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

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No. 9195

Plumbers, Gasfitters and Drainlayers Board

REGISTRATION EXAMINATION, JUNE 2011

CERTIFYING PLUMBER

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 23–25 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 25 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 2011 were provided with the following documents:

- AS/NZS 3500 Part 1: Water services
- AS/NZS 3500 Part 2: Sanitary plumbing and drainage

SECTION A

QUESTION 1

(a) State TWO conditions that would cause a reduced pressure zone backflow prevention device to discharge from the relief valve.

1 _____

2 _____

(2 marks) ☐

(b) (i) Name the pipe material that is NOT permitted to be used between a backflow prevention device and a carbonated drink dispenser.

_____

(1 mark) ☐

(ii) State the reason why the material in (i) is not permitted to be used.

_____

_____

(1 mark) ☐

Total 4 marks ☐

QUESTION 2

A sanitary venting system is being designed so that it complies with AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

(a) Give the circumstance in which each of the following vents are required.

(i) Relief vent

_____

_____

(ii) Cross relief vent

_____

_____

(2 marks)

(b) The drawing opposite shows a range of sanitary fixtures connected to an offset discharge stack. The WCs are flushed from cisterns. Each floor level is 3 metres in height.

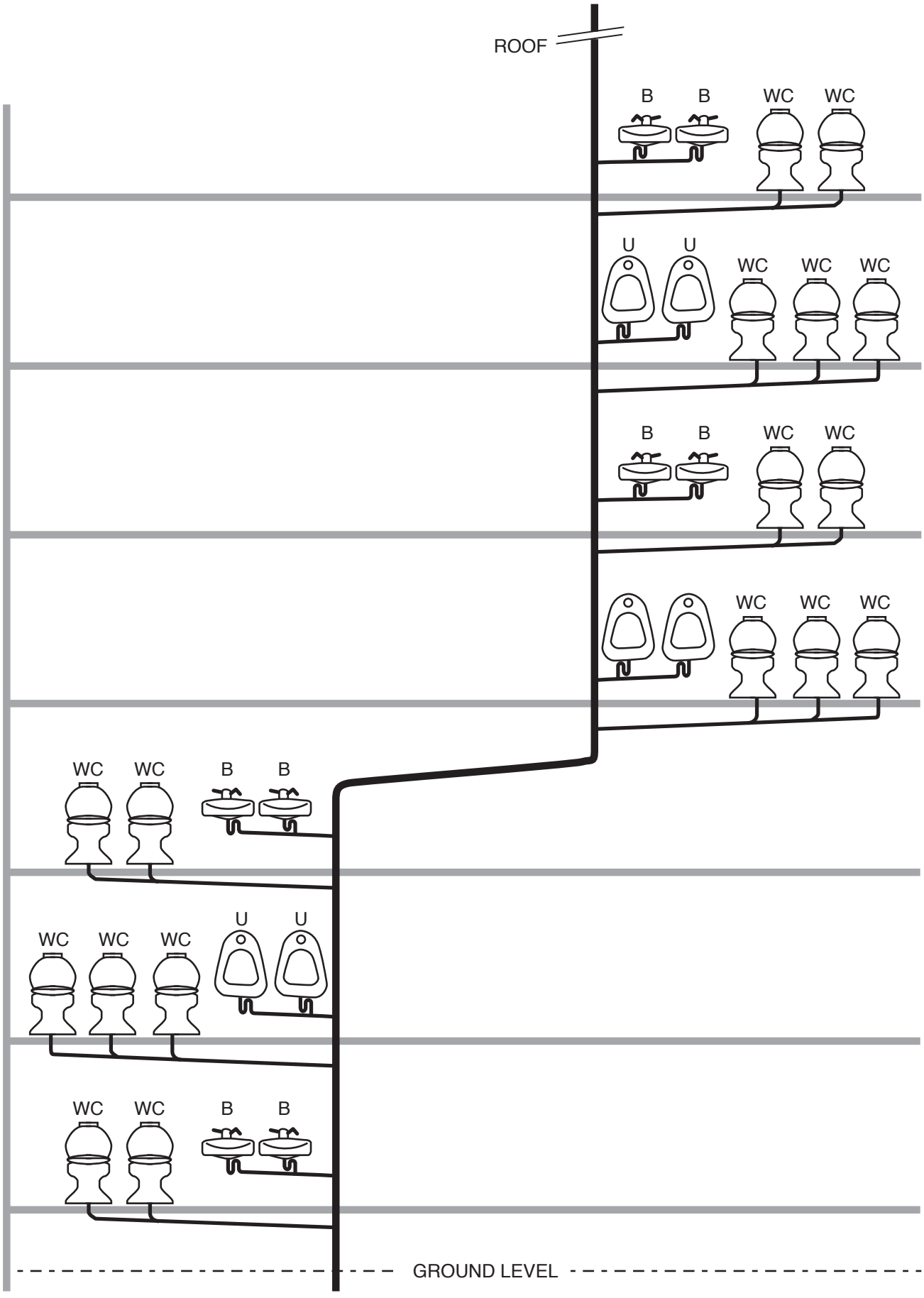
(i) Complete the drawing to show the vents required for a fully vented modified system.

