Affix label with Candidate Code Number here.
If no label, enter candidate Number if known

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No. 9198

⦿ Plumbers,
Gasfitters and
◯ Drainlayers Board

REGISTRATION EXAMINATION, JUNE 2022
CERTIFYING DRAINLAYER

QUESTION AND ANSWER BOOKLET

Time allowed THREE hours

INSTRUCTIONS

Check that the Candidate Code Number on your admission slip is the same as the number on the label at the top of this page.

Do not start writing until you are told to do so by the Supervisor.

Total marks for this examination: 100.

This exam booklet consists of 2 sections

        Section A – Questions 1 to 9

        Section B – Questions 1 to 10

The pass mark for this examination is 60 marks.

Write your answers and draw your sketches in this booklet. If you need more paper, use pages 23–24 at the back of this booklet. Clearly write the question number(s) if any of these pages are used.

All working in calculations must be shown.

Candidates are permitted to use the following in this examination:

    Drawing instruments, approved calculators, document(s) provided.

    Publications, Acts, Regulations, Codes of Practice, or Standards other than the ones provided are NOT permitted in the examination room.

    Do not use red pen for drawings or writing in your paper.

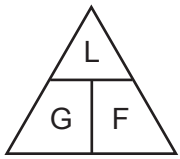Check that this booklet has all of 26 pages in the correct order.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION

USEFUL FORMULAE

Circumference of circle = 2 × π × R   or   Circumference of circle = π × D

Area of circle = π × R²   or   Area of circle = 0.7854 × D²

Volume of cylinder = π × R² × H   or   Volume of cylinder = 0.7854 × D² × H

length = L

gradient = 1:G

fall = F

SECTION A

QUESTION 1

(a)   Give THREE locations where there is an increased risk of dangerous gases being present when excavating a trench.

1   _____

2   _____

3   _____

(3 marks)

(b)   Name TWO naturally occurring hazardous gases that may be encountered in a trench.

1   _____

2   _____

(2 marks)

(c)   Explain why some gases tend to gather in excavations rather than dissipate into the air.

_____

(1 mark)

(d)   State FOUR hazards that can occur when dangerous gases are present.

1   _____

2   _____

3   _____

4   _____

(2 marks)

Total 8 marks

QUESTION 2

(a) Give EIGHT items of safety equipment in addition to personal protection equipment that may be required in a drainage excavation.

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

7 _____

8 _____

(4 marks)

(b) Give THREE instances when an excavation must be examined by an employer or an employer's representative.

1 _____

2 _____

3 _____

(3 marks)

QUESTION 2 (cont'd)

(c)   A trench has collapsed trapping a co-worker up to the waist.

   (i)   Describe the safety precaution that should be taken immediately prior to commencing any drainlaying rescue operation.

_____

_____

_____

(1 mark)

   (ii)   Give TWO actions that should be taken after the one in (i) to assist the trapped worker.

   1   _____

   2   _____

(2 marks)

(d)   A trainee drainlayer reports to a certifying drainlayer that an unlabelled orange pipe and a second unidentified pipe have been uncovered while an excavation was being dug. The trainee drainlayer asks for advice on the actions to take.

   Give the TWO actions the certifying drainlayer should advise the drainlayer to take.

