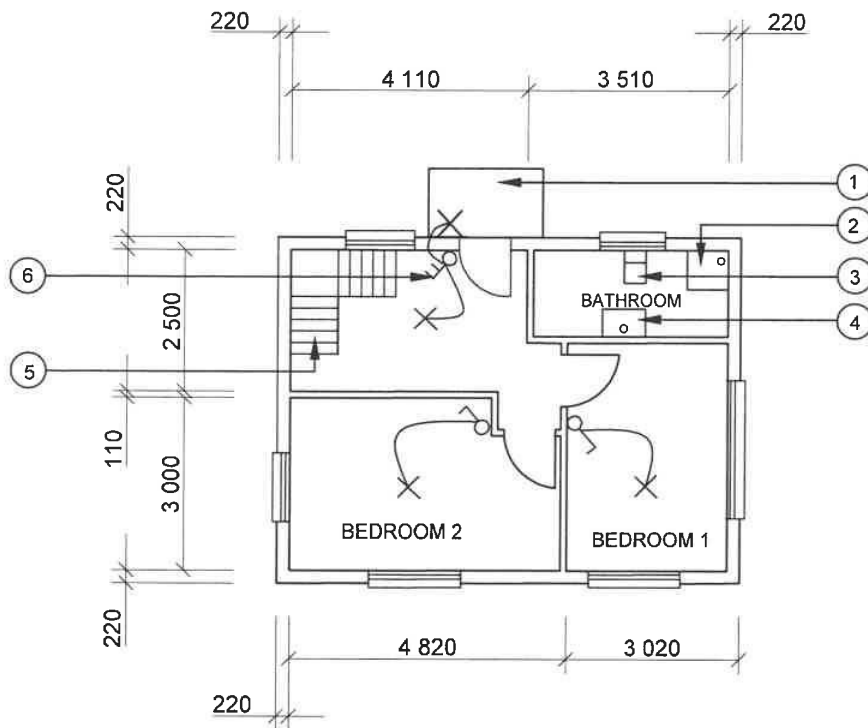


FIGURE A

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.

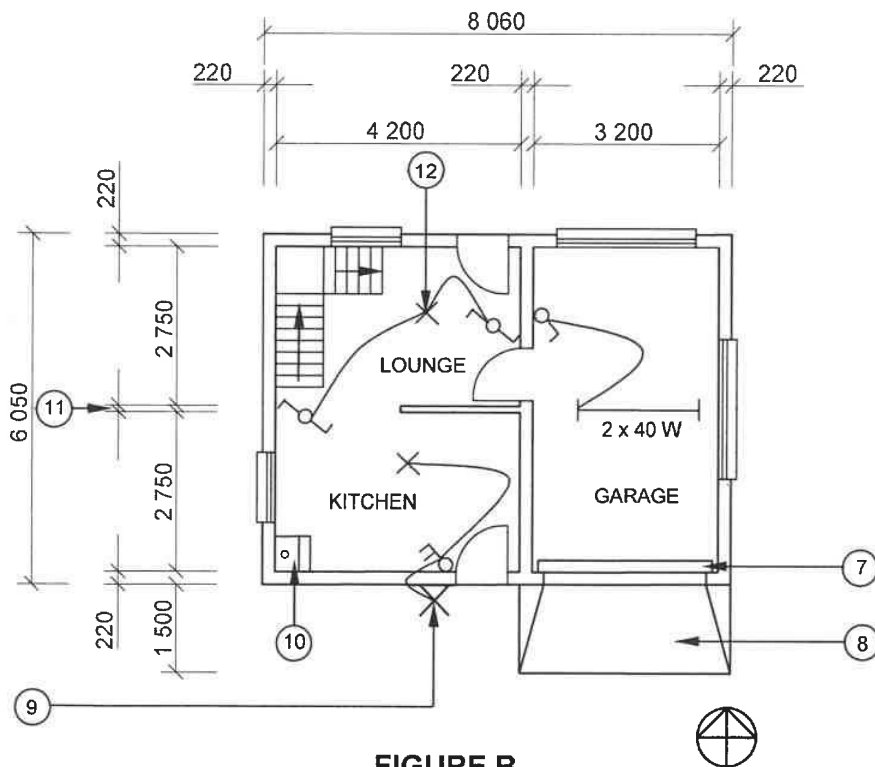


FIGURE B

| | | |
|---|------------------|---------------------------|
| 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: 24/03/2023 | DRAWN: KB BAM | CHECKED: P KRIEL |
| FLOOR PLANS | | SCALE 1 : 100 |
| REFERENCE CODE: QP 8 - 2023 | | |
| [40] | | |

