



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

BCECD 308: FLUID MECHANICS II

Date: 10/8/2016

Time: 2.00-4.00 PM

INSTRUCTIONS

- This paper comprises of **five** questions
- Question **one** is **compulsory** and carry 30 marks
- Answer any **other two** questions

1. a) Differentiate between the following terms as used in discharge measurement
 - i. Co-efficient of velocity
 - ii. Co-efficient of contraction
 - iii. Co-efficient of discharge (6 marks)
- b) Using relevant sketches, explain the difference between each of the following types of orifices
 - i. Small orifice
 - ii. Large orifice
 - iii. Fully drowned submerged orifice
 - iv. Partially submerged orifice (12 marks)

- c) From an experimental determination of coefficient of velocity for a particle of water flowing through an orifice, show that: $C_v = \frac{x}{\sqrt{4yH}}$
- Where x and y are the horizontal and the vertical distances travelled by the particle in t seconds respectively. (12 marks)
2. a) Define the following terms
- Hydraulic grade line
 - Total energy line
 - Datum line
 - Air lock (8 marks)
- b) A closed vessel contains water up to a height of 1.5 m and over the water surface there is air of 7.848 N/m² above the atmospheric pressure. At the bottom of the vessel there is an orifice of diameter 100 mm. Find the rate of flow of water from the orifice given that $C_d = 0.6$ (12 marks)
3. Two reservoirs are connected by a pipeline which is 150 mm in diameter for the first 6 m and 225 mm for the remaining 15 m. the water surface in the upper reservoir is 6 m above that which is lower. If the friction coefficient for both pipes is 0.001;-
- Tabulate the losses of head which occur
 - Calculate the rate of flow in m³/s
 - Sketch the hydraulic gradient line (H.G.L) and the total energy line (T.E.L) (20 marks)
4. A pipe 1800m long having a diameter of 200 mm connects two reservoirs and forms a siphon as it crosses a ridge whose summit is 7.5 m above the upper reservoir. The surface of water in the lower reservoir is 30 m below the upper reservoir. The length of pipe from the upper reservoir to the summit ridge is 300 m. given $f = 0.008$, find;-
- The minimum depth of the pipe below the summit of the ridge in order that pressure at the apex does not fall 7.5 m below the atmosphere.
 - The discharge to the lower reservoir in liters/s (20 marks)

- 5 a) Using elaborate sketches tabulate all the major and minor head losses that occur in a pipe network conveying a particular fluid from one reservoir to another. (8 marks)
- b) A 720 m long and 1.2 m diameter pipe in form of a siphon connecting two reservoirs A and B having a difference of water level of 6m is conveying water from A to B. The pipe rises to a height of 3 m above the upper reservoir at a distance of 240 m from the entrance before falling to the lower reservoir. Given the coefficient of friction for the pipe as 0.01, calculate;
- i. The rate of flow through the pipeline
- ii. The pressure at the highest point of the pipeline (12 marks)