   1   _____

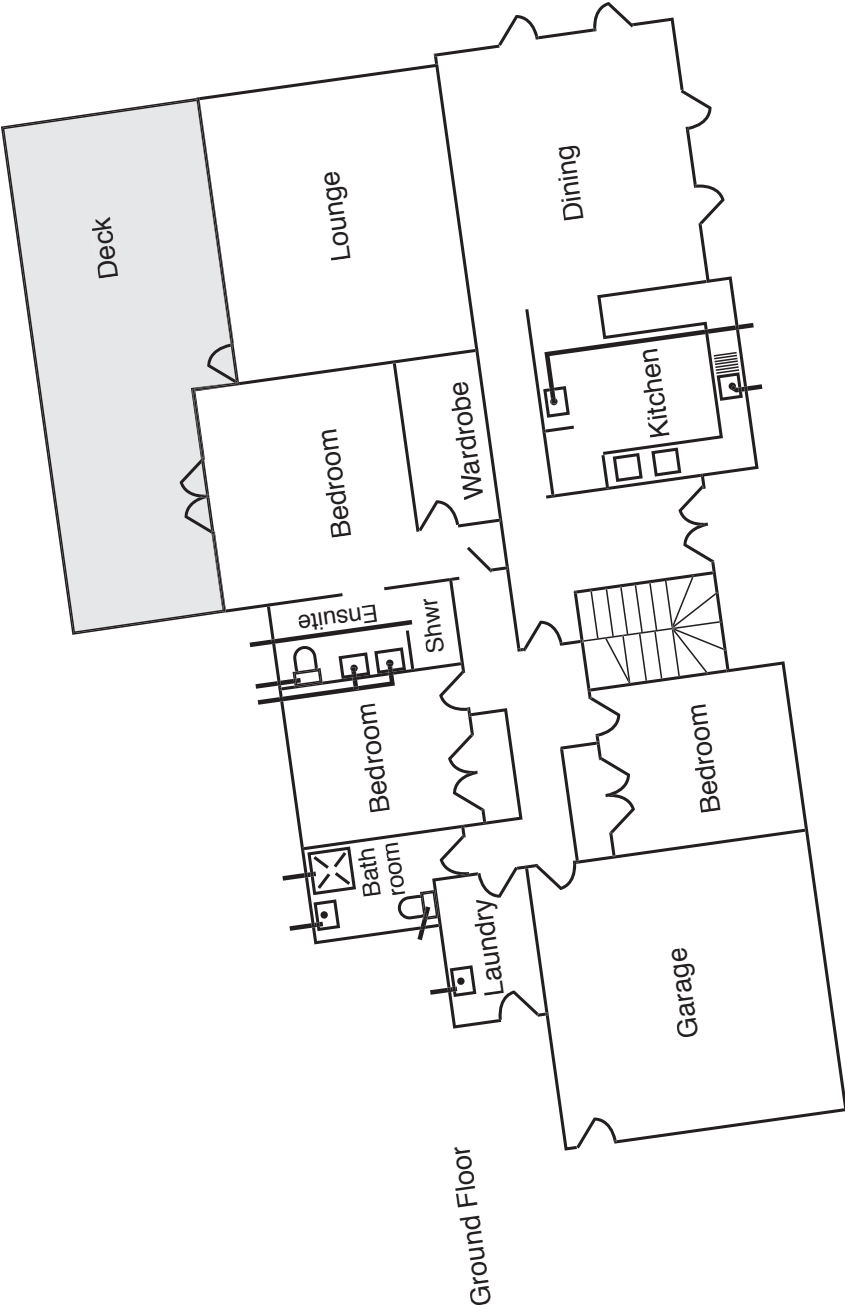   2   _____

(2 marks)

Total 12 marks

QUESTION 3

The diagram opposite shows the ground floor plan, and the layout of the sanitary fixtures and the discharge pipe for a new dwelling on a site. The plan has been drawn to a scale of 1:100. The network utility operator's (NUO) connection point is shown as X.

Complete the diagram to show suitable foul water pipework to convey waste to the NUO sewer connection point. The system is to comply with AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

Total 9 marks

(X)

