

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 2018

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.

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 18–21 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.

Check that this booklet has all of 21 pages in the correct order and that none of these pages is blank.

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

Candidates that sat this examination in June 2018 were provided with the following documents:

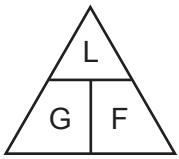
- NZBC clause E1: Surface Water
- AS/NZS 3500 Part 2: Sanitary plumbing and drainage

USEFUL FORMULAE

Circumference of circle = $2 \times \pi \times R$ or Circumference of circle = $\pi \times D$

Area of circle = $\pi \times R^2$ or Area of circle = $0.7854 \times D^2$

Volume of cylinder = $\pi \times R^2 \times H$ or Volume of cylinder = $0.7854 \times D^2 \times H$



length = L

gradient = 1:G

fall = F

SECTION A

QUESTION 1

- (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 may determine the suitability of the site.

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____
- 6 _____

(6 marks)

- (b) Give FOUR changes that could be made within a dwelling to reduce the amount of effluent produced and therefore reduce the area required for the disposal of the effluent.

- 1 _____
- 2 _____
- 3 _____
- 4 _____

(4 marks)

- (c) A house drain connected to an on-site sewage disposal system is overflowing at the fresh air inlet.

Give FOUR different possible causes of this.

- 1 _____
- 2 _____
- 3 _____
- 4 _____

(2 marks)

