



University of South Australia

If you are required to use a calculator, please note the make and model here:

Calculator Make:

Calculator Model:

2006 Mid Year Examination

Student ID Number

Student ID Number																		
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Family Name	
Given Names	

Division of ITEE

School of NBE

Course Name Water Engineering Hydraulics (Hydraulics and Hydrology)

Subject Area CIVE Catalogue Number 3009

Examination Day Thursday Examination Date 29/06/06

Examination Time 2.00pm Length of Exam 3hrs

Examination Venue:	Ridley Centre
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Instructions to Candidates
<ol style="list-style-type: none">1 Time allocated; 3 hours.2 Students will be allowed 15 minutes reading time before the examination commences.3 Open book examination.4 Non-programmable calculator5 Answer all <u>5 questions</u>.6 Dictionaries are permitted.

Conduct in examinations

- Students are responsible for finding out their examination times and locations and for travelling to the venue. Examination times and locations are published on the University web site and advertised on the student portal. It is recommended that students arrive at least 15 minutes prior to the advertised start time.
- Students who arrive up to 30 minutes after the published start time will be permitted to enter the examination room but will not be allowed any additional time to complete the examination.

- Students who arrive more than 30 minutes after the published start time will not be permitted to enter the examination room and will receive a zero mark for that assessment.
- All students must bring with them, and display on their desk:
- their student identification card: or
- an alternative form of photographic identification such as a passport or driver's license. If a student does not provide acceptable photographic identification the invigilator will compare the student's likeness with University records in order to verify the student's identity;
- Where applicable, students must also display on their desk:
 - an approved disability access plan; and/or
 - an ENTEXT Card (for students who are entitled to extra time but have not been issued with an indicator on their student identification card)
- Unless otherwise specified in the course information booklet or as an agreed provision under Section 3: Moderation and Variation, a student must not take into the examination room any item with the potential to provide them or another student with an advantage, including but not limited to:
 - text books or any other book including dictionaries
 - calculators
 - mobile telephones, personal digital assistants, messaging devices or any other electronic device
 - notes, or other written documents
 - devices or personal items
 - examination answer booklets, attendance slips or scrap paper
- Any items specified as being allowed in the course information booklet must not be enhanced or tampered with in any way that provides an additional advantage to the student or any other student.

Procedures during the examination

- Every student must complete the attendance slip provided.
- The examination starting time may include a designated reading time for students. During this reading time, students are not permitted to write in the examination booklets but may complete attendance slips, fill in details required on the front cover of examination booklets, and make notes on loose-leaf paper provided. An invigilator will announce when the reading time has elapsed, after which students may write in the examination booklet.
- No student will commence writing answers until authorised by an invigilator. All students must stop writing when instructed by an invigilator. At the end of the examination all students must remain seated until all examination booklets have been collected.
- During an examination students are not permitted to speak to or communicate with any other student, or give or receive any form of assistance, academic or otherwise.

Procedures for leaving the examination room

- Students are not permitted to leave the examination room in the first 30 minutes after the published starting time or during the last 10 minutes of any examination.
- After the first 30 minutes of the examination has lapsed, a student can request to leave the examination room for a short break. When approval is given by an invigilator, the student will be supervised during the period of absence.
- Students wishing to permanently leave the examination room must hand all examination booklets to the invigilator who will endorse the booklets as correctly identifying the student. Students cannot remove any examination answer booklets, scrap paper or attendance slips from the examination room.

Breaches of examination procedures

- A breach of the examination procedures may constitute academic misconduct. Procedures are deemed to be breached even if it cannot be demonstrated that the student gained an advantage from the breach. For example, if a student takes a mobile telephone or device into the examination room but does not switch it on or remove it from their pocket, it may still constitute academic misconduct although the intent is recognised in determining an appropriate outcome.
- Breaches of the examination procedures will be recorded under Section 9: Academic Integrity of this manual whether they constitute academic misconduct or not.

Procedures for breaches that cause disruption to an examination

- Any student disrupting the examination can be instantly dismissed from the examination room at the discretion of the chief invigilator. Where dismissal is the appropriate course of action, the chief invigilator will document the incident and provide a report to the Head of School or Director: Regional Engagement or nominee.
- The Head of School or Director: Regional Engagement or nominee will investigate the incident as either:
- academic misconduct by following the procedures for formal inquiry set out in Section 9: Academic Integrity, or
- misconduct under Statute 7: Student Misconduct.
- Where dismissal is not deemed appropriate by the chief invigilator, the student will be permitted to remain in the examination, and clause 6.6 will apply.

Procedures for breaches that do not cause disruption to an examination

- If a breach is detected that does not cause disruption to the examination, or is assessed by the chief invigilator as not warranting dismissal from the examination room, the invigilator will tell the student that the breach has been detected and will be reported.
- The invigilator will document the incident and will provide a copy of this report to the Academic Integrity Officer at the relevant school within 5 working days of the incident.
- If the Academic Integrity Officer considers that the breach constitutes academic misconduct, they will investigate the incident by following the procedures for managing alleged academic misconduct set out in Section 9: Academic Integrity.
- If the Academic Integrity Officer considers that the breach does not constitute academic misconduct, they will provide academic counselling to the student.