Deck

Lounge

Dining

Bedroom

Wardrobe

Kitchen

Ensuite

Shwr

Bedroom

Bath room

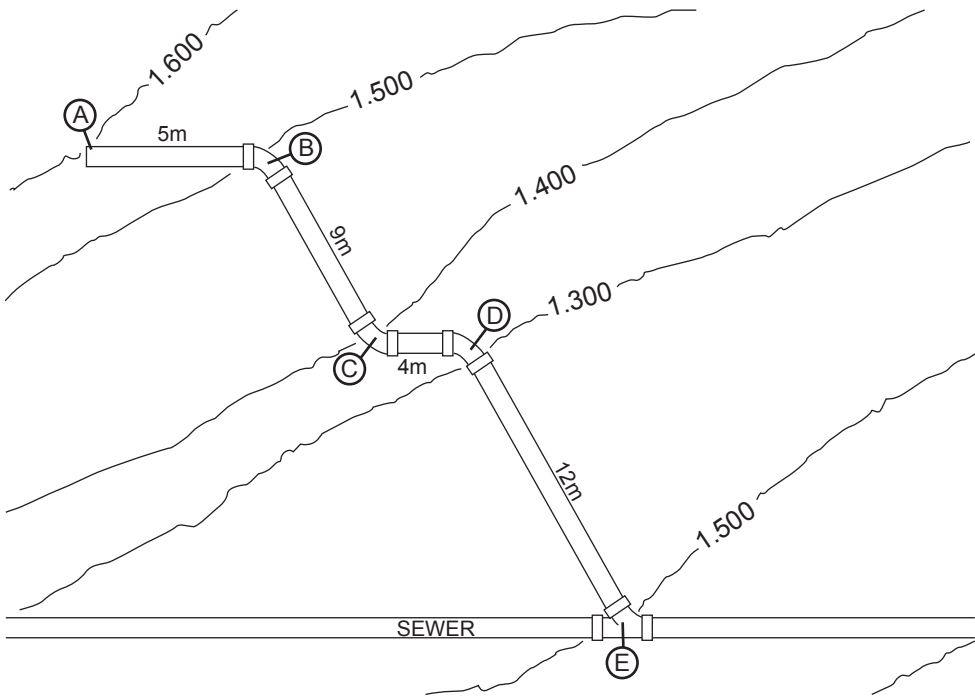Bedroom

Laundry

Garage

Ground Floor

QUESTION 4

The drawing below (not to scale) shows a newly laid drain and contour lines on a site.

The surface water drain connects to the dwelling at point A and to the network utility operator's (NUO) system at point E.

The datum is ground level, which is 900 mm above point A.

All sections of the drain have been laid at a gradient of 1 in 60 (1.65%).

(a) Complete the following tables to show the fall for each section and the depth below the ground level for the excavation at points B, C, D and E.