(ii) Show on the drawing the minimum sizes for each vent pipe.

(9 marks)

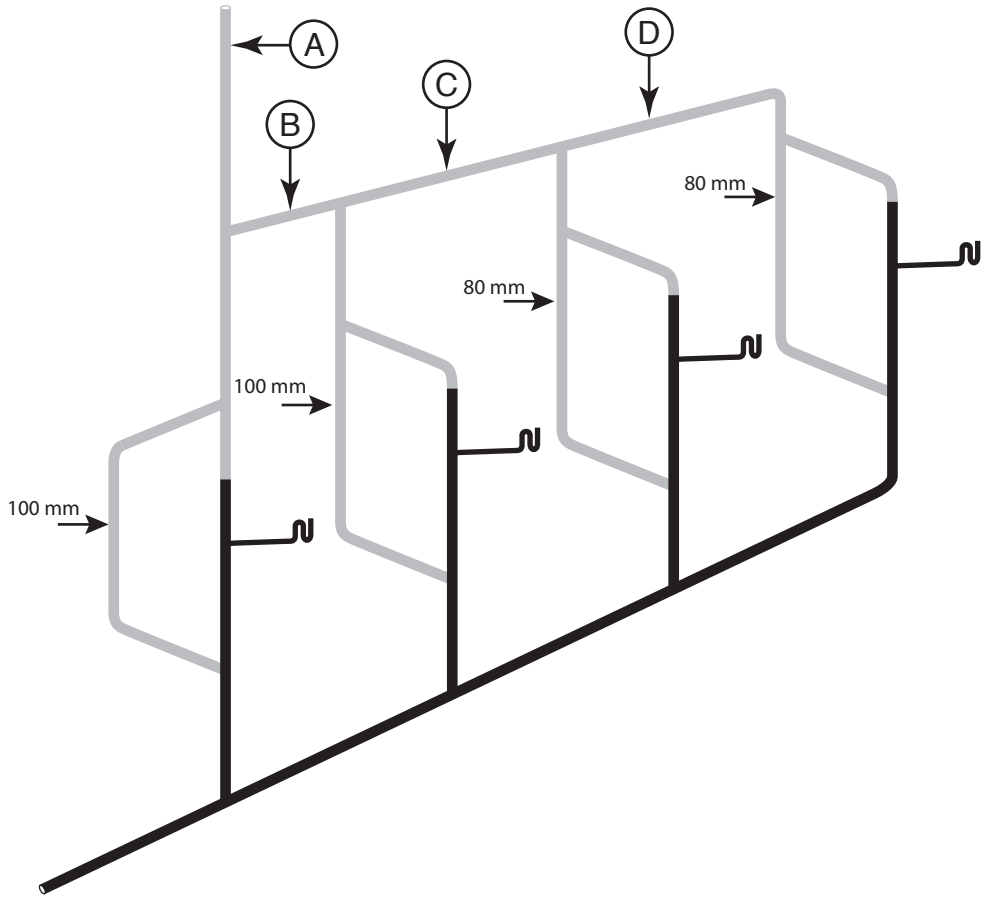
Total 11 marks

QUESTION 2 (cont'd)



QUESTION 3

(a) The following drawing shows the installation of a header vent.