QUESTION 3: CONSTRUCTION ASSOCIATED WITH CIVIL SERVICES, OHS&A AND QUANTITIES (SPECIFIC)

Start this question on a NEW page.

- 3.1 Name the maximum thickness of soil layers when compaction is done by hand. (1)
- 3.2 Explain how the lid of a concrete ring manhole deeper than 750 mm should be set to ensure airtightness. (2)
- 3.3 Name the length of the engineered bricks that are used in manhole construction. (1)
- 3.4 Draw a two-dimensional sketch to show how the sides of excavations in loose and water-logged soil should be supported. (7)
- 3.5 Name the tool and accessory that can be used to test if the slope of a drain pipe is correct over a short distance. (2)
- 3.6 Who must monitor the free end of the rope attached to the safety harness of the worker? (1)
- 3.7 Explain TWO safety precautionary measures that must be taken before a worker enters a confined space to work. (2)
- 3.8 State TWO regulations that must be adhered to when working in elevated places. (2)
- 3.9 The internal measurement of the sides of a cubic water storage tank is 3 700 mm.
- Calculate the following. Show ALL calculations:
- 3.9.1 The volume of the tank in m^3 (4)
- 3.9.2 The volume of the tank in litres (2)
- 3.10 FIGURE 3.10 below shows the top view of a one-brick wall built in English bond.

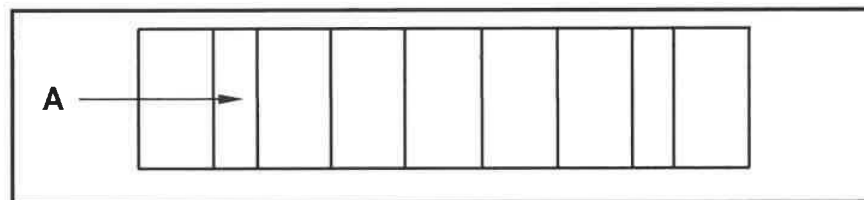


FIGURE 3.10

- 3.10.1 Identify A. (1)
- 3.10.2 Use ANSWER SHEET 3.10. Project and draw, in good proportion, the FRONT VIEW of TWO consecutive brick courses. (5)
- [30]**

QUESTION 4: COLD AND HOT-WATER SUPPLY, 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 Air lock | A does not generate heat but moves the heat instead |
| 4.1.2 Heat pump | B sole purpose is to prevent water from flowing back in the wrong direction |
| 4.1.3 Pressure-control valve | C hot-water outlet of a solar geyser |
| 4.1.4 Vacuum breaker | D enables local authorities to calculate the amount of water |
| 4.1.5 Stopcock | E to balance the water pressure of the hot- and cold-water supply |
| 4.1.6 Thermostat | F regulates the heating of water inside the geyser |
| 4.1.7 Solar geyser | G used to close or shut off the water supply |
| 4.1.8 Drip tray | H the panels must face north |
| | I collecting and draining away water from a geyser |
| | J no hot water, only a spluttering |
| | K prevents the siphoning of water out of a geyser when cold water is shut off |
| | L self-sacrificing rod that protects the geyser |

(8 x 1)

(8)

