

**The University of Melbourne**  
**Semester-One Assessment 1997**

**Department :** Environmental Science  
**Subject Number :** 600-201  
**Subject Title :** Physical Environment

**Student Number :** ..... **Student Name :** .....

**Exam Duration :** 3 Hours

**Reading Time :** 15 minutes

**This paper has** 4 pages

**Authorised Materials:**

Electronic Calculators are permitted.

**Instructions to Invigilators:**

Students will require at least one 14-page script book. Some students may require additional books.

**Instructions to Students:**

We recommend that you include labelled diagrams in your answer(s). If you do, it is not necessary to duplicate the information that they show, in your written reply.

This examination is in two parts:

Part A: Short answers — *Attempt all questions.* (40 marks possible)

Part B: Short essay — *Answer 6 out of the 8 questions.* (60 marks possible)

**This Paper may be held by the Baillieu Library for future reference.**

# The University of Melbourne

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**Subject Number:** 600-201  
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Part A: Short answers — *Attempt all questions.* (40 marks possible)

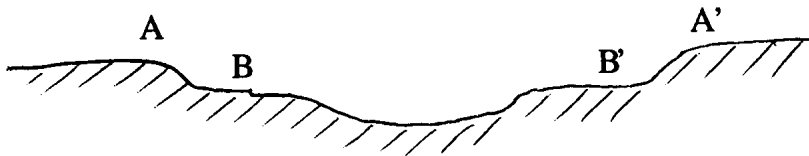
Part B: Short essay — *Answer 6 out of the 8 questions.* (60 marks possible)

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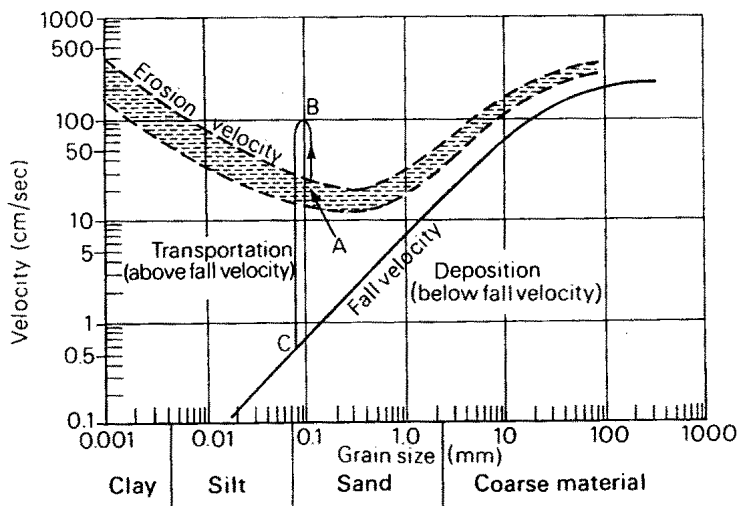
### Part A: Short Answers (Marks possible for this section = 40)

Attempt *All* questions in this section: each answer is worth a maximum of four marks, and should take about 5-7 minutes.

- A1. Where would you be most likely to find channels with ephemeral flow regimes?
- A2. This diagram shows the cross-section of a river valley with two levels of alluvial terrace on either side (A-A', B-B'). What does the presence of these terraces tell you about the geomorphological history of the river?



- A3. Below is a diagram of Hjulstrom's curve. Explain what it tells you about the relationship between a river's flow velocity and its ability to transport sediment.



- A4. What is the difference between laminar and turbulent flow?
- A5. Three soil-forming factors are Time, Topography and Organisms.
- (a) What are the other two?
- (b) Briefly discuss **each** of the five soil-forming factors, mentioning (where possible) examples from the Westernport excursion areas.
- A6. Discuss the important similarities and differences between sun-synchronous and geo-synchronous meteorological satellites. Mention their relative advantages and disadvantages in terms of temporal and spatial resolution and coverage. RL
- A7. In general, there is a relationship between the global distribution of mean surface ocean currents and the atmospheric circulation. Discuss this connection.
- A8. Comment on the average vertical structure of temperature in the ocean. In particular, state what temperature you would expect to find on the ocean floor at the equator.
- A9. Suppose the radius of the Earth were considerably smaller than in reality. Would you expect the typical tidal heights to be larger, smaller, or unchanged? Give reasons for your answer.
- A10. List four differences in recognising groundwater recharge and discharge areas. Draw cross-sections to illustrate your answer.

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(Part B follows, next page.)

**Part B: Short Essays (Marks possible for this section = 60)**

Attempt *six (6)* questions in this section: each answer is worth a maximum of ten marks, and should take about 20 minutes.

- B1. Discuss the conditions under which you could use flow dilution gauging for measurement of discharge in a river.
- B2. Explain why the presence of pools and riffles within a river channel contributes to maintenance of biodiversity.
- B3. Discuss the general circulation of the atmosphere in terms of energy and energy transformation processes.
- B4. The range of temperature in an urban area is generally less than that in the surrounding rural area. Explain why this is so.
- B5. Describe in broad terms the distribution of annual-average sea surface temperature over the world's oceans.  
Your answer should refer to the roles played by the ocean current systems and by upwelling in influencing this distribution.  
Over which region of the ocean is found the warmest water in the world?  
Comment on the consequences to atmospheric climate linked with any associated longitudinal differences.
- B6. Discuss where and how most ocean waves are generated in the Southern Hemisphere. Explain what you understand by 'deep water' waves and 'shallow water' waves. From this, comment on the propagation of energy in these waves from the source region to the southern coast of Australia.
- B7. Within an alluviated valley a buried gravel bed extending along its length acts as a confined aquifer. This aquifer is 230 m wide and 14 m thick. Its potentiometric surface slopes down the valley at 2.7 m per kilometre, its hydraulic conductivity is 12 m per day and its porosity is 20%.  
Estimate for this aquifer the groundwater throughflow, and the Darcian velocity and actual velocity of groundwater flow. If the porosity were larger than 20%, would this slow the actual velocity of groundwater movement, or increase it?
- B8. Groundwater: friend or foe? Discuss.
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