Section	Fall (mm)
A – B	
B – C	
C – D	
D – E	

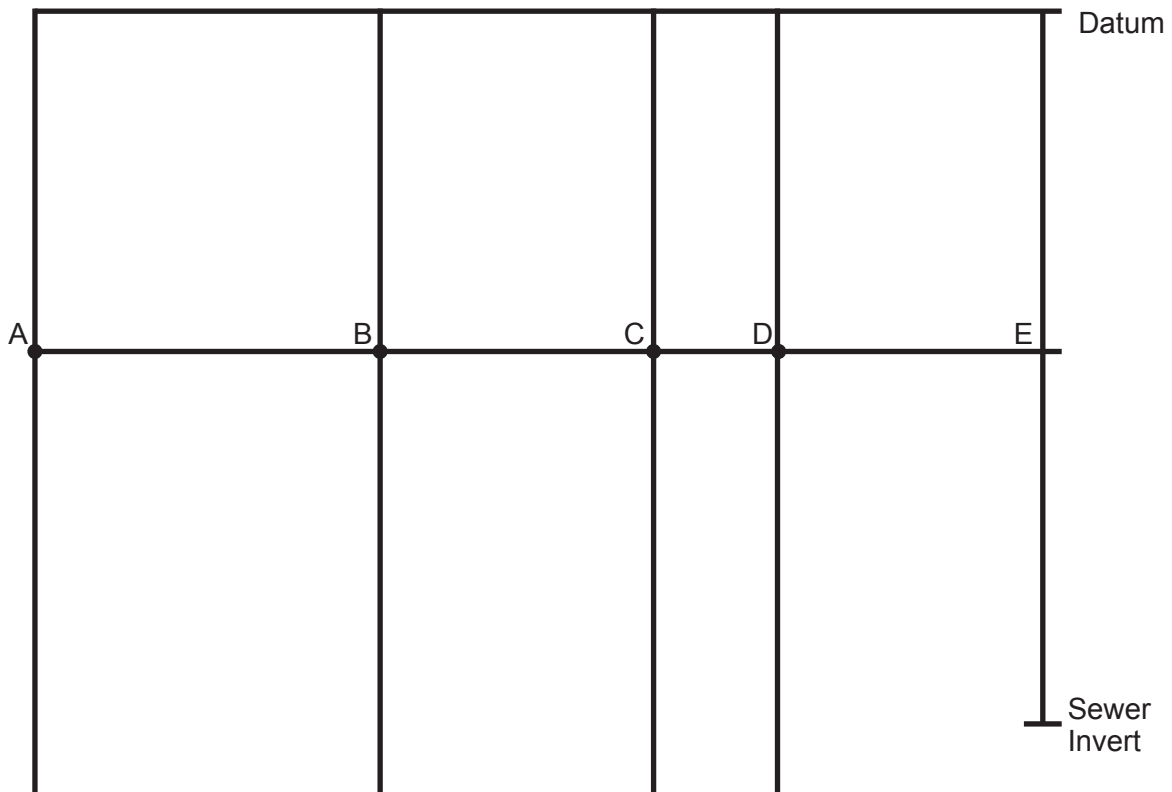| Point	Depth (mm)
A	900
B	
C	
D	
E	

(8 marks)

QUESTION 4 (cont'd)

(b)   On the chart below show the following information.

     (i)   The ground levels.

     (ii)   The depth of the drain invert below the ground.
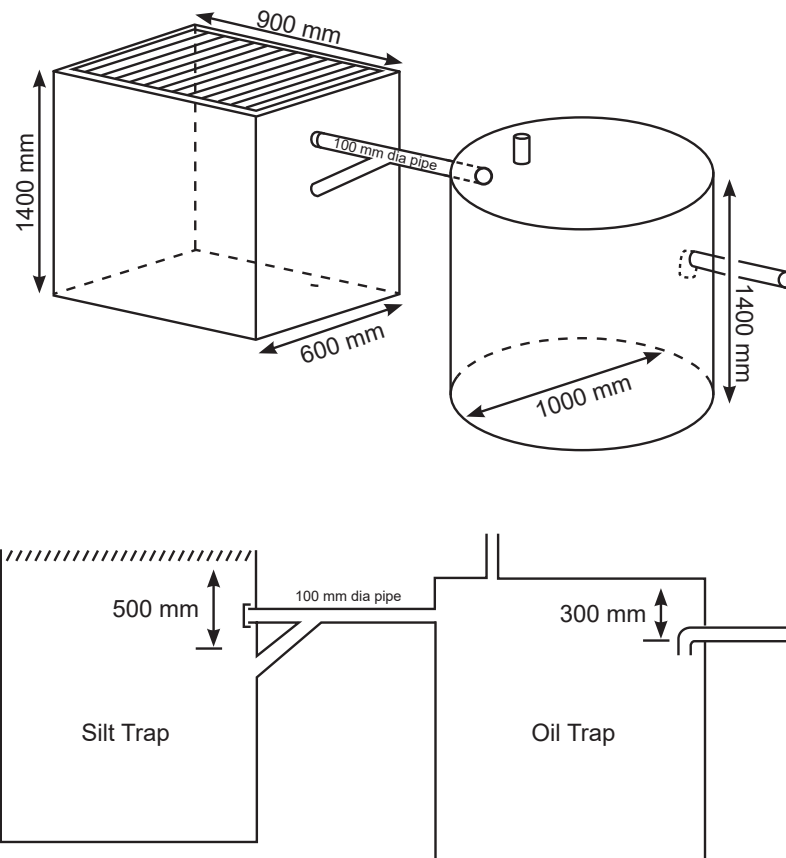
     The scale for the depths is to be 1:20

(4 marks)

Total 12 marks

QUESTION 5

(a) The diagrams below show pits used for steam cleaning at a workshop.

(i) Calculate the volume of silt that can be trapped before the silt trap is blocked.

_____

(2 marks)

(ii) Calculate in litres, the maximum possible volume of the liquid trap.

_____

(4 marks)

QUESTION 5 (cont'd)

(b)   An excavation is full of water. The excavation is 12.25 m long, 0.75 m wide and 1.3 m deep.

A dewatering pump has a discharge rate of 50 litres/minute.

Calculate the time required to dewater the excavation using this pump.

_____

_____

_____

_____

(3 marks) ☐

Total 9 marks ☐

QUESTION 6

(a) A section of land is being considered as a location for an effluent disposal system.

Give SIX site assessment factors, excluding soil assessment, that will determine its suitability.

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

(6 marks)

(b) Give the purpose of a dosing system that is used with an on-site sewage treatment system.

_____

_____

(1 mark)

(c) Draw and label a cross-section of a multi-chamber sewage treatment tank.

(4 marks)

QUESTION 6 (cont'd)

(d) (i) Six people are going to be living in the house served by a single septic tank and trench effluent field system.