Total 12 marks

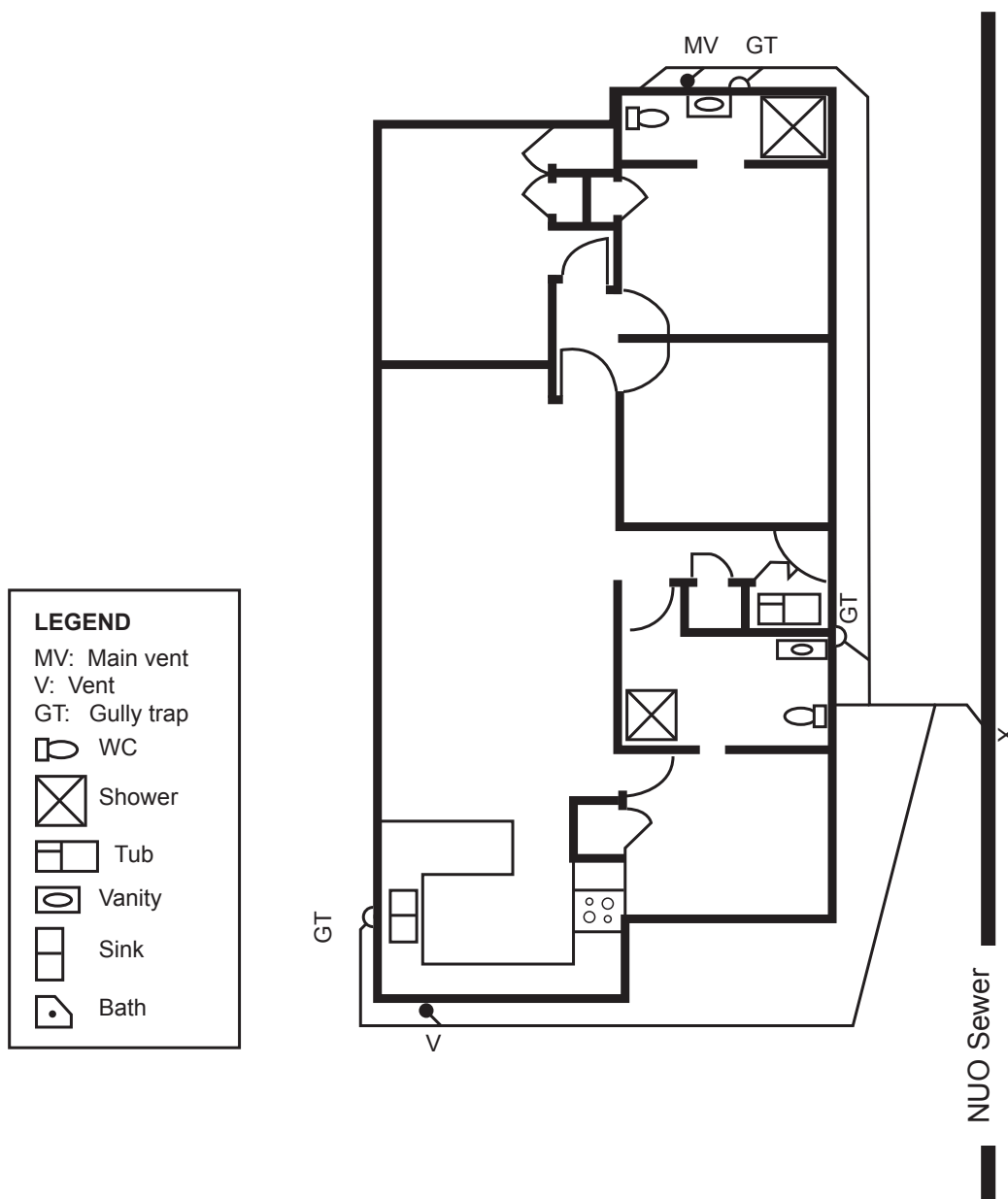
QUESTION 2

The plan below shows the foul water drainage plan for an existing concrete floor dwelling. The dwelling is undergoing renovations.

A plan showing the proposed layout for the sanitary fixtures, walls and a deck for the renovated dwelling is shown on the page opposite.

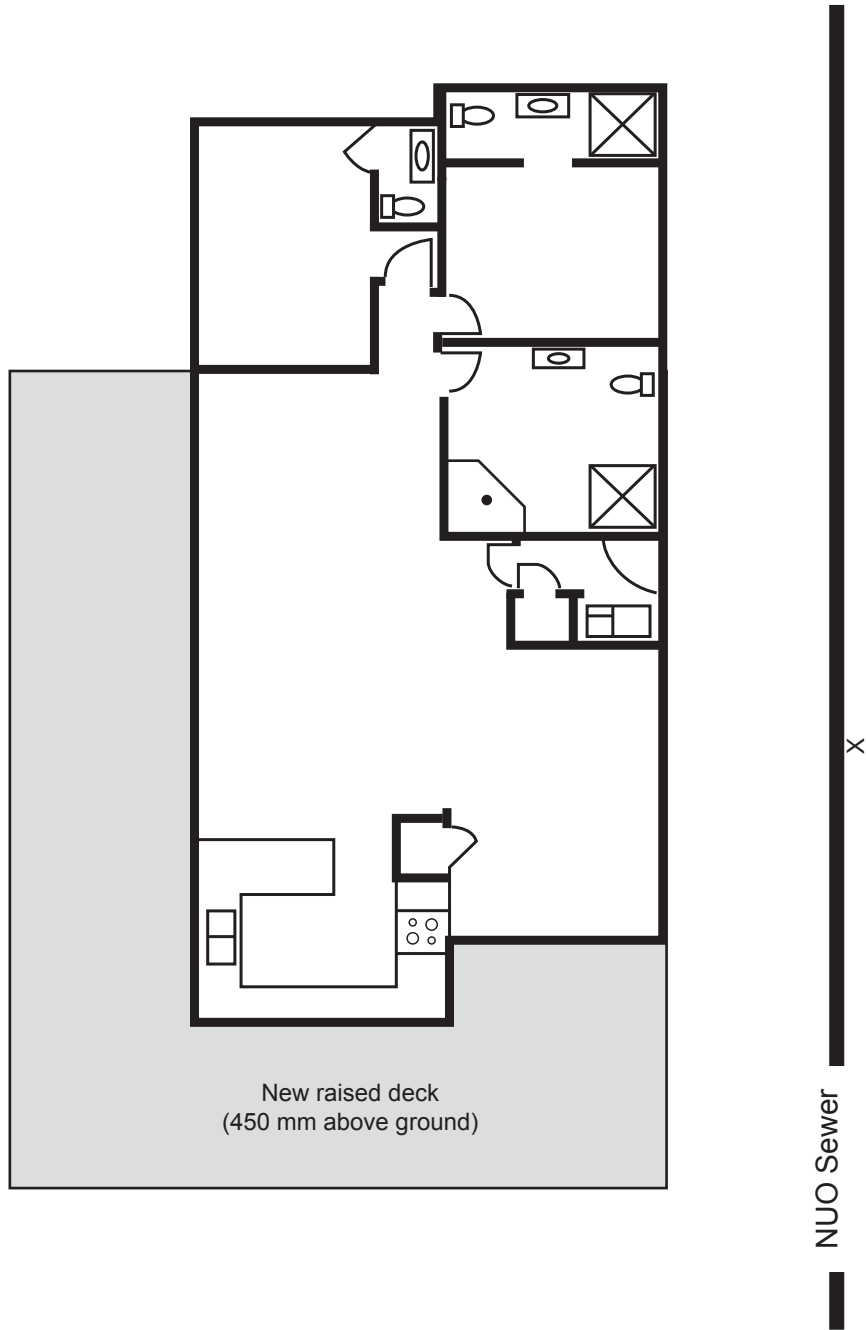
Both plans are drawn to a scale of 1:100