Complete the table below to show the minimum size for each section of vent labelled A, B, C, and D.

A	
B	
C	
D	

(4 marks)

(b) State the maximum size a header vent pipe is ever required to be.

_____

(1 mark)

Total 5 marks

QUESTION 4

(a) An 80 mm discharge stack serving sanitary fixtures on three levels is installed so that it complies with AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

Give FOUR restrictions that apply to the system.

1 _____

2 _____

3 _____

4 _____

(2 marks)

(b) A discharge stack has been offset using a 60° bend at each change of direction.

State how this impacts on the sizing of the stack.

_____

(1 mark)

Total 3 marks

QUESTION 5

A ring main is being installed to supply hot water to multiple bathroom fixtures at an aged people's home. The hot water thermostat is set to 70°C to prevent the growth of legionella bacteria within the cylinder.

(a) Give TWO solutions that would provide tempered water to the outlets and also protect the ring main system from legionella bacteria.

1 _____

2 _____

(2 marks)

(b) As a community care building, the home must store 50 litres of water per person in case the water supply is interrupted.

Describe how the system should be constructed to ensure that the water in the storage tank does not become stagnant.

_____

_____

_____

_____

(1 mark)

Total 3 marks

QUESTION 6

(a) A rural home has been supplied by bore water. The bore supply is no longer suitable and the owner has decided to install a tank to collect rain water from the roof and supply the house via a new pump.

Give THREE factors regarding the existing site that need to be checked to ensure the rain water collected will be of sufficient quality.

1 _____

_____

2 _____

_____

3 _____

_____

(3 marks)

(b) Give TWO different components that could be included in the installation to help maintain the water quality before the water enters the tank.

1 _____

_____

2 _____

_____

(2 marks)

Total 5 marks

QUESTION 7

Five houses are to be built down a right-of-way as shown in the plan on the opposite page.

The pressure available from the public water supply is 300 kPa.

The height of the highest fixture outlet is 2 metres above the public water supply.

The minimum head required for the fixture outlets is 5 metres.

For this exercise a value of 10 kPa per metre head is to be used.

The length of consumer pipework from the toby labelled G to the furthest outlet is 12 metres.

The pipe material to be used is copper.