Recommended capacities for septic tanks (litres)				
Type of Wastewater	Persons		Bedrooms	
	1 to 5	**6 to 10**	**1 to 3**	**4 to 6**
All-waste	3000	4500	3000	4500
Greywater only	1800	2700	1800	2700
Blackwater only	1500	2500	1500	2500

Using the table above, determine the required capacity for the septic tank.

_____

_____

(1 mark)

(ii) The house is supplied with water from a rain-water tank and has a waste disposal unit and dishwasher installed in the kitchen.

- The Design Loading Rate (DLR) for the soil in the area is 30mm/day.
- The effluent trenches will be 0.9 m wide.

Expected Daily Waste Water Flow (EDWF) in Litres/Person/Day		
Source	On-site Roof Water Tank Supply	Mains or Borehole Water Supply
Households with standard facilities (including automatic washing machine)	140	180
Households with full water reduction fixtures	115	145
Households with extra wastewater producing facilities (waste disposal units, dishwashers, bidets etc)	170	220

Using the table above, calculate the length of trench required for the effluent field.

Formula: Length = $\dfrac{\text{EDWF}}{\text{DLR x width}}$

_____

_____

_____

(3 marks)

Total 15 marks

INTENTIONALLY BLANK

QUESTION 7

Define the following terms as they relate to domestic waste water management.