On the plan on the opposite page, show the foul water pipework system to carry the waste to the network utility operator's connection point (X) that will meet the requirements of the New Zealand Code clause G13/AS2 Foul Water.



Total 10 marks

QUESTION 2 (cont'd)



QUESTION 3

The surface water drain from a property is lower than the local territorial authority's (TA) main drain connection point.

(a) Name TWO options that could be used to dispose of surface water from the property.

1 _____

2 _____

(2 marks)

(b) Draw and label a diagram showing the key requirements that must be met for one of the options named in (a).

(4 marks)

Total 6 marks

QUESTION 4

(a) Give the meaning of the term 'angle of repose' in relation to excavation.

(1 mark)

(b) Give THREE factors that have an effect on the angle of repose.

1 _____

2 _____

3 _____

(3 marks)

(c) Trench collapse is a hazard when working in an excavation.

Give THREE other hazards that may be present when working in an excavation.

1 _____

2 _____

3 _____

(3 marks)

(d) Give FOUR actions that could be taken to reduce the risk of an accident when working in an excavation.

1 _____

2 _____

3 _____

4 _____

(4 marks)

Total 11 marks

QUESTION 5

(a) Give TWO conditions under which an excavation becomes particular hazardous work (notifiable work).

1 _____

2 _____

(2 marks)

(b) A certifying drainlayer is to instruct a trainee how to use a piece of machinery.

Give FOUR matters regarding safety that should be covered in the instruction.

1 _____

2 _____

3 _____

4 _____

(4 marks)

(c) Explain why a reduced pressure test is used when testing large diameter drains.

(1 mark)

Total 7 marks

QUESTION 6

(a) A cable and pipe locator is being used to locate underground services.

Give TWO reasons why using this type of locator may not be adequate.

- 1 _____
- _____
- 2 _____
- _____

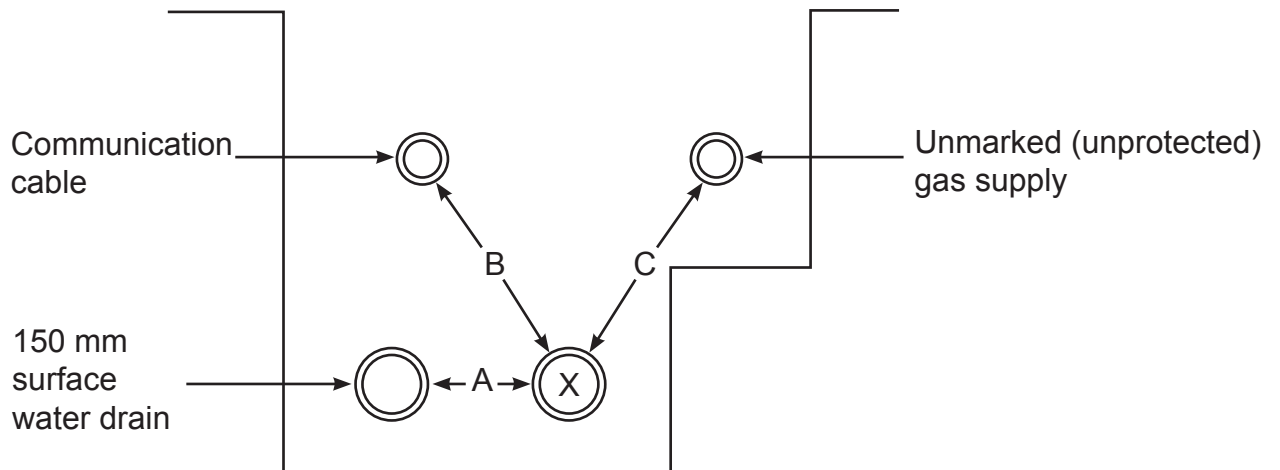
(2 marks)

(b) Name TWO methods that could be used other than a cable and pipe locator to locate and reduce the risk of damage to an existing service when excavating.

