

POLITEKNIK
Jabatan Pengajian Politeknik

EXAMINATION AND EVALUATION DIVISION
DEPARTMENT OF POLYTECHNIC EDUCATION
(MINISTRY OF HIGHER EDUCATION)

CIVIL ENGINEERING DEPARTMENT

FINAL EXAMINATION
JUNE 2012 SESSION

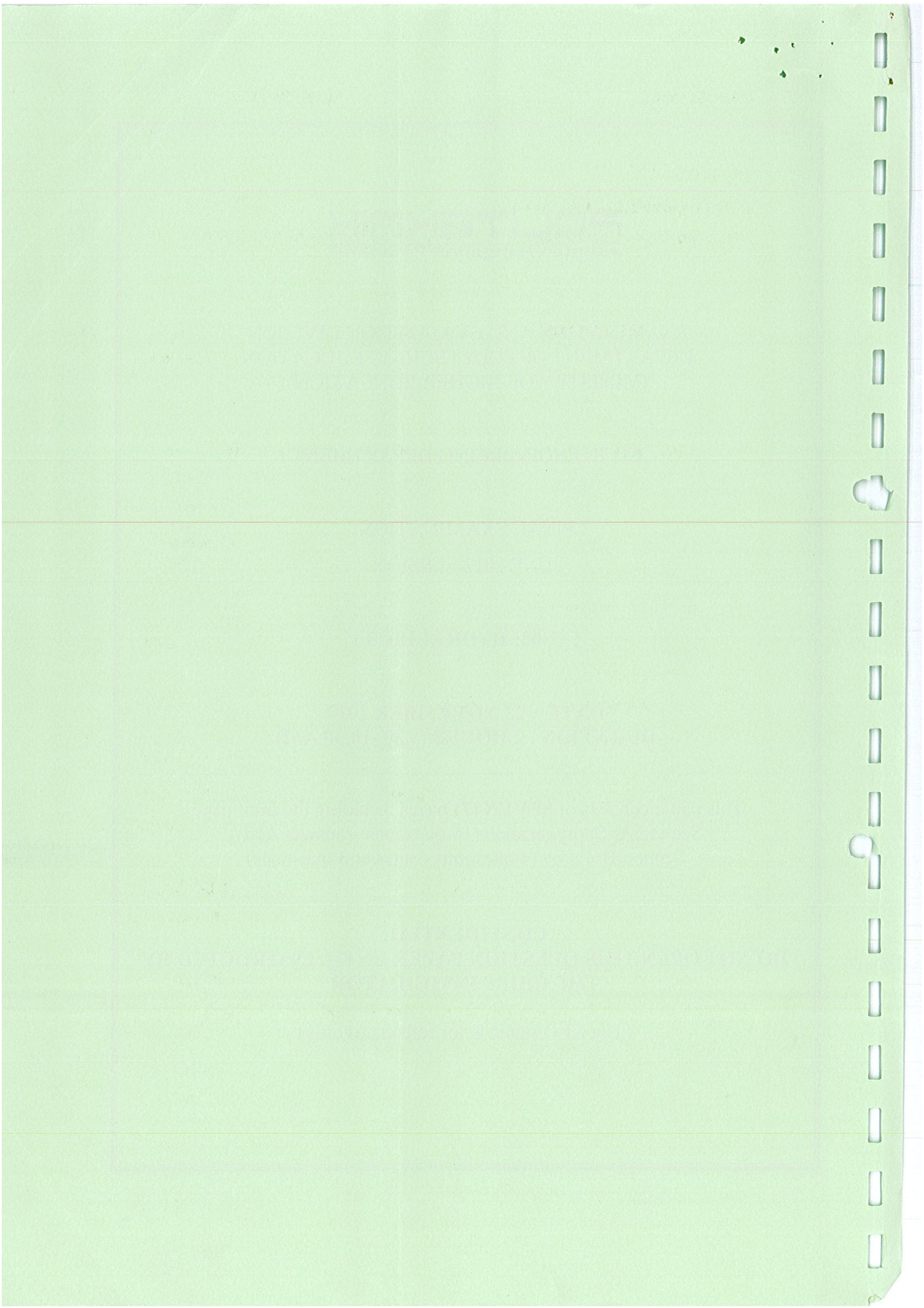
CC303: HYDRAULICS 1

DATE : 23 NOVEMBER 2012
DURATION : 2 HOURS (8.30 -10.30 AM)

This paper consists of **SEVEN (7)** pages including the front page.
Section A: Short question (10 questions – answer **ALL**)
Section B: Essay (4 questions – answer **3** questions)

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THE CHIEF INVIGILATOR

(The CLO stated is for references only)



SECTION A

SHORT QUESTION (40 marks)

Instruction: This section consists of 10 short questions. Answer **ALL** questions.

