MURANG'A UNIVERSITY COLLEGE

(A constituent college of Jomo Kenyatta University of Agriculture and Technology)

SCHOOL OF ENGINEERING

DEPARTMENT OF BUILDING AND CIVIL

HYDRAULICS I

UNIT CODE ; SEB 1211

CLASS ; BC /C /14D MAY

DATE: 23TH APRIL 2015 **TIME: 2hrs**

ATTEMPT **THREE** QUESTIONS WITH QUESTION **ONE COMPUSORY**

QUESTION ONE 30 MARKS

a Define the following terms

i) ideal liquid ii) real liquid iii liquid iv surface tension [**2marks]**

b) calculate the specific weight, specific mass ,specific gravity of a liquid having a volume of $9m^3$ and a weight of 68KN. [**6marks]**

c) A rectangular tank of 1.2m x0 85m in cross section, and a height of 3.0m ,is filled with water up to a height of 1.8m, and the remaining part filled with oil of relative density of 0.85. IF the tank is opened to the atmosphere, calculate

i) Intensity of pressure at the interface

ii) Absolute and gauge pressures at the base in terms of water head and oil head.

iii The net force experienced by the base of the tank [**9marks]**

d) In a pipeline water is flowing. A manometer is used to measure the pressure drop for a flow through the pipe .The difference in level was found to be 20 cm .If the manometer fluid is calcium chloride of density

1.596 g /cm^3 was changed to mercury of density. 13.6g/cm^3, what will be the difference in level ?
[**5marks]**

e) A trapezoidal plate of parallel sides l and 2l and height h immersed vertically in water with its side of length l horizontal and top most. The top edge is at a depth h below the water surface. Determine

i. total force on one side of the plate

ii. The location of the centre of pressure. [**8marks]**

QUESTION TWO

a) A Jet of water of diameter 60mm moving with a velocity of 40m/s , strikes a curved fixed plate tangentially at one end at an angle of 30^o to horizontal. The jet leaves the plate at an angle of 20^o to the horizontal. Find the force exerted by the jet on the plate in the horizontal and vertical directions.
[**15marks]**

b) Given that;

Barometer reading = 740mm of mercury , Sp. Gr. Of mercury =13.6 , Intensity of pressure=40kpa.

Express the intensity of pressure in SI units both in gauge and absolute [**5 marks]**

QUESTION THREE

a) The inlet to a pump is 10.5m above the bottom of sump from which it draws water through a suction pipe. If the pressure at the pump inlet is not to fall below 28KN/m^2 absolute, work out the minimum depth of water in the tank

[**10marks]**

b) The fig. below shows an inverted differential manometer having an oil of sp. gr. Of .8 connected to two different pipes carrying water under pressure. Determine the pressure in pipe B. The pressure in pipe A is 2.0m of water. [**10marks]**

QUESTION FOUR

a) Outline with neat sketches the working principles of THREE mechanical Gauges [**6marks]**

b) State three advantages and three limitations of manometers [**3mrks]**

c) The barometric pressure at sea level is 760mm of mercury while that on a mountain top is 735mm. IF the density of air is assumed constant at 1.2kg /m^3 , what is the elevation of the mountain top?. [**6marks]**

d) A differential manometer connected at two points A and B in a pipe containing an oil of relative density of o.9 . shows a difference in mercury levels as 150mm.Find the difference in pressures at the two points .
[**5marks]**

QUESTION FIVE

a) Define the following terms

i. total pressure

ii. centre of pressure [**4marks]**

b) A trapezoidal plate of parallel sides l and 2l and height h immersed vertically in water with its side of length l horizontal and topmost The top edge is at a depth h below the water surface .Determine

i) The Total force on one side of the plate

ii The location of the centre of pressure [**8marks]**

C) A trapezoidal channel, 2m wide at the bottom and 1m deep has side slopes 1:1. Determine;

i total pressure

ii centre of pressure on the vertical gate closing the channel when it is full of water [**8marks]**