



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)

University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

BCECD 208: FLUID MECHANICS I

Date: 10/8/2016

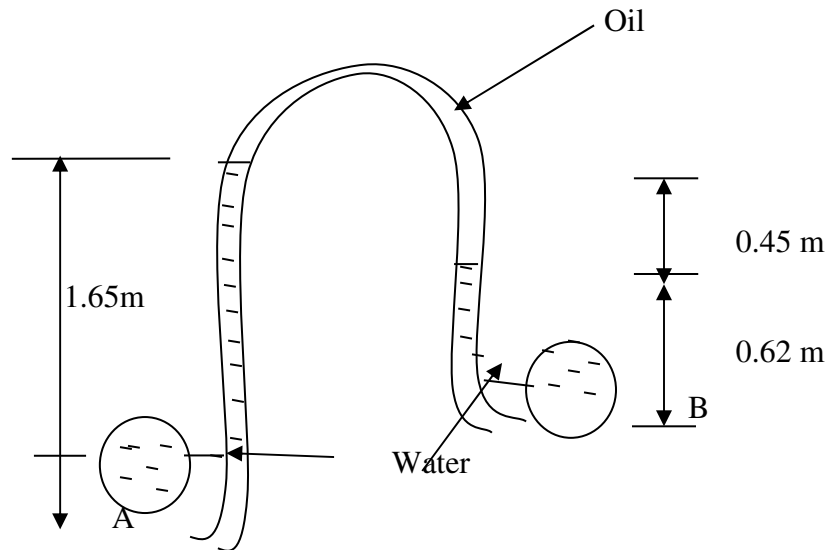
Time: 11:00 – 1:00 PM

INSTRUCTIONS:

- *This paper comprises of five questions*
- *Question one is compulsory and carry 30 marks*
- *Answer any other two questions*

- 1 a) State three assumptions made in the Bernoulli's theorem (3 marks)
- b) Differentiate between each of the following terms
- i. Potential head
- ii. Datum head
- iii. Kinetic head (6 marks)
- c) State and proof Pascal's law (6 marks)
- d) Define the following terms
- i. Mass density
- ii. Specific gravity
- iii. Viscosity
- iv. Weight density
- v. Capillarity (10 marks)
- e) State the expression for total energy head for a flowing fluid (5 marks)

- 2 a) Using elaborate sketches explain the working principle of the following velocity measuring devices
- Pitot tube
 - Pitot static tube (10 marks)
- b) The figure below shows an inverted U-tube manometer connected to two pipes A and B which convey water. The fluid in the manometer is oil of specific gravity 0.8. Determine the pressure difference between pipes A and B.



- (10 marks)
- 3 a) A cold storage cistern is filled 3m above a 50mm diameter gate valve. Calculate
- the intensity of pressure on the gate valve
 - the total pressure on the gate valve (8 marks)
- b) A liquid flows in a horizontal pipeline and gradually converges from diameter of 200mm at a position A to a diameter of 150mm at position B. if the velocity is 2m/s and the pressure head at A is 15m, calculate the velocity and pressure head at B. (12 marks)
- 4 A vertical dock gate is 5m and has water at a depth of 7.5m on one side and to a depth of 3m on the other side.
- Find the resultant horizontal force on the dock gate and the position of its line of action
 - Sketch the pressure distribution diagram for this case
 - To what position does the resultant force tend to as the depth of water on the lower side rises to 7.5? (20 marks)

- 5 a) Derive an expression for the Bernoulli's formula for an inclined tapered venturi-meter attached to a differential u-tube manometer. (10 marks)
- b) A 2m x 2m tank with vertical sides contains oil of density 900kg/m^3 to a depth of 0.8m floating on 1.2m depth of water.
- i. Calculate the total thrust and its location on one side of the tank.
- ii. Sketch the pressure diagram to represent this case (10 marks)