(a)   Dispersive soil

_____

_____

(1 mark) ☐

(b)   Setback

_____

_____

(1 mark) ☐

(c)   Soil permeability

_____

_____

(1 mark) ☐

(d)   Reserve area

_____

_____

(1 mark) ☐

(e)   Design flow

_____

_____
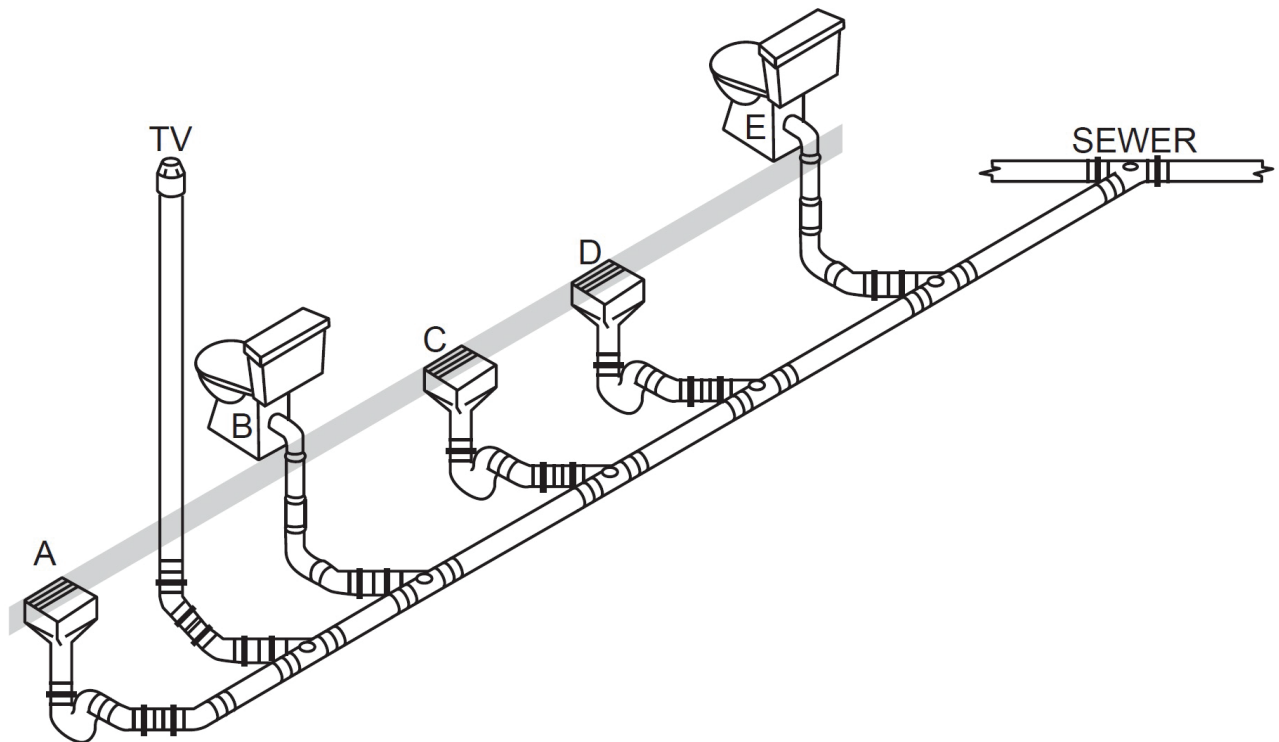
(1 mark) ☐

Total 5 marks ☐

QUESTION 8

The diagram above shows an as-laid plan of foul water drain for a residential property.

A blockage has occurred, causing foul water to overflow from the gully dishes marked A and C when the WC marked B is flushed.

(a)   Show on the diagram a likely location for the blockage.

(1 mark)

(b)   State how the location of the blockage in (a) could be confirmed without excavating the drain or using a camera.

_____

_____

_____

(2 marks)

QUESTION 8 (cont'd)

(c)   Give THREE different potential causes for the blockage in (a) to have occurred.

1 _____

2 _____

3 _____

(3 marks) ☐

(d)   Give THREE installation requirements as stated in New Zealand Building Code Acceptable Solution G13/AS2 Foul Water that reduce the risk of blockages in a foul water drain.

1 _____

2 _____

3 _____

(3 marks) ☐

(e)   Name THREE methods which may be used to clear a blocked drain.
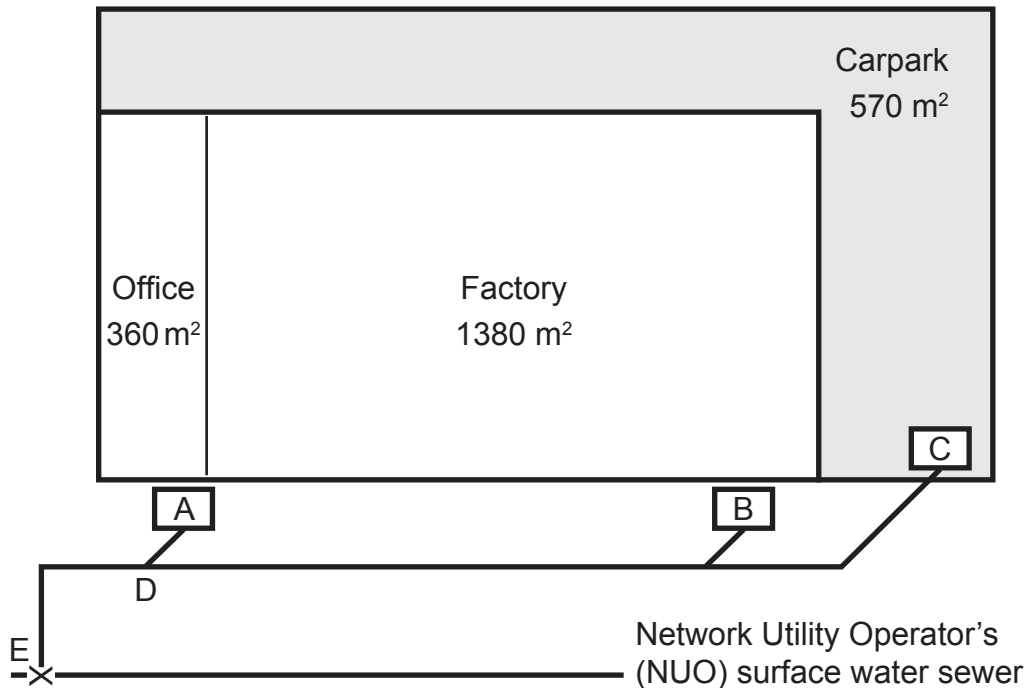
1 _____

2 _____

3 _____

(3 marks) ☐

Total 12 marks ☐

QUESTION 9

The diagram below shows a factory and office with a sealed carpark. The area of each part has also been shown.

The surface water from the roof drains to the downpipes labelled A and B. The driveway and carpark drain into the sump labelled C.

(a)   The installation has been designed for a rainfall intensity of 63 mm/h.

The installation is to comply with the minimum requirements of the New Zealand Building Code Acceptable Solution E1/AS1 Surface Water.

