MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering and Technology

MECHANICAL AND AUTOMOTIVE ENGINEERING DEPARTMENT

DIPLOMA IN CHEMICAL ENGINEERING

ECH 2207 FLUID MECHANICS II

SEMESTER II

SPECIAL/SUPLEMENTARY EXAMINATIONS

SERIES: OCTOBER, 2011

TIME: 2 HRS

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination

- Answer booklet
- Battery operated calculator

This paper consists of **TWO** Section **A and B.**

Answer **ALL** the questions in Section **A** and any **TWO** Questions from Section **B.**

Maximum marks for each part of a question are indicated.

This paper consists of **THREE** ***printed pages.***

SECTION A

QUESTION ONE (COMPULSARY)

(a) Define the following terms:

(i) Steady flow

(ii) Discharge

(iii) Mean velocity

(iv) Uniform flow

(v) Forced cortex

(10 Marks)

(b) A vessel partly filled with liquid and moving horizontally with a constant linear acceleration has its liquid surface inclined at $45°$. Determine its acceleration. **(5 Marks)**

(c) A reservoir of water has the surface at 310m above the outlet nozzle of a pipe with diameter 15mm. what is:

(i) The velocity of the jet
(ii) The discharge out of the nozzle
(iii) Mass flow rate

(9 Marks)

Water at an altitude of 36m above sea level has a velocity of 18m/s and a pressure of $350kN/m^2$. Calculate the total energy per newton of this water reckoned above sea level. **(6 Marks)**

SECTION B

Question TWO

(a) Define the coefficients used in connection with flow through orifices, explaining why these coefficients are necessary.

(b) Describe with sketches, three different types of orifices, indicating the approximate values of the co-efficient of discharge for each.

(c) A 25mm diameter nozzle discharges $0.76m^3$ of water per minute when the head is 60m.

The diameter of the jet is 22.5mm. Determine:

(i) The value of the coefficients,

(ii) The loss of head due to fluids resistance.

Question THREE

A 0.225m diameter open circular cylinder is 1.50m long and contains water up to a height of 1.05m. Calculate:

(i) The speed at which the cylinder may be rotated about its vertical axis so that the axial depth becomes zero.

(ii) The difference in total pressure force due to rotation at the bottom of cylinder.

(iii) The difference in total pressure force due to rotation on the sides of the cylinder.

(20 Marks)

QUESTION FOUR

Prove that in case of forced vortex the rise of liquid level at the ends is equal to the fall of liquid at the axis of rotation. **(20 Marks)**

Question FIVE

Define the following terms as used in fluid mechanics;

(i) Turbulent flow
(ii) Viscous flow
(iii) Unsteady flow

(6 Marks)

Oil flows through a pipe line which contracts from 450mm diam at A to 300mm diam at B and then forks, one branch being 150mm diam discharging at C and the other branch 225mm diam discharges at D. If the velocity at A is 1.8m/s and the velocity at D is 3.6m/s. what will be the discharge at C and D and the velocities at B and C.

(14 Marks)