TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 12S)

EBC 2214: FLUID MECHANICS I

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*
- *Calculator*

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) 1 litre of a certain liquid weighs 7N. Determine:
      (i)   Its specific weight
      (ii)   Its mass density
      (iii)   Its specific gravity
      (iv)   The volume of 68kg of the liquid   **(8 marks)**

b) Define the following terms:
      (i)   Viscosity
      (ii)   Surface tension
      (iii)   Mass
      (iv)   Energy   **(8 marks)**

c) Differentiate the following:
      (i)   Dimension
      (ii)   Unit of measurement   **(4 marks)**

Question Two

a) Define the following terms:
      (i)   Absolute vacuum
      (ii)   Absolute pressure   **(4 marks)**

b) For the manometer shown in figure 1, determine the difference in pressure between pipe A and pipe B.

Water

      (i)   In N/m^2
      (ii)   In metres of mercury   **(6 marks)**

c) Outline TWO desirable properties of the manometer liquid suitable for the manometer in figure 1
                                                                         (4 marks)
d) With the aid of sketch, show the relationship between atmospheric pressure, absolute pressure and
      gauge pressure.   **(6 marks)**

Question Three

a) A circular plate 1.5m diameter is immersed vertically in water as shown in figure 2.
  Determine:

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(i)	The total pressure on the plate
(ii)	The position of centre of pressure

(10 marks)

b) The tainter gate shown in figure 3 is a 90° sector of a circle of 4m radius as shown:

(i)	The total pressure on the gate
(ii)	The angle at which it acts to the horizontal

(10 marks)

<div align="center">90°</div>

Question Four

a) (i) State Pascal's Law
   (ii) Prove Pascal's law using usual notations **(14 marks)**

b) With the aid of sketches, briefly describe the following conditions of equilibrium of a solid body:

(i)   Stable equilibrium
(ii) Neutral equilibrium   **(6 marks)**

Question Five

a) Define the following types of flow:
    (i)   Steady
    (ii) Unsteady
    (iii) Laminar
    (iv) Turbulent
    (v)   Non-uniform   **(10 marks)**

b) With the aid of a sketch, briefly describe the method of measuring point velocity using a surface float in an open channel   **(4 marks)**

c) A jet of water 5cm in diameter impinges on a fixed plate and has a velocity of 30m/s. Find the normal force on the plate when:
    (i)   The jet is held normal to the plate
    (ii) The jet in inclined at 60° to the plate   **(6 marks)**