1. List **FOUR (4)** general characteristics of fluid. [CLO 1:C1]
(4 marks)

2. A fluid with a mass of 5000kg filled an open cylinder container with 150 cm diameter and 300cm height. Calculate the: [CLO1:C2]
(4 marks)
 - i. Density of fluid , ρ
 - ii. Specific weight , $\omega @ \gamma$

3. State **FOUR (4)** types of manometers. [CLO1 : C1]
(4 marks)

4. Define Gauge Pressure and Absolute Pressure. [CLO1 : C1]
(4 marks)

5. Define Flow Rate and Pressure Energy. [CLO 1: C1]
(4 marks)

6. Tapered pipe is carrying water from A to B. Diameter of the pipe is 250cm in A and B is 150cm. Calculate the velocity of water in B if the velocity of water in A is 3.5m/s. [CLO1:C3]
(4 marks)

7. The Reynolds Number for a flow in a pipe is 1900 and kinematics viscosity is $0.745 \times 10^{-4} \text{ m}^2/\text{s}$. Calculate the velocity of oil in this pipe, if the diameter of pipe is 30cm.

[CLO2:C3]

(4 marks)

8. Calculate the energy loss due to friction in a pipe, with the pipe length of 450m and diameter of 20cm. Given velocity of water is 3m/s and coefficient of friction = 0.01

[CLO2:C3]

(4 marks)

9. A pipe with 8cm in diameter is connected in series with a pipe of 19 cm in diameter. The discharge is $0.02 \text{ m}^3/\text{s}$. Calculate the head loss.

[CLO3 : C3]

(4 marks)

10. i) Define hydraulic min depth (hydraulic radius), m in open channel
ii) State the formula for hydraulic min depth (hydraulic radius).

[CLO 3 : C1]

(4 marks)

SECTION B

SUBJECTIVE QUESTION (60 marks)

Instruction: This section consists of **FOUR (4)** questions. Answer **THREE (3)** questions only.

QUESTION 1

- a) Energy is defined as potential work. List **THREE (3)** types of energy in motion liquid.

[CLO 1:C1]

(3 marks)

- b) Water is flowing through a 45mm diameter pipe with an average velocity of 2.5m/s. The pressure of the pipe is 200kN/m² and the height of the pipe is 7m from the datum. Calculate the total energy of the pipe.

[CLO 1:C3]

(7 marks)

- c) An orifice with a diameter of 35mm discharges water from a tank with a velocity of 8.5m/s. The water head above the orifice is 5.0m. Calculate the coefficient of velocity (C_v), coefficient of contraction (C_c) and the coefficient of discharge (C_d) if the actual flow rate is 0.008 m³/s.

[CLO1:C4]

(10 marks)

QUESTION 2

Water with a dynamic viscosity, $\mu = 1.49 \times 10^{-3} \text{Ns/m}^2$ flows through a pipe of 0.3 cm in diameter with a velocity of 0.9 m/s. The length of the pipe is 9m.

- a) Calculate the Reynolds number and state the type of flow.

[CLO2 : C3]

(5 marks)

- b) Calculate the head loss due to friction, using Hagen – Poissulle formula.

[CLO2 : C3]

(5 marks)

- c) Calculate the head loss due to friction, using Darcy- Weisbach formula.

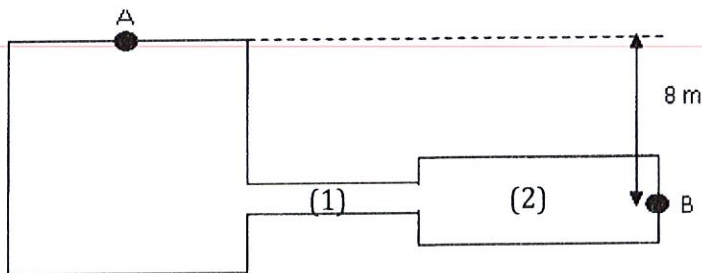
[CLO2 : C3]

(10 marks)

QUESTION 3

A horizontal pipeline of 40m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25m of its length from the tank, the pipe is 150mm in diameter and its diameter is suddenly enlarged to 300mm. The height of water level in the tank is 8m above the centre of the pipe. Consider the minor losses which occur and neglect the friction losses. Calculate the flow rate in the pipeline.

[CLO3 : C3]



$$\begin{aligned} D_1 &= 150 \text{ mm} & D_2 &= 300 \text{ mm} \\ L_1 &= 25 \text{ m} & L_2 &= 15 \text{ m} \\ f_1 &= f_2 = 0.01 \end{aligned}$$

(20 marks)

QUESTION 4

- a) Calculate the discharge through a trapezoidal channel of 8m width and side slopes of 1:3. The depth of water is 2.4 m and the slope of the bed is 1 in 4000. Take Chezy's constant $C=60$.

[CLO 3 : C3]

(10 marks)

- b) A water flows in a rectangular channel with a discharge of 100liter/sec. Calculate the bottom slope of the rectangular channel if the following data is given:

Width of channel = 600mm

Depth of slope = 300mm

Manning's constant, $N = 0.0013$

[CLO 3 : C3]

(10 marks)