TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 12J)
DIPLOMA IN CIVIL ENGINERING (DCE II)

EBC 2304: FLUID MECHANICS II

END OF SEMESTER EXAMINATION
SERIES: APRIL 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

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

Question One

a) A 150mm x 75mm venturimeter is used to measure the flow rate of oil of sp gr 0.9. A mercury manometer connected to the throat and inlet of the meter reads a deflection of 150mmof the mercury. The actual discharge is 1.7m3/minute. Determine the coefficient of discharge of the meter.

(10 marks)

b) A pitot static tube is used to measure the velocity of water in a pipe. If the mercury manometer attached to it shows a reading of 0.7m, and the coefficient of velocity C = 0.98, calculate the velocity of water in the pipe. **(6 marks)**

c) A rectangular orifice 2m wide and 4m deep is discharging water from a tank whose water level is 10m above the top edge of the orifice. Cd = 0.6, determine the discharge. **(4 marks)**

Question Two

a) Water is discharged through a 15cm diameter orifice in the vertical side of an open tank at a rate of 190l/s. Water stands 15m above the centre line of the orifice. A point on the jet measured from the vena contracta has co-ordinates 5m horizontal and 0.5m vertical. Determine:
(i)   Coefficient of discharge, Cd
(ii)   Coefficient of velocity, Cv
(iii)   Coefficient of contraction, Cc   **(10 marks)**

b) An orifice meter 0.15m diameter is fitted to a 0.3m diameter pipe to measure the flow rate of water through it. If the pressure difference across the orifice is 10m of water and Cd = 0.59, calculate the discharge in the pipe. **(8 marks)**

c) State TWO advantages of an orifice meter over a venturimeter. **(2 marks)**

Question Three

a) A weir 2.5m long has 0.6m head of water over the crest. The channel approaching the weir is 6m wide. Using Francis formula, determine the discharge over the weir considering velocity of approach (Answer to 2 decimal places) **(14 marks)**

b) Outline **THREE** major differences between a "notch" and a "weir' **(6 marks)**

Question Four

a) Derive the discharge equation over a rectangular notch using usual notations. **(8 marks)**

b) A cippolett weir 3m long and Cd = 0.6 is used to measure the rate of flow in a channel. If the height of water above the crest level is 0.5, determine the discharge. **(5 marks)**

c) A trapezoidal notch has 30cm base and sides inclined at 30º to the vertical Cd = 0.6 and the actual discharge was measured as 0.042m³/s. Determine the head causing flow. **(7 marks)**

Question Five

a) Define the following terms as used in pipe flow.
    (i)   Total energy line
    (ii)   Hydraulic grade line
    (iii)   Parallel pipes
    (iv)   Pipes in series   **(8 marks)**

b) A pipe 60m long and 150mm in diameter is connected to a water tank at one end and water flows freely into the atmosphere at the other end. The height of the water level in the tank is 2.6m above the of pipe which is horizontal. Darcy's f = 0.01. Determine the discharge through the pipe considering all loves.   **(12 marks)**