- 1 _____
- 2 _____

(2 marks)

(c) The diagram below shows a foul water drain marked X laid in a trench shared with other services.



Give the minimum required separation distances between the services, shown by A, B, and C.

- A _____
- B _____
- C _____

(3 marks)

Total 7 marks

QUESTION 7

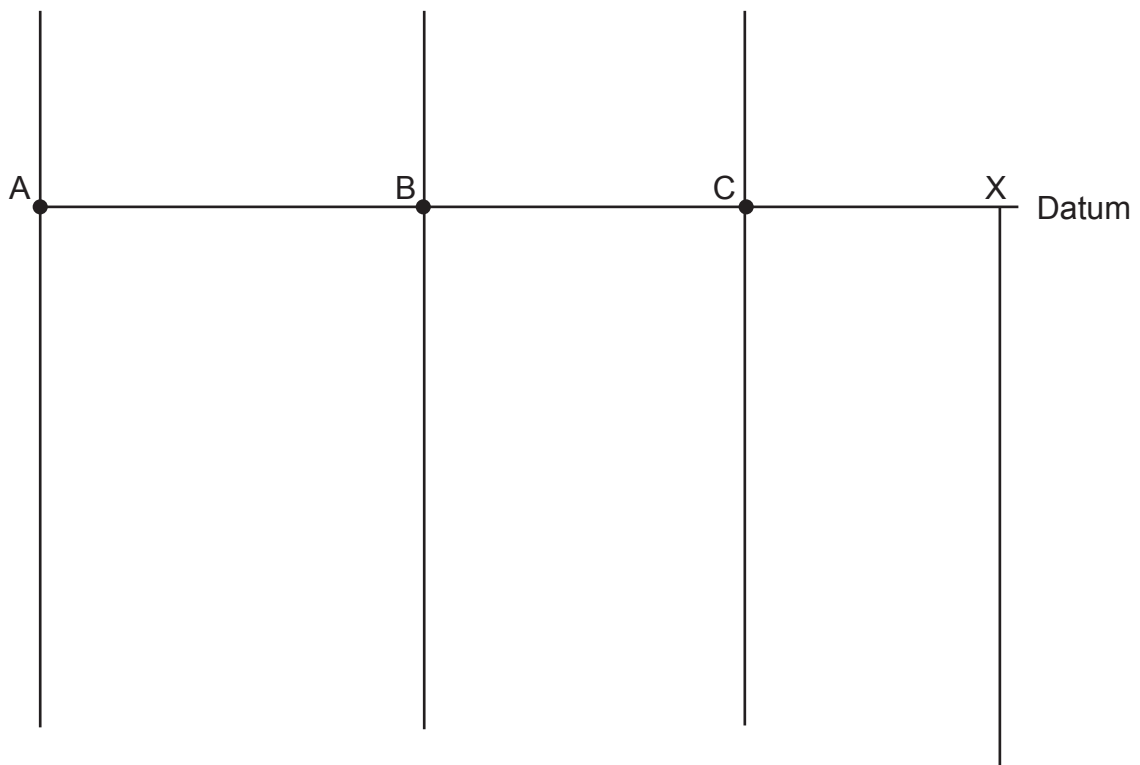
The plan opposite (not to scale) shows a building and contour lines on a site. The surface water drain connecting the dwelling to the network utility operator’s (NUO) system is also shown.

The invert for the NUO’s connection at X is 1.4 metres below ground level. The datum is as shown on the chart below.

The gradient of the drain is 1:60 and the distances between the points are as shown in the table below.