Module 1- Open channel hydraulics

Question 1

1. Explain the difference between uniform and non-uniform flows in open channels.

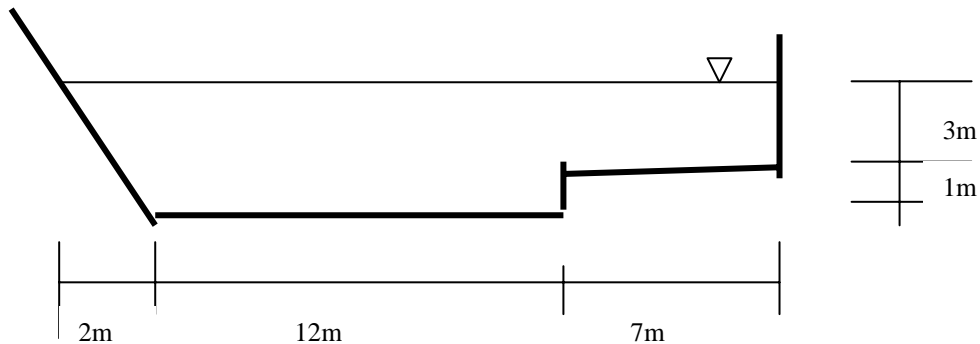


Figure 1

2. If the compound (Effective) Manning's roughness of the channel given in Figure 1 is 0.06 and the bed slope is 0.025, decide whether the flow is supercritical or sub critical.

(1 x 5 + 5 = 10 marks)

Question 2

A 6m wide rectangular concrete lined carries $30 \text{ m}^3/\text{s}$. If the bed slope of the channel equals to 0.02, Manning's roughness equals to 0.013 and flow depth at the entrance to the reservoir is 3.0m.

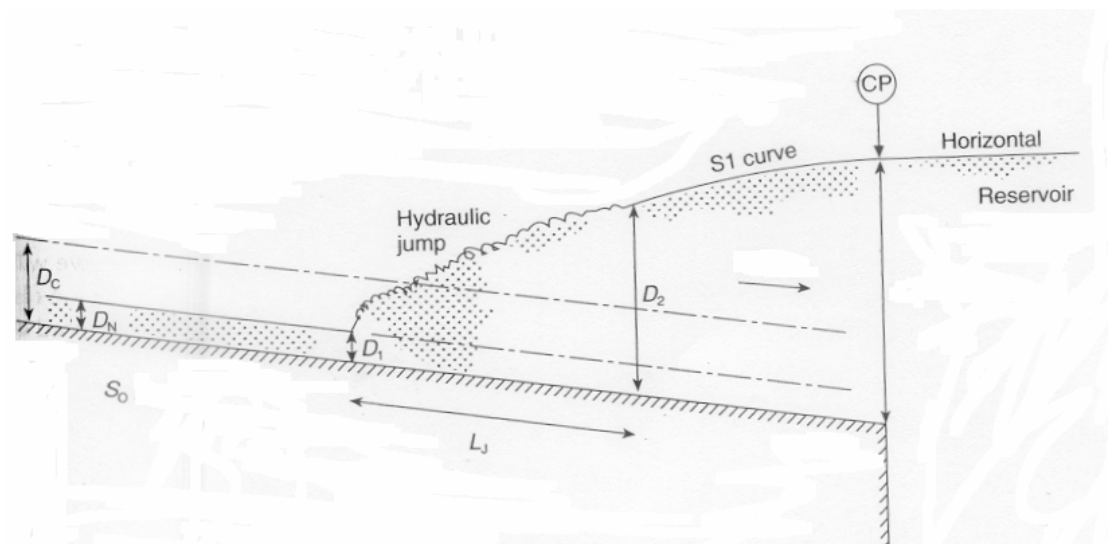


Figure 2

1. Prove that Figure 2 is accurate (ie, indication of d_c , d_n , formation of hydraulic jump and formation of S1 curve).
2. Estimate the distance between X_1 and X_{cp} .
3. Locate X_1 , X_c , X_2 and X_{cp} in;

- Depth versus Specific Energy graph and,
- Specific energy versus channel length graph (length doesn't have to be into scale).

Where, X_1 is the start of the jump, X_2 is the end of the jump, X_{cp} is the entrance to the reservoir and X_c is the critical depth point (between X_1 and X_2)

(Note –if needed profile computation should be conducted in one step, all calculations needs to be shown clearly)

(7+8+5x2 = 25 marks)

Module 2 – Hydrology Question 3

- Define the terms “hyetograph”, “Hydrograph” and “IDF curves”.
- The catchment shown in Figure 3 was originally had greatly scattered houses. Later the top portion of the catchment was developed as a car parking space for a shopping complex in the adjacent catchment. Reduced levels at A, B, C, D and the catchment outlet are 108.0, 108.0, 104.0, 105.0 and 100m respectively. Estimate the percentage increase of the 100 yr-peak discharge due to catchment's development. (Scale ; length of a square =100m)

