THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering & Technology

DEPARTMENT OF CIVIL AND BUILDING ENGINEERING

DIPLOMA IN CIVIL ENGINEERING (DC 09) &
BRIDGING TO HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING (HDB 09)

END OF COURSE EXAMINATIONS

APRIL/MAY 2010 SERIES

FLUID MECHANICS I

TIME: 2 HOURS

Instructions to Candidates

Answer Question **ONE** and any other **TWO** Questions Correctly.

Question ONE

(a). Derive an expression for the theorical discharge through a horizontal venturi meter and show how it must be modified to obtain the actual discharge. **(20 Marks)**

(b). A venturi meter tapers from 300mm in diameter at the entrance to 100mm in Ø at the throat, and the discharge coefficient is 0.98.

A differential mercury U-tube gauge is connected between pressure tappings at the entrance and the throat. If the meter is used to measure the flow of water and the water fills the leads to the U-tube and is in contract with the mercury, Calculate the discharge when the difference of level in the U-tube is 55mm. **(10 Marks)**

Question TWO

(a). Define;

(i). Tubulent flow **(1 Mark)**
(ii). Uniform flow **(1 Marks)**
(iii). Unsteady flow **(1 Marks)**
(iv). Discharge **(1 Marks)**

(b). Water is flowing along a pipe with velocity 7.2m/s.

(i). Express this as a velocity head in meters of water. **(2 Marks)**

(ii). What is the corresponding pressure in KN/m^2. **(3 Marks)**

(c). (i). 12 gall of water are discharged from a vessel in 25sec. Find the discharge in m^3/s. **(4 Marks)**

(ii). If the discharge took place through an opening 50mm Ø. Calculate the velocity of discharge. **(7 Marks)**
1 gall = 4.546 litres

Question THREE

(a). State Pascal's Law. **(2 Marks)**

(b). An inverted differential manometer, when connected to two pipes A and B gives the readings shown in fig. 1.
Determine the pressure in tube B, if the pressure in tube A is $98.1KN/m^2$. **(8 Marks)**

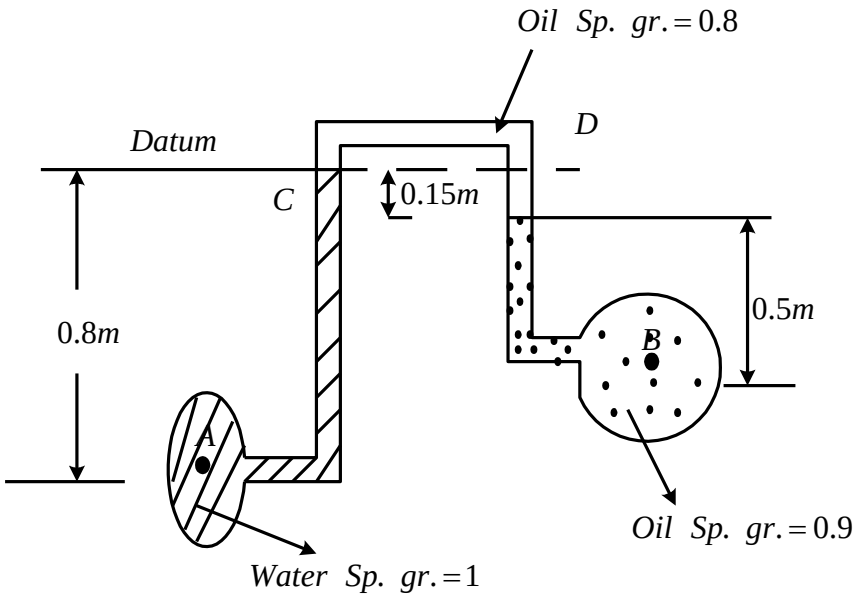

Fig. 1

(c). An isosceles triangular plate with a base of 2m and height of 3m is immersed in water as shown in fig. 2.
Determine the following:

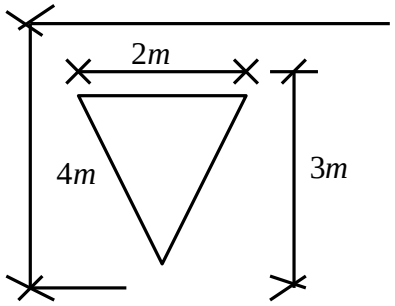

Fig. 2

(i). The total pressure on the plate **(5 Marks)**

(ii). The position of center of pressure. **(5 Marks)**

Question FOUR

(a). The pipeline in Fig. 3 has particulars as shown:

Calculate the discharge through the pipe considering all loses. **(15 Marks)**

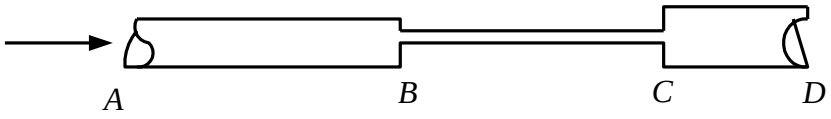

Fig. 3

Diameter AB = CD = 300mm, BC = 150mm

Length AB = 60m, BC=CD = 30m

Pressure at A = 200m of water at D = 179m of water.

f for AB & CD = 0.005, f for BC = 0.00375
k = 0.37 for sudden contraction.

(b). A rectangular tank 19m long and 16m wide contains water upto a depth of 1.25m. It is required to empty the water through a circular opening at the bottom of the tank. The diameter of this opening is 58cm. Calculate the time required to empty this tank if C_d = 0.62 for the opening. **(5 Marks)**

Question FIVE

(a). (i). State the Bernoulli's Theorem
(ii). Define each term used
(iii). State **FOUR** assumptions of Bernoulli's Theorem. **(10 Marks)**

(b). A pitot tube was placed in the centre of a horizontal pipe 200mm diameter. A tapping was made infront of the pitot tube and the pressure difference of the two was 40mm of water. Taking the mean velocity of the pipe to be 0.8 of the maximum velocity. Calculate the discharge through the pipe. **(10 Marks)**