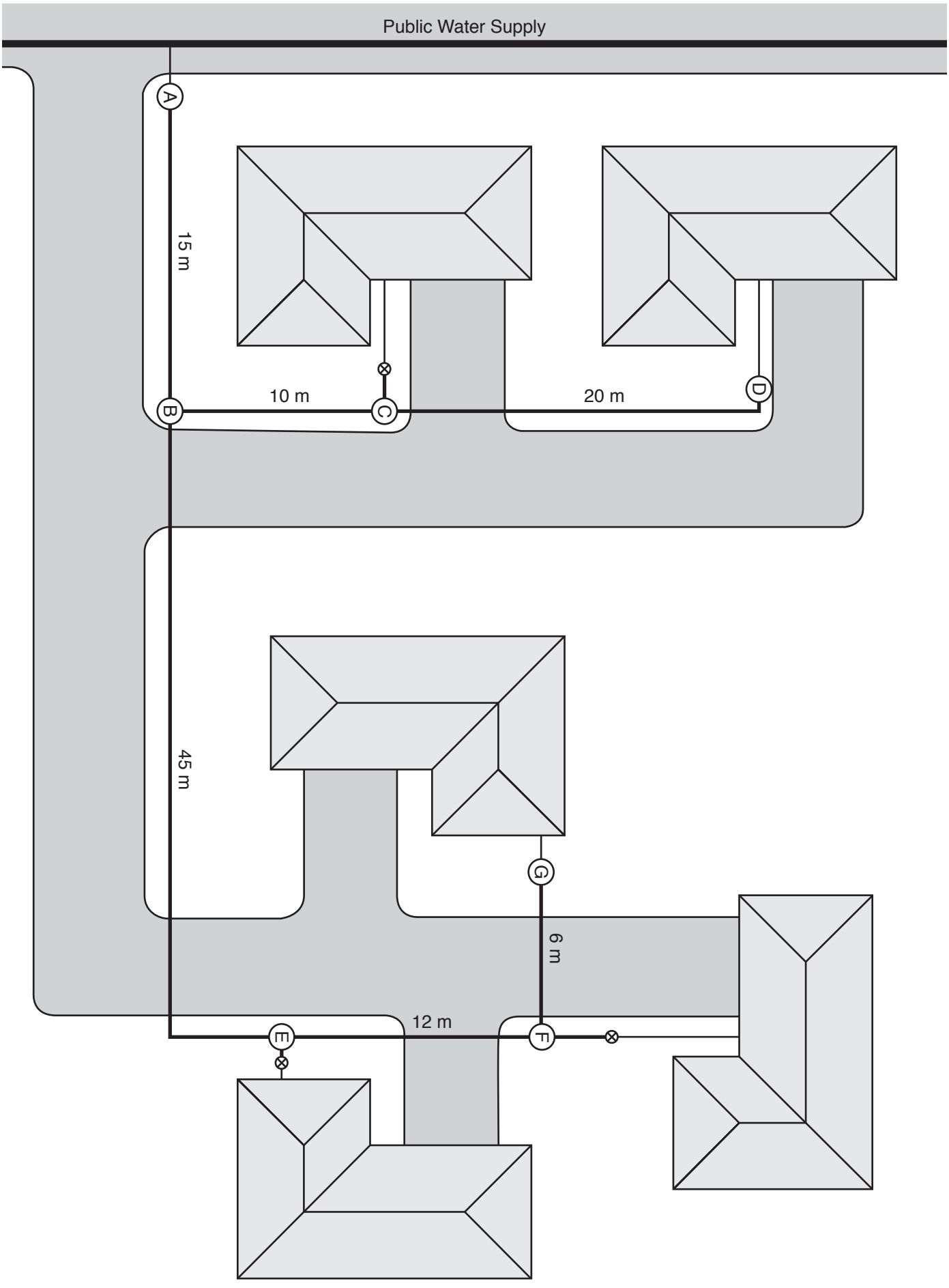
Using the procedure in AS/NZS 3500 Part 1: Water supplies Appendix C, complete the tables below to size the pipework. Give your answers in New Zealand equivalent pipe sizes.

Index length of installation	Pressure drop

Pipe Section	Probable simultaneous demand (L/s)	Nominal pipe size (DN)
A-B		
B-C		
C-D		
B-E		
E-F		
F-G		

Total 15 marks

QUESTION 7 (cont'd)



QUESTION 8

The diagram opposite shows a series of fixtures fitted with flushing valves supplied by a break tank. The available head to the upper flush valves is 5 metres.

Using AS/NZS 3500 Part 1: Water services, answer the following.

(a) Complete the following table to show the diameter of the pipe supplying the flushing valves in each labelled section of the diagram.