(5+20 =25 marks)

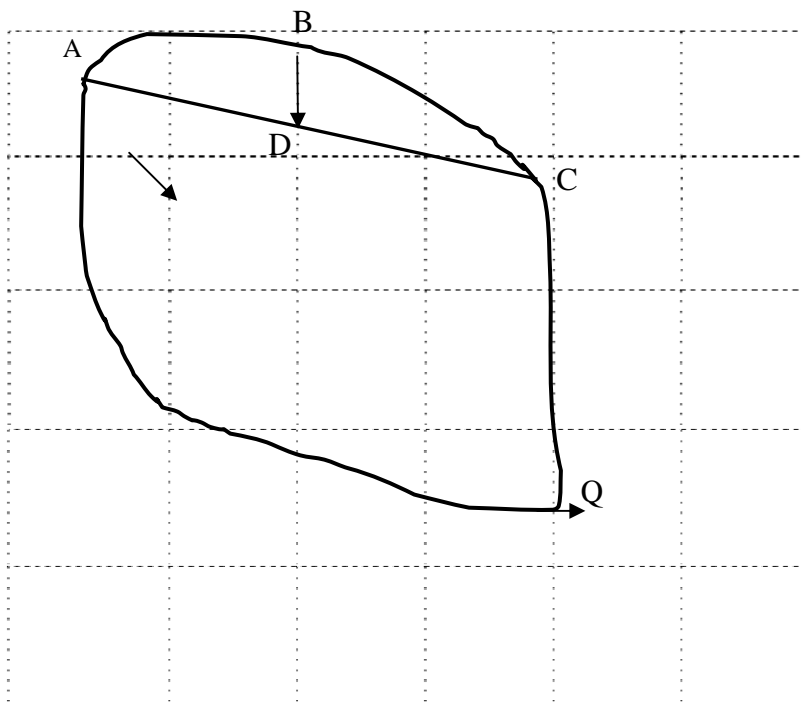
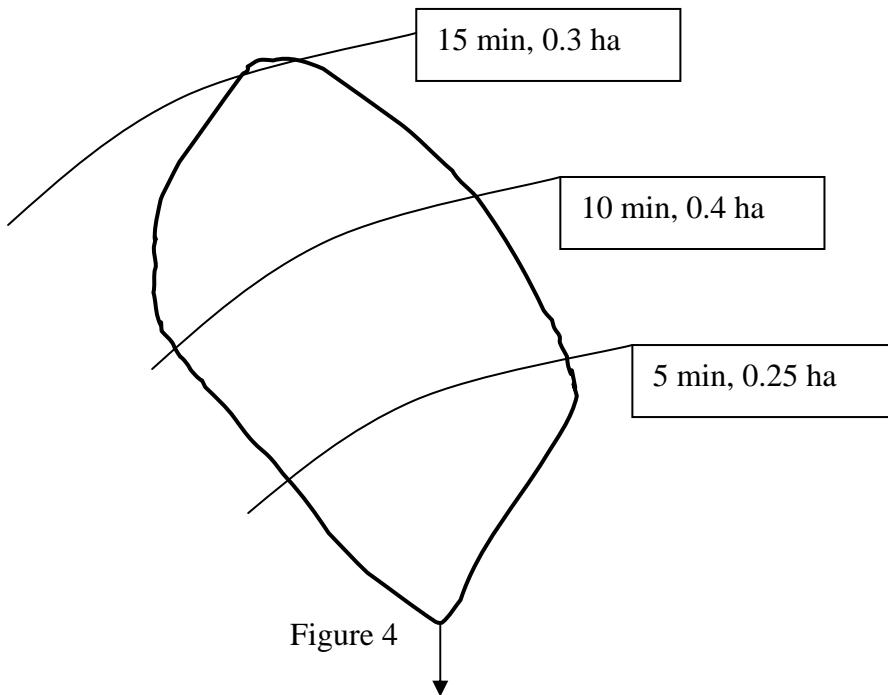


Figure 3

Question 4

Estimate 100-yr Peak runoff at the outlet of the catchment shown in Figure 4 if the 0.18 of runoff coefficient is applied throughout the catchment. How long it takes to have zero runoff at the outlet.

(16 marks)



Question 5

Measured total hourly discharge rates (in m^3/s) from a 10km^2 drainage basin are tabulated below. A rainstorm having a uniform intensity of 10 mm/hr starting at 9am and abruptly ending at 10am produced the hydrograph given in the table below. The base flow from 8am to 3pm was a constant of $3.0\text{m}^3/\text{s}$

Time	8am	9	10	11	12	1	2	3pm
Discharge (m^3/s)	3.0	3.0	9.0	14.0	9.0	5.0	3.0	3.0

1. Estimate ϕ index for the catchment
2. Derive a 1-hrUH for the basin by tabulating time in hours and discharge in m^3/s
3. A 2-hr rainstorm had total rainfall intensity of 12mm/hr in the first hour and 12mm of total rainfall in the next hour. Derive the resulting total runoff hydrograph at the catchment outlet.

(8 +8+8 = 24 marks)