4.2 FIGURE 4.2 below is a picture of a device used in cold-water systems.

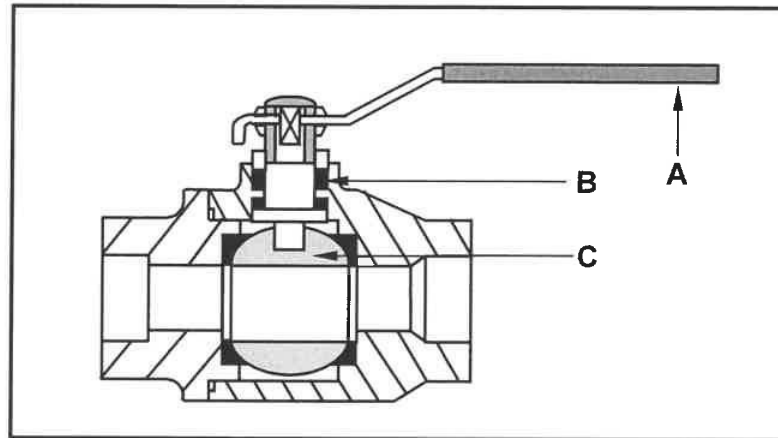


FIGURE 4.2

- 4.2.1 Name the device. (1)
- 4.2.2 Identify A, B and C. (3)
- 4.2.3 Explain what will happen to C when A is turned 90°. (1)
- 4.2.4 What is the valve used for? (1)

4.3 FIGURE 4.3 below shows a blocked sewer pipe.

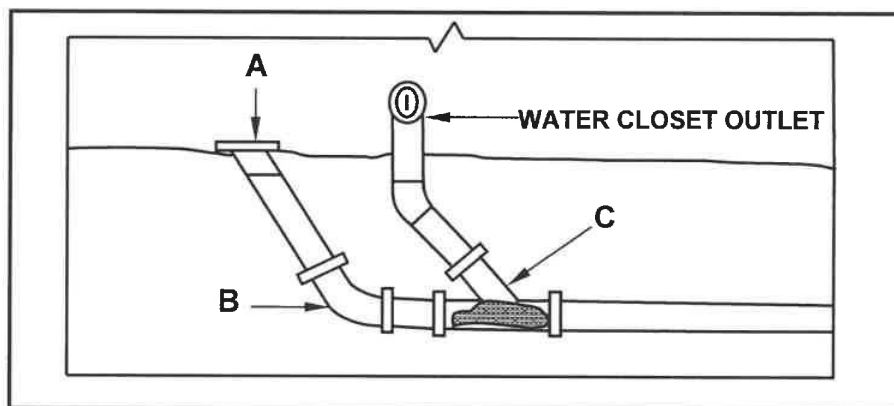


FIGURE 4.3

- 4.3.1 Name a non-electrical hand tool that can be used to unclog the sewer pipe. (1)
- 4.3.2 Identify fittings A, B and C. (3)
- 4.4 Differentiate between a *compressed air test apparatus* and a *centrifugal pump* in terms of their use. (2)
- 4.5 There is a constant running of water into the water closet pan. Identify the possible problem. (1)

- 4.6 FIGURE 4.6 below shows a valve used in cold-water installation as a water-saving device.

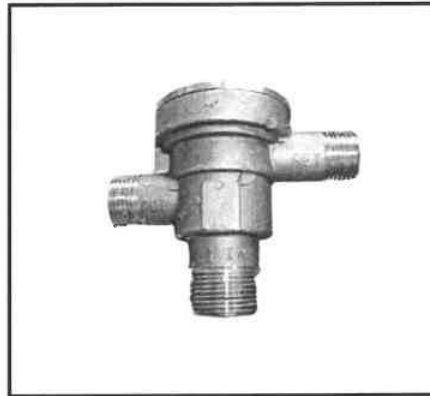


FIGURE 4.6

- 4.6.1 Name the valve. (1)
- 4.6.2 Explain how this valve works. (2)
- 4.7 Draw the following symbols that are used in hot-water systems:
- 4.7.1 Shower (movable) (2)
- 4.7.2 Non-return valve (2)
- 4.8 FIGURE 4.8 below shows a part in a solar water heater installation.