Section	Diameter
A-B	
B-C	
C-D	
D-E	
F-G	

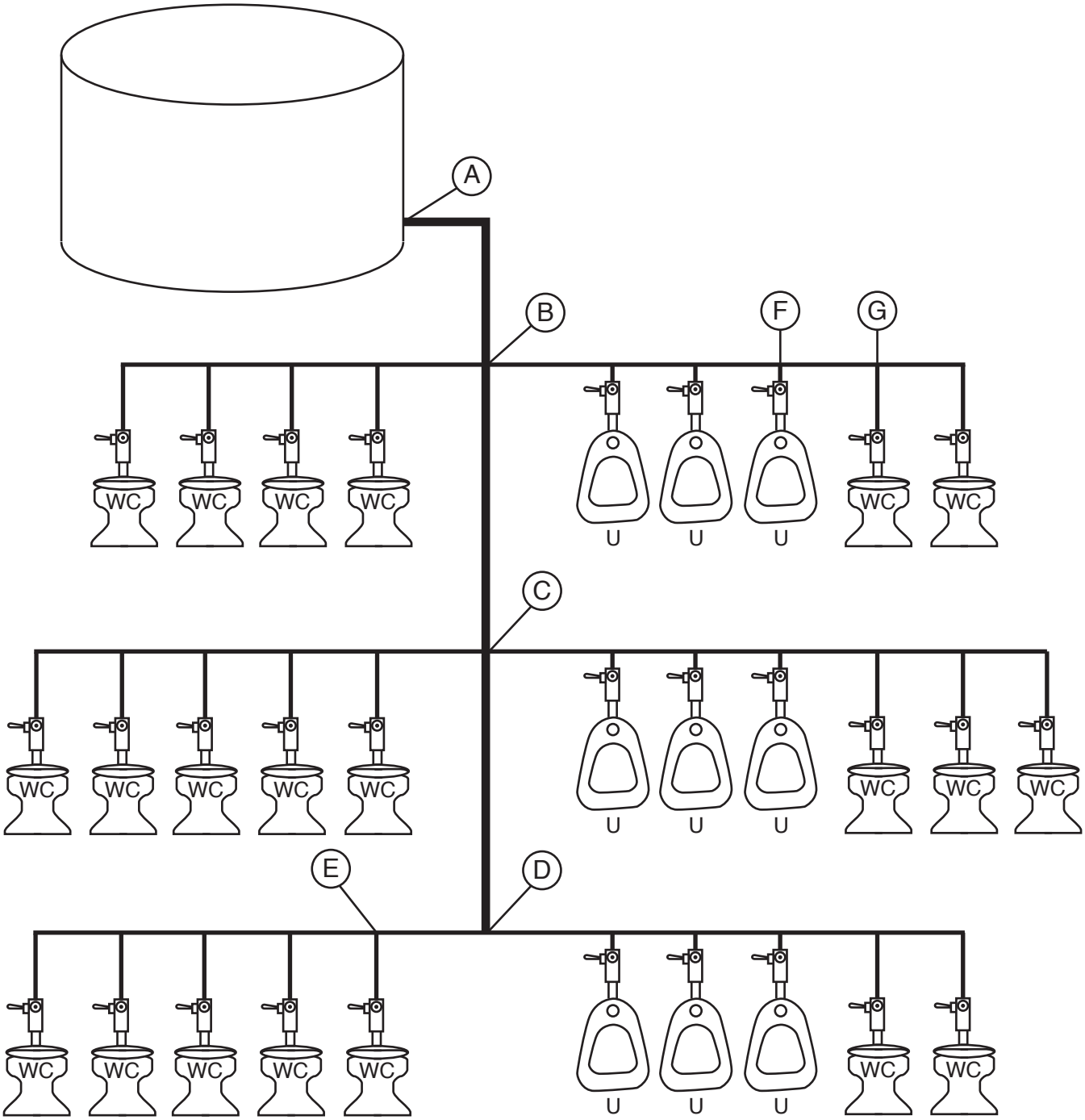
(6 marks)

(b) Calculate the minimum capacity permitted for the break tank supplying water to the flushing valves.

(4 marks)

Total 10 marks

QUESTION 8 (cont'd)



QUESTION 9

The drawing opposite shows parts of a hot water system. The available head at the tempering valve is 2.500 metres.

Using your own knowledge and Table 4 from New Zealand Building Code Clause G12: Water supplies below, complete the table at the bottom of the page to give the sizes required.