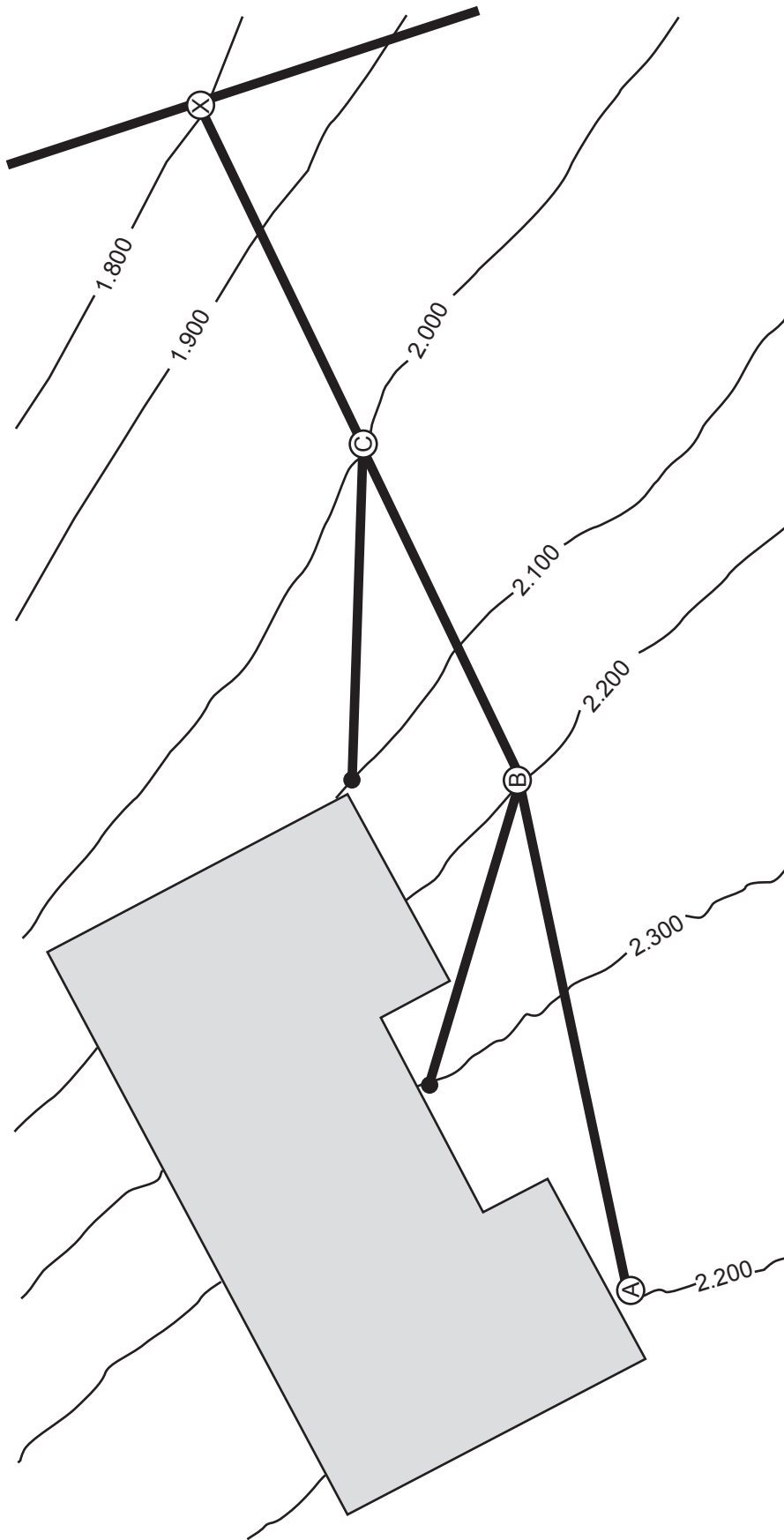
Length of pipe sections		
Pipe section	Distance	Fall
A - B	12 metres	
B - C	10 metres	
C - X	8 metres	

- (a) Complete the table to give the fall for each section of pipework. Use a scale of 1:20 for the depths.
- (b) On the chart below, show the following information.
 - The ground levels.
 - The depth of the drain invert below the datum.
 - The depth of the drain invert below the ground.