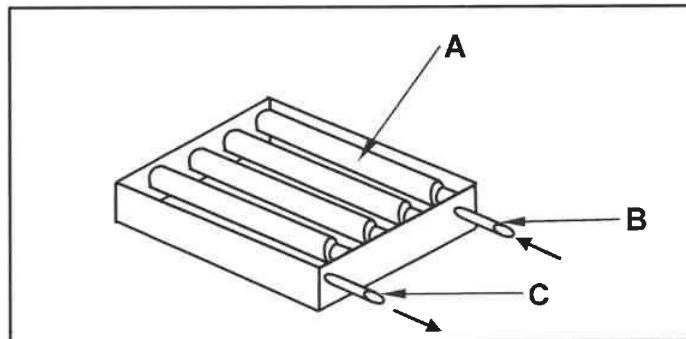


FIGURE 4.8

- 4.8.1 Identify A, B and C. (3)
- 4.8.2 What could be a clear sign that part A is malfunctioning? (2)
- 4.9 ANSWER SHEET 4.9 shows an incomplete drawing of a high-pressure geyser installed vertically against a wall without the cold- and hot-water pipes and components. Draw the correct installation of the cold- and hot-water pipes and indicate the direction of the flow of water with the TWO vacuum breakers. (7)

[40]

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

Start this question on a NEW page.

- 5.1 Describe TWO factors that must be determined before installing the flashing for a ventilation pipe on a pitched roof. (2)
- 5.2 Discuss TWO regulations that must be adhered to when artificial storm-water channels connect with open natural channels. (2)
- 5.3 By means of neat freehand sketches, differentiate between the top/plan views of a rectangular and a round gutter outlet. (4)
- 5.4 Name the component that can be used to secure the downpipe of a gutter to a wall. (1)
- 5.5 ANSWER SHEET 5.5 shows the front view and top view of a square-based truncated pyramid.

Use the views and information given and draw the development of the pyramid. Start the development at **A**.

The pyramid has a 3-mm seam on both sides.

Show ALL construction and projection lines.

(21)
[30]

QUESTION 6: SEWERAGE, SANITARY FITTINGS AND JOINING (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 ... decompose the solid matter in a septic tank.
- A Hydrochloric acid
 - B Viruses
 - C Bacteria
 - D Water
- (1)
- 6.1.2 The septic tank consists of two chambers that are called the ...
- A settling and discharge chambers.
 - B inspection and soil chambers.
 - C soil and water chambers.
 - D bacteria and sludge chambers.
- (1)
- 6.1.3 Which ONE of the following is the acceptable slope for a 110 mm diameter sewer pipe?
- A 1 : 75
 - B 1 : 100
 - C 1 : 20
 - D None of the above-mentioned
- (1)
- 6.1.4 The ... allows gases to escape from a sewer system.
- A manhole
 - B vent pipe
 - C gully
 - D rodding eye
- (1)
- 6.1.5 ... is the colour used to indicate soil water pipes on a drainage plan.
- A Green
 - B Brown
 - C Blue
 - D Orange
- (1)

6.2 FIGURE 6.2 below shows a water closet pan.

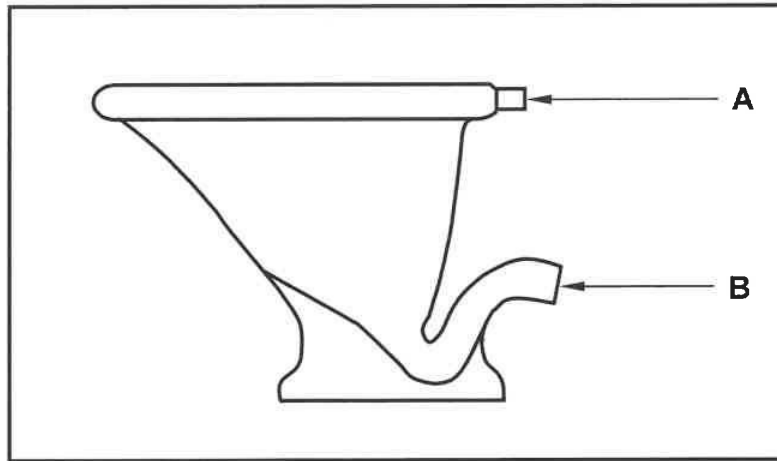


FIGURE 6.2

- 6.2.1 Name the unit that supplies water to the water closet pan. (1)
- 6.2.2 Name the pipe that comes from the water supply unit and joins the water closet pan at A. (1)
- 6.2.3 What component is used at A to prevent leaks? (1)
- 6.2.4 Name the PVC fitting that is used at B to connect the water closet pan to the sewer pipe. (1)
- 6.2.5 State ONE material that is used to manufacture the water closet pan. (1)
- 6.2.6 Name ONE fixing agent that can be used to attach the water closet pan to a floor. (1)