Table 4: Tempering Valve and Nominal Pipe Diameters
Paragraphs 5.3.1 and 6.12.1

	Low pressure (i.e. header tank supply or low pressure)	Low and medium pressure unvented (valve vented) and open vented	Mains pressure
Pressure of water at tempering valve (kPa)	20 – 30	30 – 120	over 300
Metres head (m)	2 – 3	>3 – 12	over 30
Minimum tempering valve size	25 mm	20 mm	15 mm
Pipes to tempering valve	25 mm (see **Note 3**)	20 mm	20 mm (15 mm optional) (see **Note 1**)
Pipes to shower	20 mm	20 mm (see **Note 4**)	20 mm (see **Note 5**) (15 mm optional) (see **Note 1**)
Pipes to sink/laundry (see **Note 2**)	20 mm	20 mm	15 mm
Pipes to bath (see **Note 2**)	20 mm	20 mm	15 mm
Pipes to basins (see **Note 2**)	15 mm	15 mm	10 mm

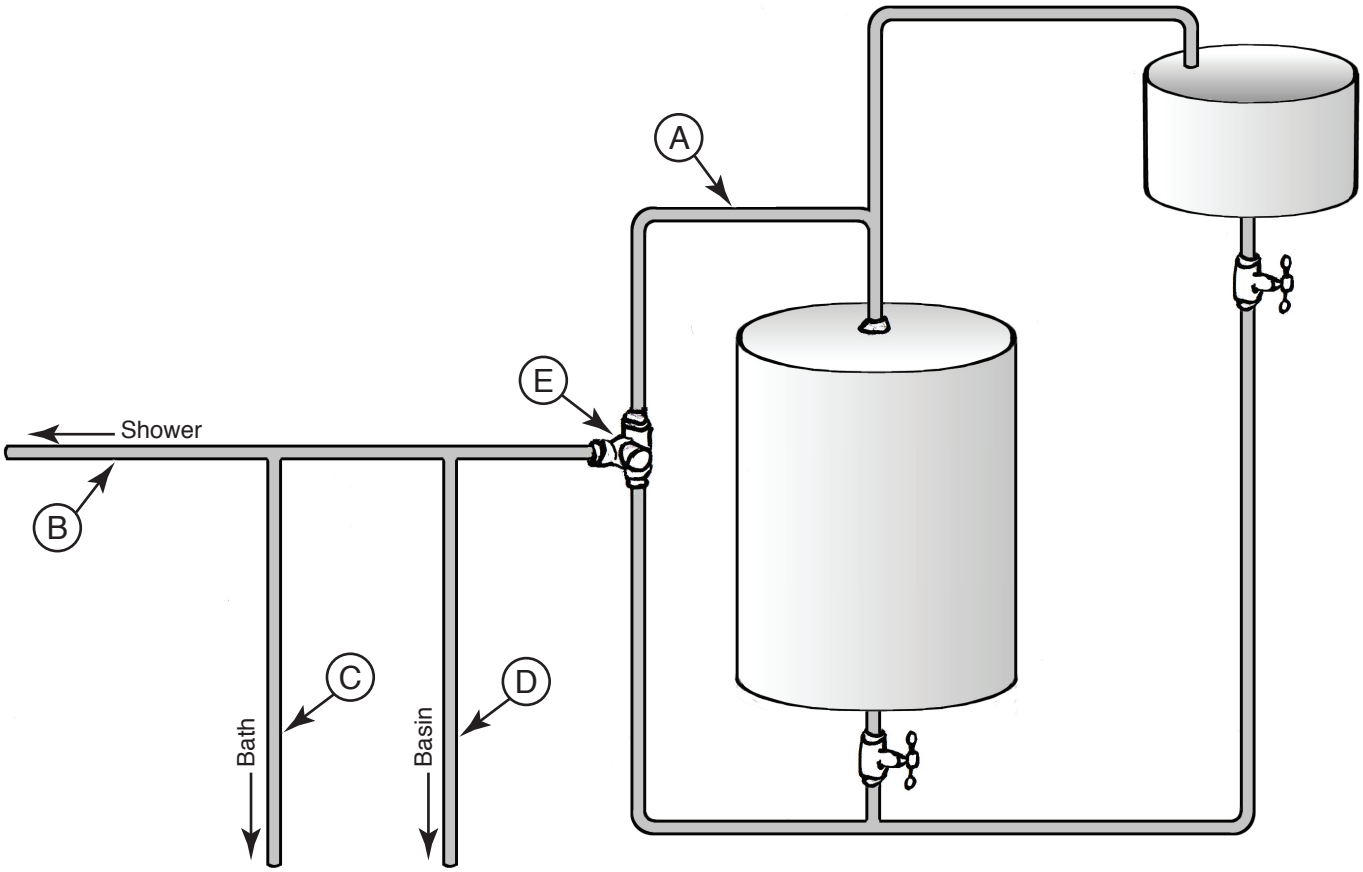
Notes:

1. If supplied by separate pipe from *storage water heater* to a single outlet.
2. This table is based on maximum pipe lengths of 20 metres.
3. 2 m maximum length from *water heater* outlet to tempering valve.
4. 15 mm if dedicated line to shower.
5. 10 mm if dedicated line to shower.
6. Table 3 pipe sizes have been calculated to deliver water simultaneously to the kitchen sink and one other *fixture*.

Diameter of pipe A	
Diameter of pipe B	
Diameter of pipe C	
Diameter of pipe D	
Maximum length of pipe A	
Minimum length of pipe A	
Diameter of Tempering Valve E	

Total 4 marks

QUESTION 9 (cont'd)



QUESTION 10

(a) Draw a diagram showing the components and pipework for an indirect (closed loop) thermosyphon solar hot water heating system.

(3 marks)

(b) Give a benefit of a solar water heating system being indirect (closed loop).

(1 mark)

Total 4 marks

QUESTION 11

Name TWO methods of ensuring fluid will circulate around a solar water heating system, and for each method give TWO aspects of the design that will ensure that the system will perform.

Method: _____

Design aspects:

1 _____

_____

2 _____

_____

Method: _____

Design aspects:

1 _____

_____

2 _____

_____

Total 6 marks

QUESTION 12

The relief valve on a low pressure valve-vented hot water system is dripping at its outlet.

Give TWO possible causes for this dripping to occur, for each cause describe the check that should be carried out to determine this and explain how the cause can be identified before replacing parts.

1 Cause: _____

_____

Check: _____

_____

_____

2 Cause: _____

_____

Check: _____

_____

_____

Total 6 marks

QUESTION 13

(a) A 6 metre length of 100 mm diameter foul water pipe is being installed at a gradient of 1:50.

Calculate in mm the fall required.

_____

_____

(2 marks)

(b) A 5 metre length of 65 mm diameter foul water pipe falls 125 mm over its length. Calculate the gradient the pipe has been installed at.

_____

_____

(2 marks)

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.

Note that should your choice of answer be unclear in this section of the examination no marks will be awarded for that question.

1. To provide backflow protection, what is the minimum size for an air gap?

   A 20 mm.

   B 40 mm.

   C Equal in size to the inlet pipe diameter.

   D 2 × the inlet diameter or 25 mm whichever is greater.

   E 3 × the inlet diameter or 30 mm whichever is greater.

   ☐

2. A reduced pressure zone backflow prevention device is installed and all of the downstream outlets are turned off.

   Which of the following correctly describes the position of each valve within the device for this situation?

   A Both check valves shut and relief valve shut.

   B Both check valves open and relief valve shut.

   C Both check valves open and relief valve open.

   D Both check valves shut and relief valve open.

   E First check valve open, second check valve and relief valve shut.

   ☐

3. Where would a backflow prevention device be installed to provide zone protection?

   A At the branch where the public water supply enters the property boundary.

   B Upstream from each fixture within the building.

   C Downstream from each fixture within the building.

   D At a location that protects the water supply in one area of a building from another area within the building.

   E In an area that protects the reduced pressure zone device from damage and frost.

   ☐

4. Which of the following backflow prevention devices must be installed 300 mm above the highest outlet in the system?

   A Reduced pressure zone device.

   B Pressure vacuum breaker.

   C Vented double check valve.

   D Double check valve assembly.

   E Atmospheric vacuum breaker.

