



TECHNICAL UNIVERSITY OF MOMBASA
**Faculty of Engineering &
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING
HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING (HDBCE 12S)

EBC 3108: 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) (i) Make a labeled diagram of a pitot-static tube.
- (ii) State **TWO** installation conditions of a pitot tube. **(8 marks)**
- b) Oil of specific gravity 0.8 is flowing through a 600 x 400mm venturimeter at a rate of 3 litres per second. If the manometer liquid is mercury, determine the deflection in the manometer connected to the inlet and throat of the meter. $C_d = 1$ **(10 marks)**
- c) State **TWO** requirements of the liquid used in differential u-tube manometers. **(2 marks)**

Question Two

- a) A swimming pool 5m wide and 10m long contains water to a depth of 6m. The pool is fitted with a square orifice 10mm x 10mm at the bottom. If $C_d = 0.6$ for the orifice, determine:
- (i) Time required to completely empty the orifice
- (ii) Time required to empty half the contents of the pool.
- (iii) The depth to which water falls in 4 minutes
- (iv) The quantity of water discharged in 4 minutes. **(10 marks)**
- b) Water discharges at a rate of $0.982\text{m}^3/\text{s}$ through a 120mm diameter vertical sharp edged orifice under a constant head of 10m. A point on the jet, measured from the vena contracta has coordinates of 4.5m horizontal and 0.54m vertical. Determine the following:
- (i) Coefficient of velocity C_v
- (ii) Coefficient of contraction C_c
- (iii) Coefficient of discharge C_d **(10 marks)**

Question Three

- a) An orifice 1.5m square is provided at the side of a reservoir. The water level on the upstream side is 1m above the top edge of the orifice and on the downstream side it is 0.5m below the top edge of the orifice. $C_d = 0.64$. Calculate the discharge through the orifice. **(9 marks)**
- b) A trapezoidal notch has a base 0.3m long and sides inclined at 30° to the vertical. The head causing flow is 0.16m and the coefficient of the notch is 0.6. Calculate the discharge over the notch. **(9 marks)**
- c) State **ONE** effect of the following one discharge over weirs.
- (i) End contraction
- (ii) Velocity of approach **(2 marks)**

Question Four

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

- b) A cippolett weir with a crest length of 400mm is used to measure the flow in a rectangular channel 600mm wide. The water level in the channel is 50mm above the crest of the weir. $C_d = 0.63$. Estimate the discharge in the channel in m^3/s to two decimal places, considering the velocity of approach. **(12 marks)**

Question Five

- a) Two reservoirs having a difference in the water levels of 25m are connected by a 300mm diameter pipe 8km long. Assuming Darcy's $f = 0.006$ and ignoring minor losses, determine:
- (i) The velocity in the pipe
 - (ii) The discharge in the pipe **(8 marks)**
- b) 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)**
- c) Explain **TWO** ways in which the discharge between two reservoirs can be increased. **(4 marks)**