Calculate the modified catchment area for each of the factory, the office and the carpark.

Formula: Modified catchment area = 0.01 × area × Rainfall intensity

Office

_____

Factory

_____

Carpark

_____

(3 marks)

The drain is to be laid at a gradient of 1:40

(b)   Determine the minimum size of the branch drain that is required to convey surface water from each of the points A, B and C.

A   _____

B   _____

C   _____

(3 marks)

(c)   Determine the size of the section D – E of the main drain required to convey surface water to the NUO sewer.

_____

_____

(1 mark)

(d)   Determine the type of sump that is required to be installed at point C.

_____

_____

(1 mark)

Total 8 marks

SECTION B

Answer the following multiple-choice questions by writing your answer (A, B, C, D or E) in the box provided after each one of the questions.

Each correct answer in this section of the examination is worth 1 mark.

Should your choice of answer be unclear no mark will be awarded.

1. Which of the following are NOT required locations for an access point on a surface water drain, as specified by New Zealand Building Code Acceptable Solution E1/AS1 Surface Water?

    A   Points with changes in direction of greater than 45°.

    B   Junctions of drains serving a single downpipe that are less than 2.0 m long.

    C   At least every 100 m where inspection points, inspection chambers or access chambers are used.

    D   Points with changes in gradient of greater than 45°.

    E   At least every 50 m where rodding points are used.

2. How many ml per m of pipe length is it acceptable for a 150 mm surface water drain pipe to lose per hour during a water test carried out in compliance with New Zealand Building Code Verification Method E1/VM1 Surface Water?

    A   150

    B   200

    C   250

    D   300

    E   450

3. A drainlaying company has been engaged to carry out work.

    Which party is classed as a PCBU and has the primary health and safety duty under the Health and Safety at Work Act?

    A   The company.

    B   The company's health and safety representative.

    C   The owner of the property where work takes place.

    D   The tradespeople doing the work.

    E   The company's directors.

4. A trench is to be dug in line with the footings of a building, and will be 1.5 metres deeper than the footings.

The trench is expected to be open for 3 days.

How far away from the base of the footings must the trench be?

A   1.0 m.

B   1.5 m.

C   2.0 m.

D   3.0 m.

E   4.5 m.

5. According to the New Zealand Building Code Acceptable Solution G13/AS2 Foul Water, what is the maximum number of discharge units permitted to be conveyed by a 150 mm pipe laid at a gradient of 1:160?

A   255

B   320

C   462

D   598

E   611

6. What is meant by the term surcharge loads in relation to shoring a trench?

A   The amount of ground water in the area of the trench.

B   Slippage of soil along bedding planes applying extra forces on the shoring.

C   Extra weight from soil or vehicles near the edge of the trench.

D   The removal of ground water via well-pointing changing the structure of the soil.

E   Building foundations within 1 m of a trench.

7.   A certifying drainlayer has employed a trainee who has just uplifted a trainee licence to perform restricted drainlaying. For what length of time must the trainee work in the direct presence of the certifying drainlayer?

A   6 months.

B   12 months.

C   24 months.

D   36 months.

E   Until such time as the trainee achieves registration.

8.   Why is there a maximum allowable distance between a gully dish and a grease trap it is discharging into?

A   To stop the waste cooling and fats solidifying on the internal wall of the pipe.

B   To prevent vermin from entering the grease trap.

C   So that the pipe does not require venting.

D   So that the pipe can easily be cleaned without specialised equipment.

E   So that an inspection point is not required on the inlet of the grease trap.

9.   What is the maximum amount of non-friable asbestos permitted to be removed before a licence is required?

A 1 m^2

B 5 m^2

C 10 m^2

D 15 m^2

E 20 m^2

10. Why is there a restricted zone at the base of a discharge stack?

A To prevent trap seal loss due to compression.

B To prevent trap seal loss due to oscillation.

C To prevent blockages in the drain.

D To prevent blockages in the discharge stack.

E To prevent blockages in the drain and discharge stack.

Total 10 marks

This page is available for additional working or answers

Question number _____

This page is available for additional working or answers

Question number _____

Question number	Marks	Marks
1		
2		
3		
4		
5		
6		
7		
8		
9		
Section B		
Total		