TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

Department of Building & Civil Engineering

UNIVERSITY EXAMINATION FOR DIPLOMA IN:

DIPLOMA IN CIVIL ENGINEERING

DBCE/MAY 2015 (DBCE y2s1)

ECV 2201: FLUID MECHANICS

END OF SEMESTER EXAMINATION

SERIES: MAY 2016

TIME ALLOWED: 2 HOURS

Instruction to Candidates;

You should have the following for this examination;

- *Answer booklet*
- *Pocket calculator*

This paper consists of FIVE questions. Answer ***ANY THREE*** *questions.*
Use neat, large and well labelled diagrams where required
Maximum marks for each part of a question are as shown
This paper consists of ***FOUR*** *printed papers.*

Question One

a) A simple u-tube manometer containing mercury is connected to a pipe in which fluid of specific gravity 0.8 and having a vacuum pressure is flowing. The other end of the manometer is open to the atmosphere.
Determine the vacuum pressure in the pipe if the difference in mercury level in the two limbs is 40cm and the height of the fluid in the left from the centre of pipe is 15cm below.

(7 marks)

b) Briefly describe basic working principle of a piezometer.

(4 marks)

c) (i) State Bernoulli's theorem.

(2 marks)

(ii) Water is flowing through a pipe having diameters 20cm and 15cm at sections A and B, respectively. The rate of flow through the pipe is 35litres/sec. Section A is 6m above the datum and section B is 4m above the datum. If the pressure at section A is 39.24N/cm^2, determine the intensity of pressure at section B.

(7 marks)

Question Two

a) Define the following terms;
   (i) Mass density
   (ii) Specific weight
   (iii) Specific volume
   (iv) Specific gravity.

(8 marks)

b) Given one litre of petrol of specific gravity of 0.7. Determine;
   (i) density
   (ii) Specific weight
   (iii) Weight.

(6 marks)

c) A hydraulic press has a ram of 45 cm diameter and a plunger of 12cm diameter. Determine the weight lifted by the hydraulic press when the force applied at the plunger is 500N.

(6 marks)

Question Three

a) Water is flowing through a pipe having diameters of 300mm and 200mm at the bottom upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm^2 and the pressure at the upper end is 9.81N/cm^2. Determine the difference in datum head if the rate of flow through the pipe is 40litres/sec

(7 marks)

b) Briefly describe basic working principle of a venturimeter.

(4 marks)

c) (i) A steel plate is immersed in an oil of specific weight of 7.5kN/m^3 up to a depth of 2.5m. Determine the intensity of pressure on the plate due to the oil.

(4 marks)

(ii) Briefly state the difference between capillarity and surface tension.

(5 marks)

Question Four

a) Determine the height of an oil column of specific gravity 0.9 equivalent to a pressure of 20.3kPa.

(5 marks)

b) (i) Define a manometer.

(2 marks)

(ii) A manometer connects an oil pipeline and a water pipeline as shown in Fig. 1. Determine the difference in pressure between the two pipelines using the readings on the manometer. Use specific gravity of Oil 0.86 and Mercury 13.6.

(8 marks)

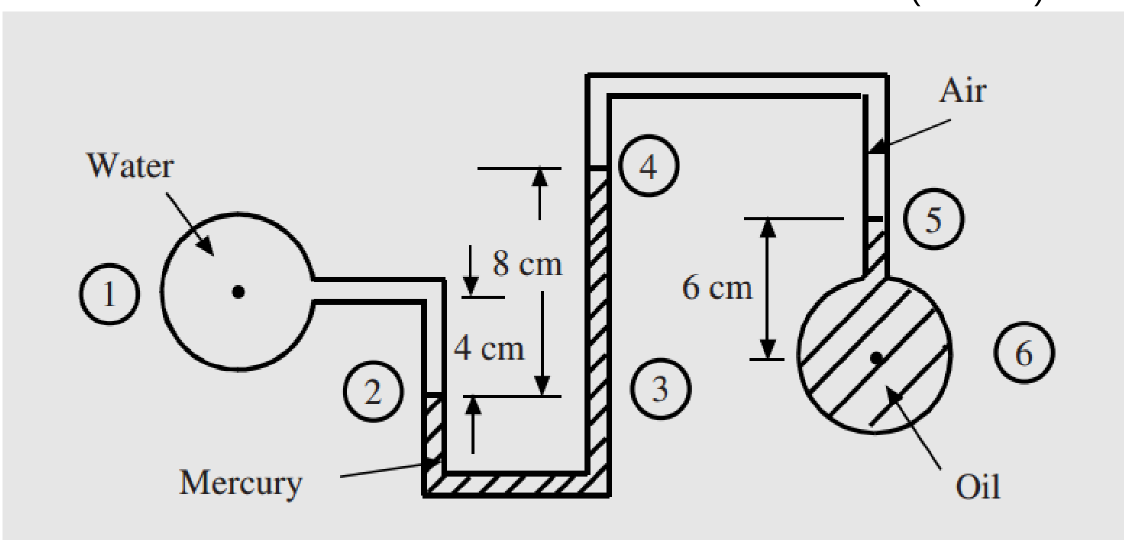

Fig.1

c) (i) Determine the surface tension acting on the surface of a vertical thin plate of 1m length when it is lifted vertically from a liquid using a force of 0.3N.

(3 marks)

(ii) State Pascal's law.

(2 marks)

Question Five

a) An open cylindrical vertical container is filled with water to a height of 30 cm above
the bottom and over that an oil of specific gravity 0.82 for another 40 cm. The oil does not mix with water. If the atmospheric pressure at that location is 1 bar. Determine;

(i) the absolute and

(ii) Gauge pressures at the oil water interface and at the bottom of the cylinder. (7 marks)

b) A U-tube open to atmosphere is first filled to a sufficient height with mercury. On one side water of volume equal to 200 mm column over which kerosene of density 830 m3/kg of volume equal to 250 mm column are added. Determine the rise in the mercury
column in the other limb.

(7 marks)

c) Determine;

(i) Gauge pressure

(ii) Absolute pressure,

at a point 3m below the free surface of a liquid having a density of 1.53 X 10^3 kg/m^3 if the atmospheric pressure is equivalent to 750mm of mercury.

(6 marks)