Total 12 marks

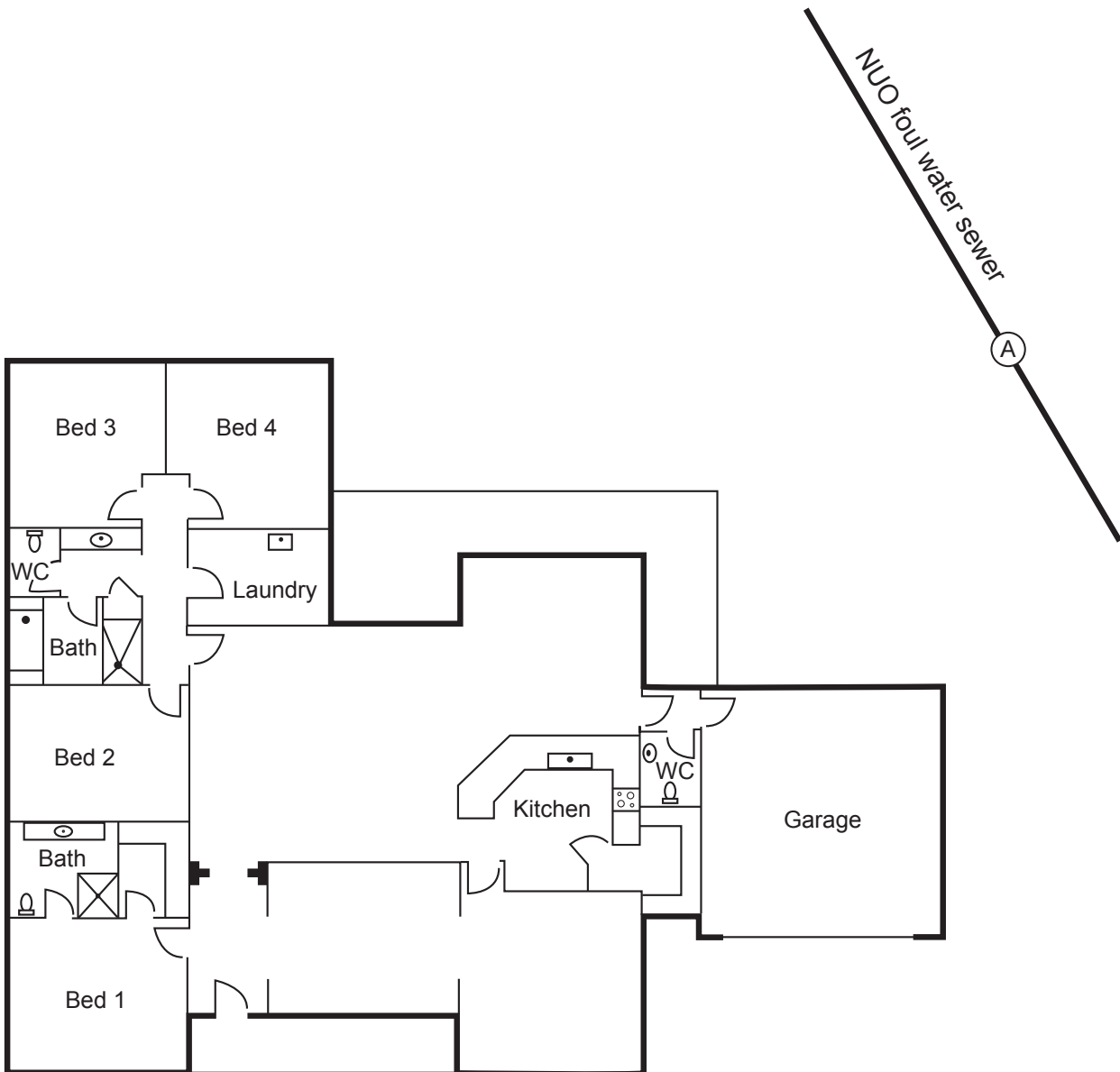
QUESTION 7 (cont'd)



QUESTION 9

The plan below shows the layout of sanitary fixtures for a new dwelling. A connection point (marked A) to the network utility operator's (NUO) foul water sewer is also shown. The plan has been drawn at a scale of 1:200.

Complete the diagram to show the foul water drainage system required to convey waste water to the NUO sewer connection point. The completed system is to comply with the minimum requirements of New Zealand Building Code clause G13/AS2 Foul Water.

