TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 12M)

EBC 2303: FLUID MECHANICS II

END OF SEMESTER EXAMINATION
SERIES: APRIL 2014
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination

- *Answer booklet*
- *Drawing Paper*
- *Drawing Instruments*

This paper consists of **FIVE** questions. Answer any **THREE** questions of the **FIVE** questions
All questions carry equal marks
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One

a) Define:
   (i) Coefficient velocity
   (ii) Coefficient of contraction
   (iii) Coefficient of discharge **(6 marks)**

b) Describe the arrangement of a venture meter and explain its mode of a theoretical. **(7 marks)**

c) Derive an expression for a theoretical discharge through a horizontal venture-meter and show how its modified to obtain actual discharge. (**7marks)**

Question Two

a) (i) Sketch an orifice nozzle.

(ii) An orifice meter with 100mm diameter orifice is fitted in 250mm diameter pipe. It has a Cd = 0.65. The pipe delivers oil with a density of 800kg/m^3. A differential mercury manometer connected to both sides of the orifice measures a deflection of 80mm of mercury. Determine the rate of flow. **(12 marks)**

b) A swimming pool 12m long and 7m wide holds water to a depth of 2m. The water is to be discharge through an opening at the bottom of the pool whose area is 0.2m2 and Cd = 0.6. Determine:
   (i) Time required to empty tank
   (ii) The depth water will have fallen in 200 seconds. **(8 marks)**

Question Three

$$Q = \frac{2}{3} Cd\ B\ \sqrt[n]{29}\ \ h_1^{3/2} - h_2^{3/2}$$

a) Show that the discharge through a free flow for a large orifice is
(8 marks)

b) A reservoir discharges through a sluice gate 0.9m wide by 1.2m deep. The top of the opening is 0.6m below the water level in the reservoir and the down-stream water level is below the bottom of the opening. Calculate:
   (i) Theoretical discharge through the opening
   (ii) The percentage error if the opening is treated as a small orifice. **(12 marks)**

Question Four

a) (i) Derive the expression for actual discharge over a V-notch.
(ii) During an experiment in a laboratory 280 litres of water flowing over a right angled V-notch was collected in 1 minute. The head causing flow was 100m. Determine the coefficient of discharge of the notch. **(12 marks)**

b) In a laboratory experiment, a cippolettti weir with a crest of length 400mm is used to measure the flow of water in a rectangular channel of 600mm wide. The water level in the channel is 50mm above the

crest of the weir. If the coefficient of discharge of the weir is 0.63 estimate the discharge in the channel in m^3/s (to two decimal places) considering velocity of approach. **(8 marks)**

Question Five

a) Water is flowing through a pipe 200mm in diameter and 60m long, with a mean velocity of 2.5m/s. Determine the head lost due to friction using:

(i) Darcy's Formula if f = 0.005

(ii) Chezy's formula if C = 55 **(6 marks)**

b) Two reservoirs whose surface elevations differ by 10m are connected by three pipes laid in series as shown in figure 1. Calculate:

(i) All the individual losses

(ii) The discharge through the pipes

All changes of pipe sections are sudden and $C_c = 0.735$ and length L, diameter 'd' and Darcy's f area as shown. **(14 marks)**

$l_2 = 200m$

$d_2 = 200mm$

$f_2 = 0.024$