



MACHAKOS UNIVERSITY

University examinations 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SUPPLEMENTARY EXAMINATION FOR BACHELOR IN CIVIL ENGINEERING

ECV 202: FLUID MECHANICS I

*Instructions: This paper contains **Five** questions attempt question **One** and any other **Two***

1. (a) Define the following terms as used in fluid mechanics

- i. Mass Density (3 marks)
- ii. Viscosity (3 marks)
- iii. Gauge pressure (3 marks)
- iv. Surface tension (3 marks)

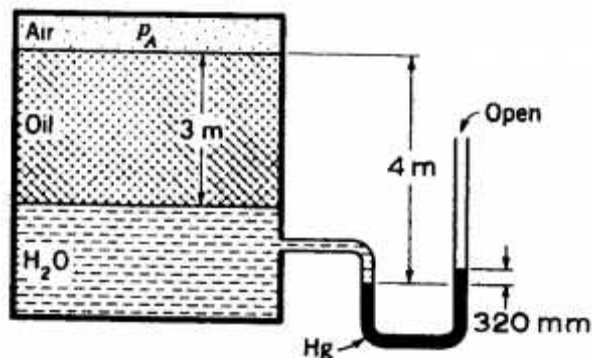
(b) If the mass density of a fluid is 789 kg/m^3 , determine its specific weight and specific volume? (4 marks)

(c) Water at an altitude of 36 m above sea level has velocity of 18 m/s and a pressure of 350 kN/m². Calculate the total energy per newton of this water reckoned above sea level (6 marks)

(d) Prove that the intensity of pressure at a point in a fluid at rest is the same in all directions. (6 marks)

(e) For the setup shown in Figure 1E, what is the pressure P_A if the specific gravity of oil is 0.82? (5 marks)

Figure 1E



(f) A diver descends from the surface of the sea to a depth of 30 m. what would be the pressure under which the diver would be working above that at the surface, assuming that the density of seawater is 1020 kg m^{-3} and remains constant.

(7 marks)

2. (a) Explain the use of a piezometer to measure the intensity of pressure in a liquid (6 marks)

(b) A U-tube is used to measure the pressure difference between two points A and B in a pipeline conveying water of density 1000 kg m^{-3} . The density of manometric

liquid Q is $= 13.6 \times 10^{-3} \text{ kg m}^{-3}$, and point B is 0.43 m higher than point A. Calculate the pressure difference when $h = 0.80 \text{ m}$. (9 marks)

3. Define the term Metacentre and show how the stability of a floating body depends upon the position of the Metacentre and the centre of gravity. (15 marks)

4. A rectangular pontoon has a width of 6.0 m, a length of 12.0 m, and draught of 1.0 in fresh water of density 1000 kg/m^3 . Calculate:

a) Weight of the pontoon (5 marks)

b) Its draught in sea water of density 1020 kg/m^3 (5 marks)

c) The load that can be supported by the pontoon in fresh water if the maximum draught permissible is 1.5 m. (5 marks)

5. (a) Differentiate between streak-line and stream-tube (5 marks)

(b) State the forms of energy, which a liquid in motion can possess and derive expressions for each of these forms in terms of pressure P , velocity V , and elevation Z for unit weight of fluid.