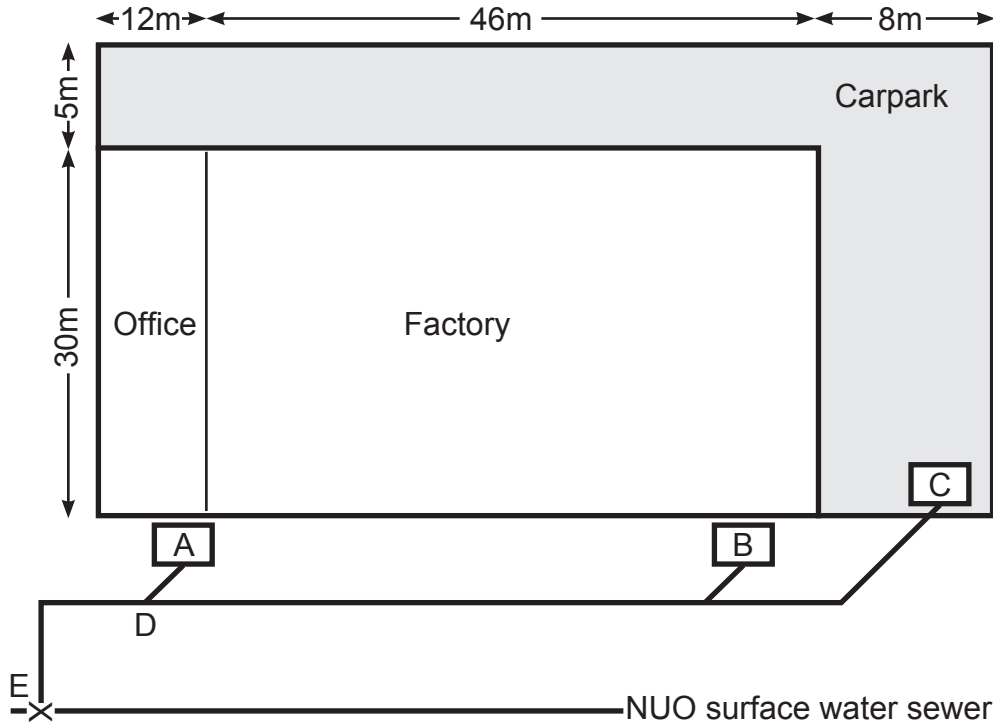


Total 10 marks

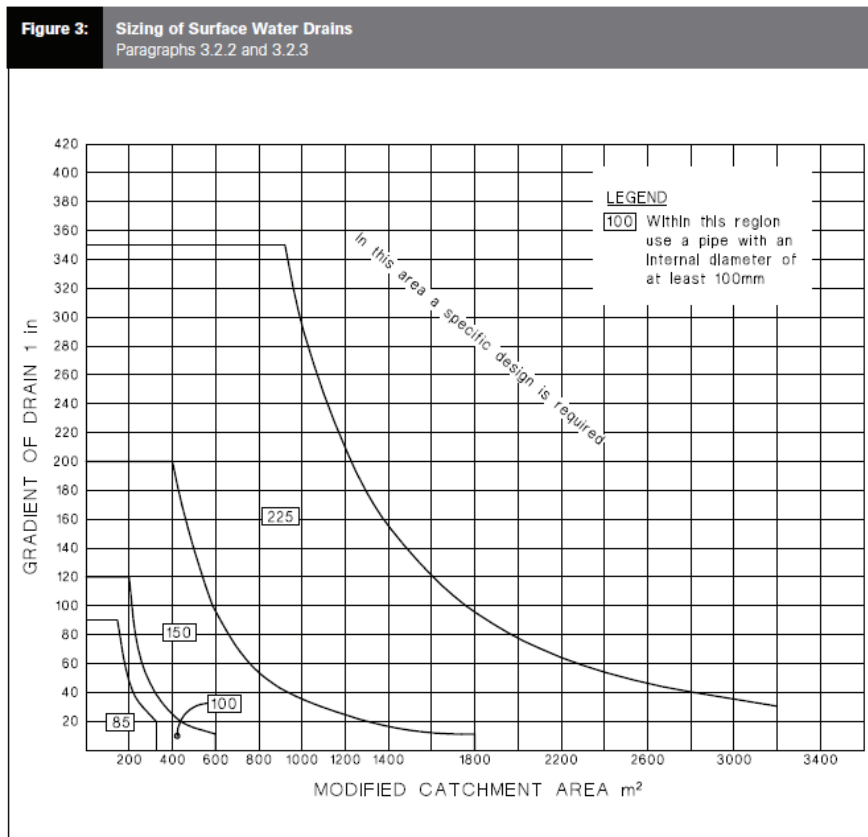
QUESTION 10

The diagram below shows a factory and office roof areas and a sealed carpark.