   ☐

5. Which of the following statements is correct for a bypass fitted to a backflow prevention installation?

   A The bypass must be larger in diameter than the main.

   B The bypass must be smaller in diameter than the main.

   C The bypass must be the same size as the main.

   D The bypass must be constructed of the same material as the main.

   E The bypass must provide the same protection as the main.

   ☐

6. What is the minimum distance above the highest outlet at which an atmospheric vacuum breaker can be installed?

   A 100 mm.

   B 150 mm.

   C 200 mm.

   D 250 mm.

   E 300 mm.

   ☐

7. What is the maximum time an atmospheric vacuum breaker is allowed to be continuously pressurised with water?

   A 1 hour.

   B 2 hours.

   C 6 hours.

   D 10 hours.

   E 12 hours.

   ☐

8. Which of the following must be achieved when installing a hose connection vacuum breaker?

A It must be ventilated to the atmosphere at all times.

B It must be installed not less than 300 mm above the surrounding surface.

C It must be installed in an area not subject to freezing.

D It must have an isolation valve fitted to the outlet.

E It must be 150 mm above the overflow level of the highest fixture served.

☐

9. Which of the following is suitable to provide backflow protection for all installation situations?

A Air gap.

B Reduced pressure zone device.

C Pressure type vacuum breaker.

D Atmospheric vacuum breaker.

E Double-check valve assembly.

☐

10. What is the maximum allowable temperature for hot water supplied to a basin in a childcare facility?

A 32°C.

B 36°C.

C 45°C.

D 50°C.

E 55°C.

☐

11. What is the function of an automatic air valve?

A To allow air to escape a water pipe system when filling it with water.

B To allow air into a water main system to prevent siphonage.

C To allow air to enter a foul water system for ventilation.

D To allow air to escape a foul water system to prevent trap seal loss.

E To allow air to automatically enter a building for ventilation.

☐

12. When is a dry riser main installed for fire fighting purposes?

A When the building contains high volumes of electrical equipment.

B When the water supply is metered.

C When the riser main is installed in an area subject to vandalism.

D When the riser main is installed in an area susceptible to freezing.

E When the riser main is over 55 metres high.

☐

13. What is the minimum size for the overflow on a storage water tank?

A 25 mm.

B 32 mm.

C 40 mm.

D 50 mm.

E 65 mm.

☐

14. What is the minimum allowable pressure for a soundness test on cold water pipework?

A 100 kPa.

B 500 kPa.

C 1000 kPa.

D 1500 kPa.

E 2000 kPa.

☐

15. Why is a restricted entry zone required at the base of a discharge stack?

A To prevent blockages occurring.

B To prevent trap seal loss.

C To stop the pipe running full bore.

D To stop oscillation within the discharge stack.

E To increase the number of discharge units the stack can convey.

☐

16. What is the maximum permitted developed length for an unvented waste pipe discharging over a gully trap?

A 2.500 metres.

B 3.000 metres.

C 3.500 metres.

D 4.000 metres.

E 4.500 metres.

17. How is the fixture unit rating of a floor waste gully determined?

A The length of the discharge pipe from the gully to the drain or stack.

B The number fixtures are discharging into the floor waste gully.

C The inlet size of the floor waste gully.

D The sum of the unit ratings of the fixtures discharging into the floor waste gully.

E The outlet size of the floor waste gully.

18. Which of the following requires the restricted zone at the base of a stack to be increased?

A When the discharge from connected fixtures is expected to be foamy.

B When the stack serves a building with more than 2 storeys.

C When the stack receives 200 discharge units per floor.

D When the discharge stack is under 80 mm in diameter.

E When an overflow relief gully is installed.

19. How many fixture units are allowed to be discharged through an 80 mm branch discharge pipe laid at a gradient of 2.50%?

A 16

B 20

C 27

D 39

E 65

20. How many fixture units are allowed to be discharged from any one floor to a 100 mm discharge stack that serves four or more levels?

A 25

B 75

C 100

D 125

E 150

☐

Total 20 marks ☐

For Examiner's use only

Question number	Marks	Marks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
Section B		
Total		