



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING
DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE)

ECV 2301: FLUID MECHANICS II

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2014
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Scientific Calculator*

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

Use neat, large and well labeled diagrams where required
This paper consists of **THREE** printed pages

Question One

- a) (i) Water is flowing through a pipe 100mm diameter where an orificemeter having an orifice of 50mm diameter is fitted. The differential mercury manometer connected with this orificemeter shows a level difference of 9cm of mercury. Assuming the coefficient of discharge of the orifice meter equal to 0.65. Determine the actual discharge of water flowing through this pipe. **(7 marks)**
- (ii) Explain any TWO differences between an orifice meter and venture meter **(4 marks)**
- b) (i) Deduce an expression for the discharge of water over a right-angled sharp edged v-notch given that the coefficient of discharge is 0.61. **(2 marks)**
- (ii) A rectangular tank 16m by 16m has the same notch in one of its short vertical sides. Determine the time taken for the head, measured from the bottom of the notch to fall from 15cm to 7.5cm. **(7 marks)**

Question Two

- a) Define the following terms:
- (i) Coefficient of contraction
 - (ii) Coefficient of velocity
 - (iii) Coefficient of discharge **(6 marks)**
- b) (i) A rectangular orifice of 2m width and 1.2m deep is fitted in one side of a large tank. The water level on one side of the orifice is 3m above the top edge of the orifice, while on the other side of the orifice; the water level is 0.5m below its top edge. Determine the discharge through the orifice if $C_d = 0.64$ **(7 marks)**
- (ii) A venturimeter with an entrance diameter of 0.3m and a throat diameter of 0.2m is used to measure the volume of gas flowing through a pipe. The discharge coefficient of the meter is 0.96. Assuming specific weight of the gas to be constant at 19.62N/m^3 , calculate the volume flowing when the pressure difference between the entrance and the throat is measured as 0.06m on a water u-tube manometer. **(7 marks)**

Question Three

- a) (i) State THREE parameter that influence coefficient of discharge. **(3 marks)**
- (ii) A circular tank of diameter 1.25m contains water up to a height of 5m. An orifice of 50mm diameter is provided at its bottom. If $C_d = 0.62$, find the height of water above the orifice after 1.5 meters. **(7 marks)**
- b) (i) A water tank 10 metres long and 6 metres wide holds water to a depth of 1.25metres. If the water is discharged through an opening at the bottom of the pool of an area of 0.23 square meter. Determine the time taken to empty it completely. Take coefficient of discharge for the opening as 0.62. **(7 marks)**

- (ii) State THREE main advantages of the venturimeter over the orifice plate. **(3 marks)**

Question Four

- a) (i) A closed tank has an orifice 0.025m diameter in one of its vertical sides. The tank contains oil to a depth of 0.61m above the centre of the orifice and the pressure in the air space above the oil is maintained at 13780N/m^2 above atmospheric. Determine the discharge from the orifice. (Use coefficient of discharge of the orifice as 0.61 relative density of oil 0.9) **(5 marks)**
- (ii) A rectangular notch 0.5metres wide has a constant head of 400mm. Find the discharge over the notch in litres per second, if coefficient of discharge for the notch is 0.62. **(4 marks)**
- b) (i) Define an orifice meter. **(2 marks)**
- (ii) Explain principle of operation of an orifice meter. **(2 marks)**
- c) A Cistern of cross-sectional area 1 square metre contains water 4 metres deep. An orifice of 60mm diameter is provided at its bottom. Determine the fall of water level after 2 minutes (Take coefficient of discharge as 0.6) **(7 marks)**

Question Five

- a) (i) State FOUR advantages of a triangular Notch over a Rectangular Notch. **(6 marks)**
- (ii) Trapezoidal notch of 1.2m wide at the top and 450mm at the bottom is 30mm high. Find the discharge through the notch, if the head of water is 225mm. (Take coefficient of discharge as 0.6) **(5 marks)**
- b) (i) Water flows over a rectangular notch of 1 metre length over a depth of 150mm. The same quantity of water passes through a triangular right-angled notch. Determine depth of water through the notch. (Take the coefficient of discharge for the rectangular and triangular notch as 0.62 and 0.59 respectively) **(5 marks)**
- c) (i) Define a notch **(2 marks)**
- (ii) State FOUR types of notches **(2 marks)**