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



The graph below shows the diameters of drains for various modified catchment areas.



QUESTION 10 (CONT'D)

- (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 clause E1/AS1 Surface Water.

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

Formula: Modified catchment area = $0.01 \times \text{area} \times \text{Rainfall intensity}$

Office: _____

Factory: _____

Carpark: _____

(3 marks)

- (b) Using the graph on the page opposite, determine the minimum size of the branch drain laid at minimum gradient that is required to convey surface water from each of downpipes A and B and sump C.

A _____

B _____

C _____

(3 marks)

- (c) Determine the size and the gradient of the main drain D – E according to New Zealand Building Code clause E1/AS1 Surface Water.

(2 marks)

- (d) State the type of sump that must be installed at point C.

(1 mark)

Total 9 marks

QUESTION 11

Define each of the following terms as they relate to onsite waste water disposal.

(a) Dispersive soil

(1 mark)

(b) Soil permeability

(1 mark)

(c) Reserve area

(1 mark)

(d) Design flow

(1 mark)

Total 4 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. The minimum depth of cover required for a drain subject to light vehicular traffic and installed to comply with AS/NZS 3500 Part 2: Sanitary plumbing and drainage cannot be achieved.

Which of the following gives the minimum requirements to protect the drain from damage?

- A Cover the pipe with 50 mm of overlay followed by 50 mm of concrete paving.
- B Cover the pipe with 25 mm of overlay followed by 75 mm of reinforced concrete.
- C Cover the pipe with 50 mm of overlay followed by 75 mm of concrete paving.
- D Cover the pipe with 25 mm of overlay followed by 100 mm of concrete paving.
- E Cover the pipe with 50 mm of overlay followed by 100 mm of reinforced concrete.

2. How long must a drain installed under a building foundation last to comply with New Zealand Building Code clause B2/AS1 Durability.

- A 5 years.
- B 10 years.
- C 15 years.
- D 30 years.
- E 50 years.

3. A wet well dual pumping system has been installed to convey foul-water from a building.

What should occur when the low level sensor is activated?

- A The main pump should start to empty the well.
- B The main pump should stop.
- C A warning system should activate to inform that maintenance is required.
- D The standby pump should start.
- E The building water supply solenoid valve should shut.

4. What is the definition of the term 'drain in common'?
- A A drain that conveys both storm water and foul water.
 - B A drain that is maintained by the local territorial authority.
 - C A drain that serves two or more properties.
 - D A drain that has been permitted to cross public land.
 - E A drain that discharges into a watercourse.

5. A drain is serving a vertical discharge stack on a two level building.
A gully dish must be connected to the drain downstream of the discharge stack connection.
How close to the discharge stack connection is the junction for the gully trap permitted to be?
- A 250 mm.
 - B 500 mm.
 - C 600 mm.
 - D 1000 mm.
 - E 2500 mm.

6. A tank has an internal volume of 8.5 m^3 . It is 60% full with material.
What is the volume of the material in the tank?
- A 4.2 m^3 .
 - B 4.5 m^3 .
 - C 4.8 m^3 .
 - D 5.1 m^3 .
 - E 5.5 m^3 .

7. A water test of a surface water drain is to be carried out to comply with New Zealand Building Code clause E1/VM1 Surface Water.

What is the required length of time for the test?

- A 5 minutes
- B 15 minutes
- C 30 minutes
- D 45 minutes
- E 60 minutes

8. What is the typical minimum acceptable content of oxygen in air for a safe environment?

- A 9%
- B 14%
- C 19%
- D 24%
- E 28%

Total 8 marks

For Examiner's use only

Question number	Marks	Marks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
Section B		
Total		