- 6.3 FIGURE 6.3 below shows the section through a 110 mm diameter PVC pipe and a 110 mm PVC socket.

The PVC socket is on ANSWER SHEET 6.3.

Complete the drawing by joining the PVC pipe to the socket and showing the solvent welding.

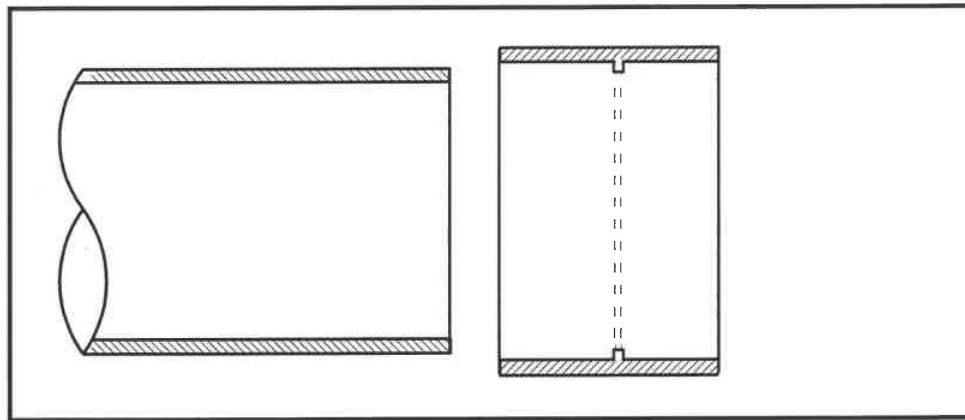


FIGURE 6.3

(3)

- 6.4 FIGURE 6.4 below shows a horizontal sectional view of a vacuum tank.

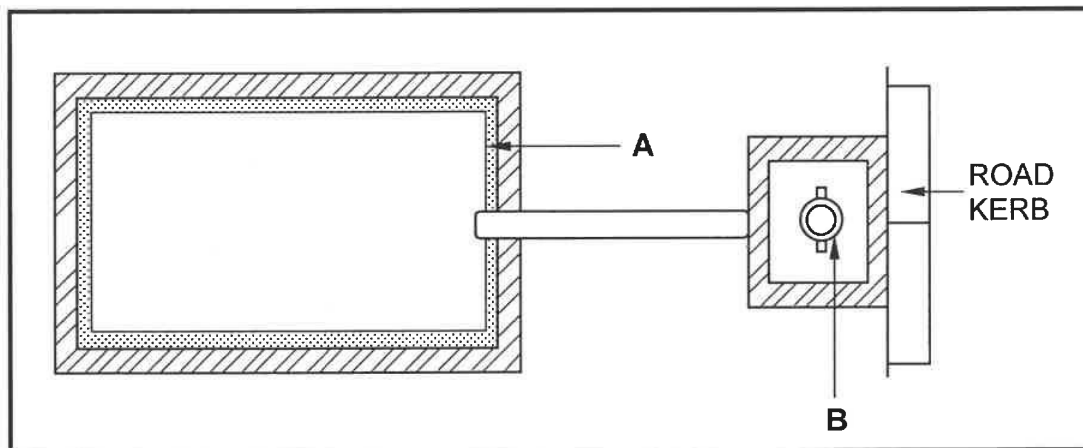


FIGURE 6.4

- 6.4.1 Identify the type of wall finish at **A**. (1)
- 6.4.2 Describe ONE reason for the type of wall finish at **A**. (1)
- 6.4.3 Identify **B**. (1)
- 6.4.4 Explain why component **B** is located close to the road kerb. (1)

6.5 FIGURE 6.5 on ANSWER SHEET 6.5 shows the outline of a French drain.

Use ANSWER SHEET 6.5 and draw a complete French drain.

