TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC IN CIVIL ENGINEERING

ECE 2212: **FLUID MECHANICS II**

END OF SEMESTER EXAMINATION

SERIES: APRIL2016

TIME: 2HOURS

DATE: 10May2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, Drawing Instruments, Scientific calculator, examination pass and student ID

This paper consists of five questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

Question One (Compulsory)

a) Explain in detail 3 classification of mouthpieces. **(3 marks)**

b) Water is to be supplied to the inhabitants of Technical University of Mombasa through a supply main. The following data is given.
Distance of the reservoir from the campus =3000m
Number of inhabitants =4000
Consumption of water per day for each inhabitant =180litres
Loss of head due to friction =18m
Coefficient of friction for the pipe, f =0.007

If half of the daily supply is pumped in 8hrs determine the size of the supply main. **(10 marks)**

c) A tank has two identical orifices in one of its vertical sides, the upper orifice is 1.5m below the water surface and the lower one is 3m blow the water surface as shown in the figure 1(c). Find the point at which the two jets will intersect, if the coefficient of velocity is 0.92 for both the orifices. **(6 marks)**

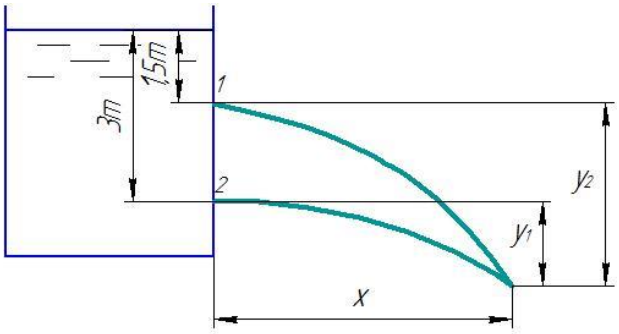

Fig 1(c)

d) A circular tank of diameter 3m contains water upto a height of 4m. The tank is provided with an orifice of diameter 0.4m at the bottom. Find the time taken:
i) by water to fall from 4m to 2m.
ii) to completely empty the tank. Take C_d=0.6 **(7marks)**

e) A 200mm x 100mm venturimeter is provided in a vertical pipe carrying water, flowing in the upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 220mm. Find the rate of flow. Assume C_d=0.98 **(4 marks)**

Question Two

a) Derive the Darcy-Weisbach equation for loss of head due to friction in pipes. **(10marks)**

b) A horizontal venturimeter with inlet and throat 300mm diameter and 100mm respectively is used to measure the flow of water. The pressure intensity at the inlet is 130kN/m^2 while the vacuum pressure head at the throat is 350mm of mercury. Assuming that 3% of head is lost in between the inlet and throat: calculate the coefficient of discharge for the venturimeter and find the rate of flow. **(10 marks)**

Question Three

a) Two reservoirs are connected by a pipeline consisting of two pipes, one of them 15cm diameter and length 6m and the other of diameter 22.5cm and length 16cm. If the difference of water levels in the two reservoirs is 6m, calculate the discharge. Take f=0.04 **(10marks)**

b) A piping system consists of three pipes arranged in series; the length of the pipes are 1200m,750m and 600m and diameters 750mm, 600mm and 450mm respectively.
i) Transform the system to an equivalent 450mm diameter pipe.
ii) Determine an equivalent diameter for the pipe 2550m long. **(10marks)**

Question Four

a) Explain briefly how the coefficient of discharge of a jet issuing through an orifice can be experimentally determined. **(6 marks)**

b) A large tank has sharp edged circular orifice of 930mm^2 area at a depth of 3m below constant water level. The jet issues horizontally and in a horizontal distance of 2.4m, it falls by 0.53m, the measured discharge is 4.3 litres/sec. Determine the coefficient of velocity, contraction and discharge for the orifice. **(6 marks)**

c) A tank 1.8m high, standing on the ground, is kept full of water. There is an orifice in its vertical side at a depth h metres below the surface. Find the value of h in order that the jet may strike the ground at a maximum distance from the tank. **(8 marks)**

Question Five

a) Derive the Hagen- Poiseuille Law. **(12 marks)**

b) A liquid with specific gravity 2.8 and viscosity 0.08Ns/m^2 flows through a smooth pipe of unknown diameter, resulting in a pressure drop of 800N/m^2 in 2km length of the pipe. What is the pipe diameter if the mass flow rate is 2500kg/hr **(8 marks).**