

**The University of Melbourne
Semester 2 Assessment 2003**

**School of Agriculture and Food Systems
208-152
Agricultural Technology**

Student Number 42
Reading Time: 10 minutes
Writing Time: 2.5 hours

This paper has 5 pages.

Authorised Materials:

Students may use any calculators

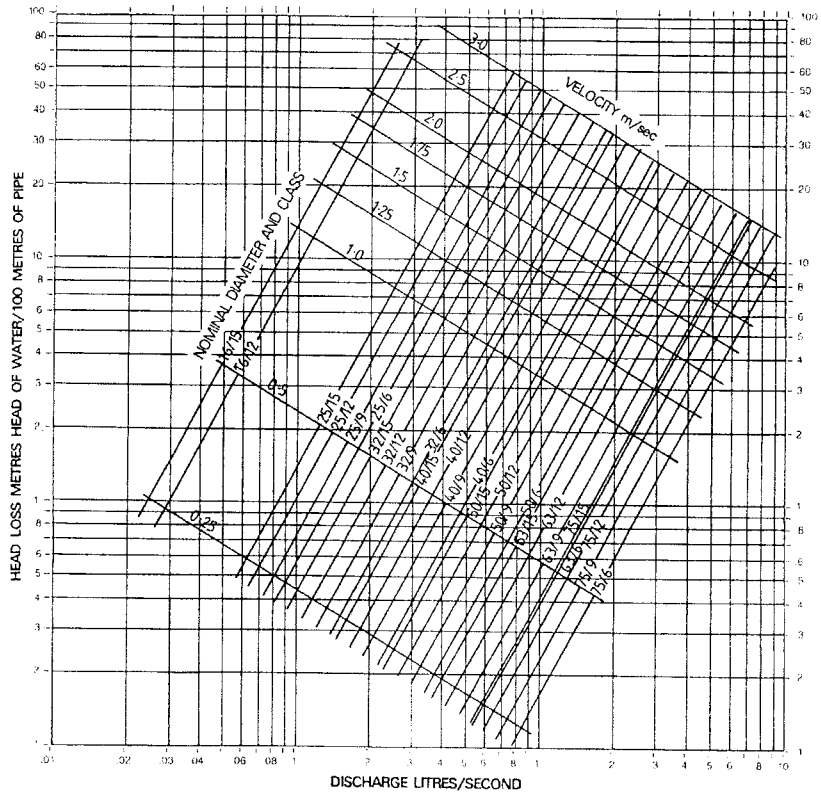
Instructions to Invigilators:

Students will require examination booklets in which to answer questions.

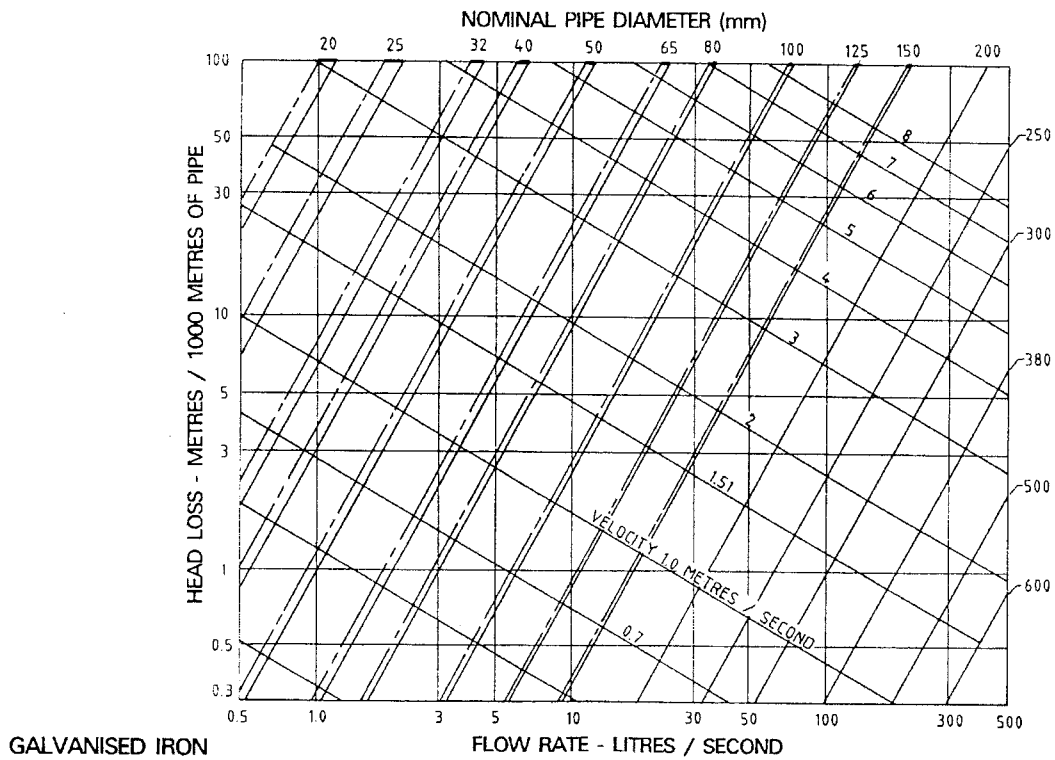
Instructions to Students:

Answer all questions
Answer all questions in the examination booklets provided
Read all questions carefully
No part of the examination material may be removed from the examination room

Paper to be held by Library: Yes



POLYETHYLENE PIPE



Q1 It is proposed to develop a pressure irrigation system for a horticultural venture. If the total dynamic head to be achieved by the pump is 45 m to deliver 20 l/sec and the pump efficiency is 65%, what is the operating power of the pump assuming that it is to be operated by a direct coupled electric motor?

(10 Marks)

Q2 It is proposed to deliver 5 l/sec of water in either a 50 mm diameter polyethylene pipe or an 80 mm diameter galvanized iron pipe. If the pipeline is 300 m long and the entry pressure is 400 kPa, what is the predicted outlet pressure?

(10 Marks)

Q3 Using principles of open channel flow, why is it necessary to:

- a) Maximise the hydraulic radius of the channel section for urban storm water control?
- b) Minimise the hydraulic radius of a grassed waterway for soil conservation purposes?

(3 + 3 = 6 Marks)

- Q4
- a) With the aid of diagrams, describe the components of a light steel framed building and indicate their purpose in the structure.
 - b) What is the principal load that light steel framed farm buildings are designed to withstand and what is the role of structural foundations in supporting this load?

(5 + 5 = 10 Marks)

- Q5
- a) With the aid of appropriate diagrams explain the operation of a scavenging port 2-stroke spark ignition engine.
 - b) There is a significant problem associated with starting electric motors. Indicate what this problem is and identify several methods for controlling it.
 - c) Explain the concept of a "state variable" listing the state variables for an appropriate example as part of your answer.

(5 + 5 + 5 = 15 Marks)

- Q6 a) Write short notes on the following survey terms:
- Datum
 - Reduced Level
 - Bench Mark
 - Back Sight
 - Fore Sight
- b) Explain how a GPS works.
- c) One of the major problems with GPS is accuracy. What are three major sources of inaccuracy associated with GPS?
- d) How can GPS accuracy be improved by using two GPS units?

(10 + 5 + 5 + 5 = 25 Marks)

- Q7 a) Calculate the percentage advantage in drawbar power by using FWA compared with 2WD based on the following data:
- Test results: FWA mode = 42 kW @ 5% wheel slip
 2WD mode = 28 kW @ 5% wheel slip
- b) An engine provides 120 Nm of torque at 2000 RPM. What is the power available from this engine?
- c) With the aid of a diagram identify and describe the key principles associated with tractor stability. As part of your answer, indicate what measures should be implemented to improve safety and stability.

(5 + 5 + 5 = 15 Marks)

- Q8 A cylindrical water tank is 3 m high and 2.5 m in diameter. If the tank is full and sits on top of a 10 m high stand find:
- a) The head of water at the base of the tank.
- b) The pressure of water on a hose connected to the tank, which is at the base of the tower.
- c) The velocity of discharge from the hose (assuming zero hose friction) if $v = \sqrt{2gh}$, where $g = 9.81 \text{ m/sec}^2$, $h = \text{head}$ and $v = \text{velocity}$.

(1 + 3 + 1 = 5 Marks)

Q9 Water supply systems often contain air and sediment as well as water. How do these constituents impact upon system performance and how can they be removed from the system?

(5 Marks)

Q10 A rectangular section channel is 0.6 m deep and 3 m wide conveying water with a velocity of 1.5 m/sec.

- a) What is the flow rate of the channel in ML/day?
- b) If the depth is increased to 0.75 m what is the impact on the flow rate?

(3 + 2 = 5 Marks)

Q11 One of the major concerns associated with electronic instruments is noise. Identify three major contributors to noise and provide appropriate examples of each to illustrate your answer.

(15 marks)

Q12 Write a few sentences to demonstrate your understanding of the following terms or expressions.

- a) Relative Humidity
- b) Heat conductivity
- c) Heat Capacity
- d) Vapour pressure deficit
- e) Controlled Atmosphere Storage

(2 + 2 + 2 + 2 + 2 = 10 Marks)

Q13 Fruit and vegetables when harvested are made up of living plant parts. Normal growth and development will continue after harvest and change the cells and tissues that make up these parts. These processes can lead to beneficial and deleterious changes.

- a) Describe one beneficial change
- b) Describe two deleterious changes

(4 + 6 = 10 Marks)

End Of Examination Paper