Print ALL labels.

(6)

6.6 FIGURE 6.6 below shows the INCORRECTLY drawn sewerage plan of a dwelling.

Identify THREE errors in the sewerage plan and give a reason for each error.

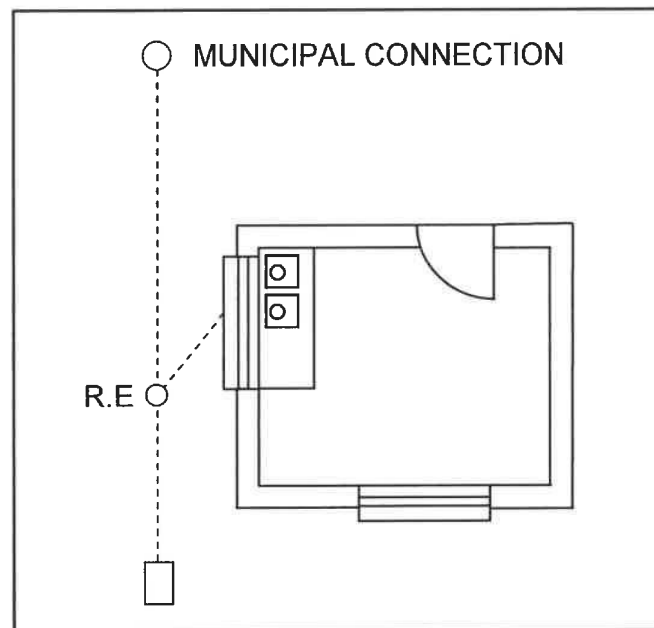


FIGURE 6.6

(6)

6.7 ANSWER SHEET 6.7 shows a building with an incomplete sewerage layout.

Use ANSWER SHEET 6.7 and design and draw the sewerage plan.

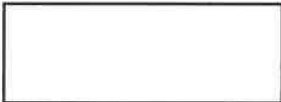


(10)
[40]

TOTAL: 200

CENTRE NUMBER: EXAMINATION NUMBER: **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: EXAMINATION NUMBER:

| | | | |
|----|--|--|---|
| 12 | Give the abbreviations for the following: <ul style="list-style-type: none"> • 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. |  | 2 |
| 21 | Draw the symbol for finished wood. |  | 2 |
| 22 | Draw the symbol for hardcore filling. |  | 2 |

| | | | | | | | | | | | | | | | | | | | | |
|-----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| CENTRE NUMBER: | | | | | | | | | | | | | | | | | | | | |
|-----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

| | | | | | | | | | | | | | | | | | | | | |
|----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| EXAMINATION NUMBER: | | | | | | | | | | | | | | | | | | | | |
|----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

| | | | |
|----|---|---------------|-----------|
| 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:

EXAMINATION NUMBER:

ANSWER SHEET 3.10

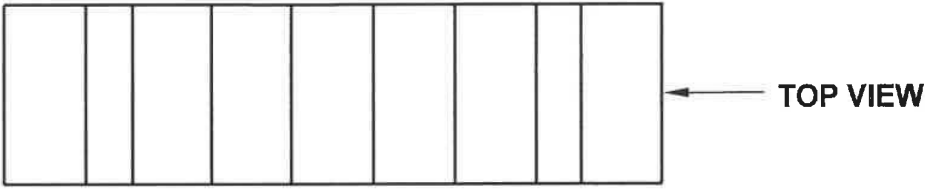


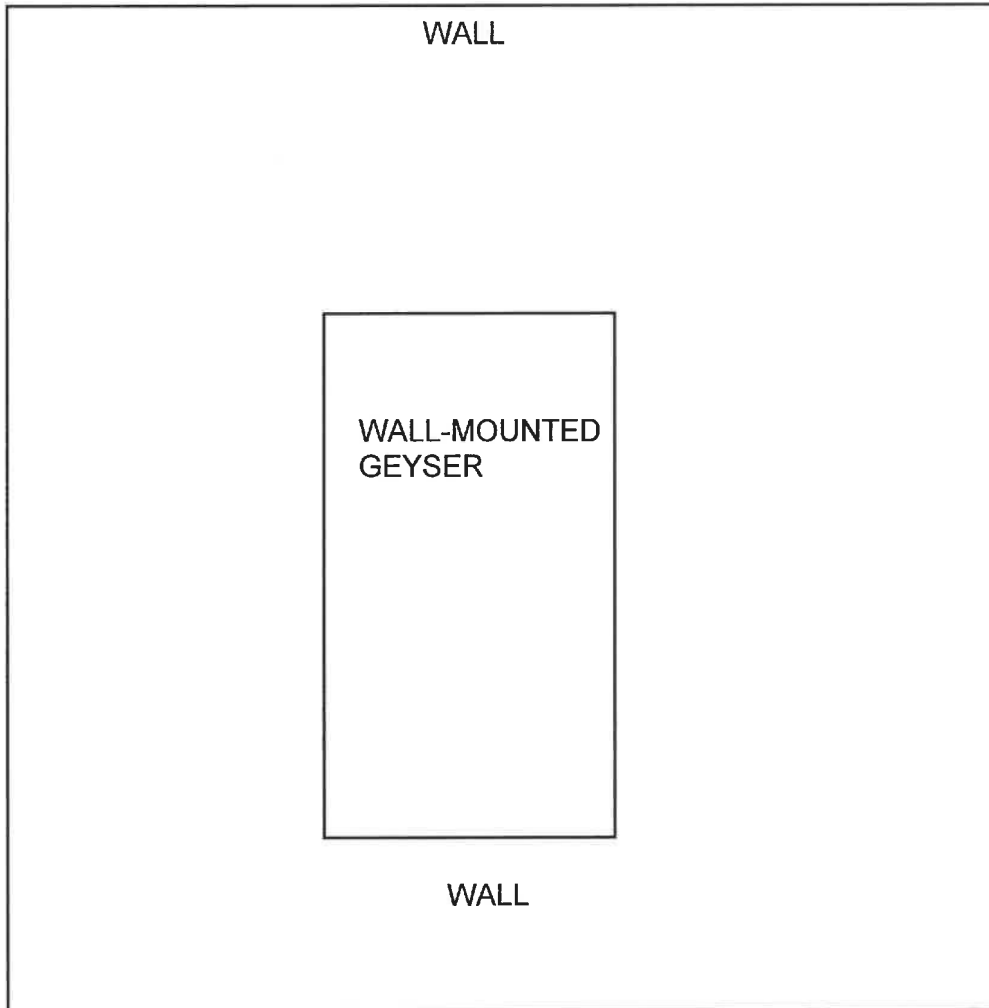
FIGURE 3.10

| ASSESSMENT CRITERIA | MARK | CM |
|------------------------------|-------------|-----------|
| Correctness of brick courses | 1 | |
| Members | 4 | |
| TOTAL: | 5 | |

CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 4.9

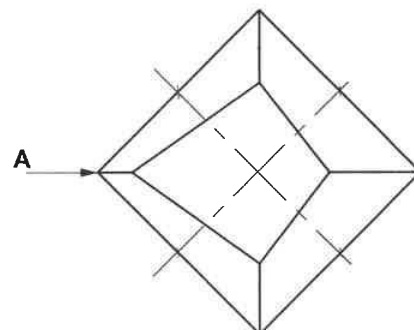
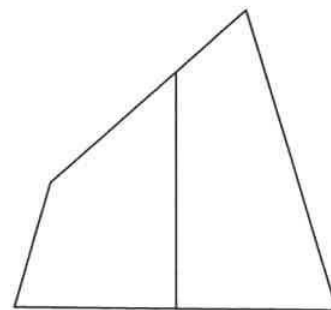


| ASSESSMENT CRITERIA | MARK | CM |
|-----------------------|----------|----|
| Correctness of layout | 1 | |
| Members | 6 | |
| TOTAL: | 7 | |

CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 5.5



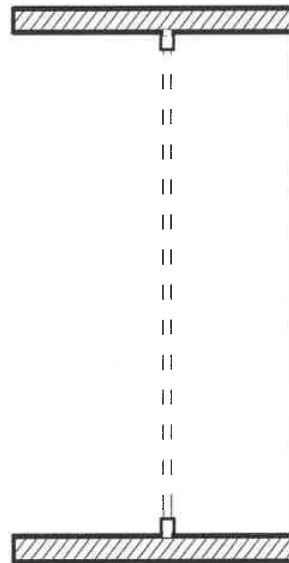
| ASSESSMENT CRITERIA | MARK | CM |
|------------------------|-----------|----|
| Correctness of drawing | 21 | |
| TOTAL: | 21 | |



CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 6.3

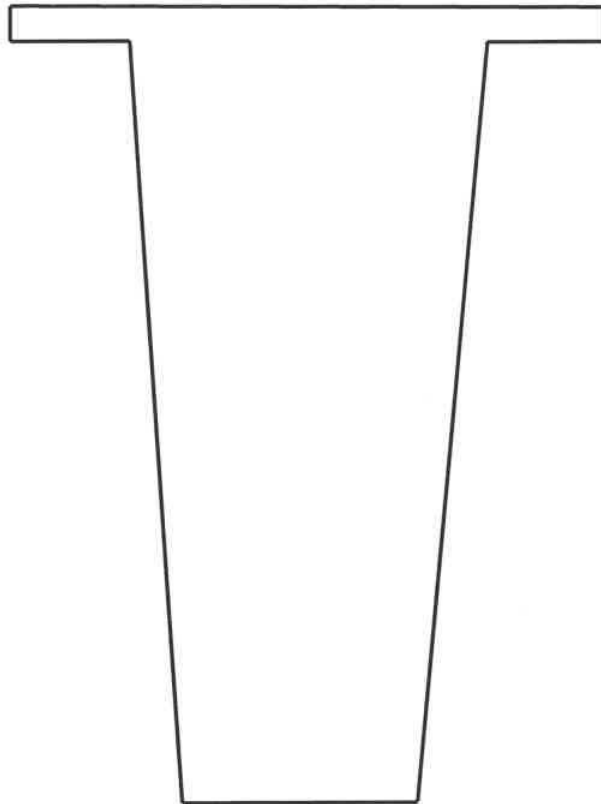


| ASSESSMENT CRITERIA | MARK | CM |
|--|----------|----|
| Correctness of joining pipe and socket | 1 | |
| Welding solvent | 2 | |
| TOTAL: | 3 | |

CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 6.5



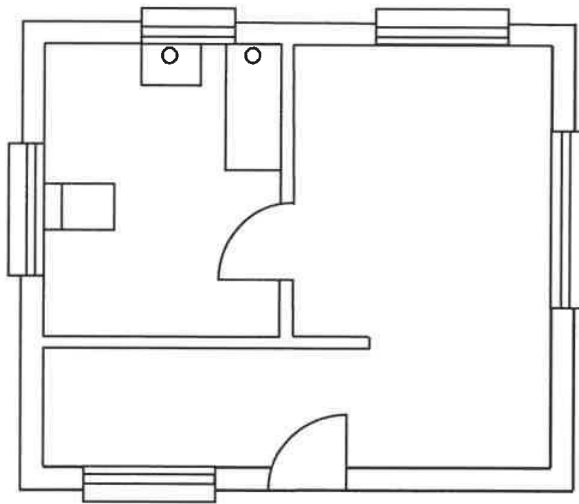
| ASSESSMENT CRITERIA | MARK | CM |
|-----------------------------|----------|----|
| Correctness of French drain | 1 | |
| Members | 5 | |
| TOTAL: | 6 | |

CENTRE NUMBER:

EXAMINATION NUMBER:

ANSWER SHEET 6.7

MUNICIPAL CONNECTION



| ASSESSMENT CRITERIA | MARK | CM |
|------------------------|-----------|----|
| Correctness of drawing | 10 | |
| TOTAL: | 10 | |