



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF SPATIAL PLANNING
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE
IN WATER RESOURCE AND ENVIRONMENTAL MANAGEMENT
SEMESTER 2018/2019 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: PWE 3211

COURSE TITLE: FLUID MECHANICS I

EXAM VENUE:

STREAM: WATER RESOURCES

DATE:

EXAM SESSION:

TIME: 2 HOURS

Instructions:

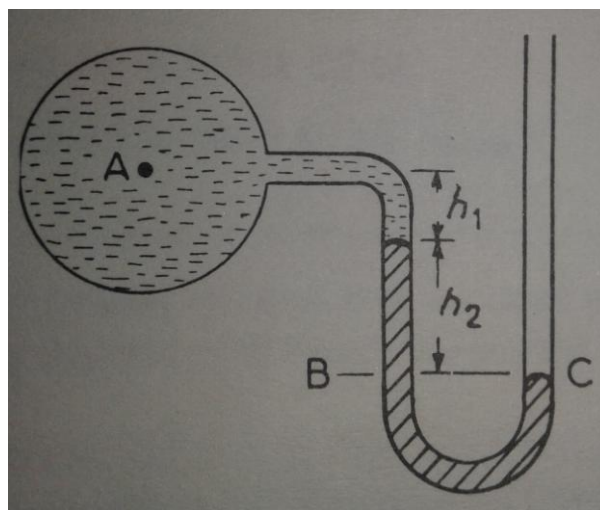
- 1. Answer question 1 (compulsory) and ANY other 2 questions.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**
- 4.**

QUESTION 1

- a) Using dimension analysis approach, find out if the equation $v^2 = u^2 + 2aS$ is dimensionally correct (where V =final velocity; u =initial velocity; a =acceleration; S = distance) **(6 marks)**
- b) Briefly describe any **Three** properties of fluid **(6 marks)**
- c) Find the pressure head (H) of water corresponding to an intensity (P) of $340,000 \text{ N/m}^2$, if mass density of water is 10^3 kg/m^3 **(6 marks)**
- d) Using sketch diagrams, distinguish between turbulent and laminar flow of fluids **(6 marks)**
- e) Using well labeled diagrams, distinguish between a manometer measuring fluid condition under (i) positive pressure and (ii) negative pressure **(6 marks)**

QUESTION 2

- a) Derive a mathematical expression distinguishing between the pressure exerted over solid surfaces and the pressure exerted on liquids **(6 marks)**
- b) The Mercury-U-Tube Manometer (*figure below*) measures the pressure of water at A, which is below atmospheric pressure.



If the specific weight of Mercury is 13.6 times that of water at atmospheric pressure (101.3KN/m), what is the absolute pressure at A when $h_1=15\text{cm}$; $h_2=30\text{cm}$; *Specific weight of water* = $9,81 \times 10^3 \text{N/m}^3$
(14 marks)

QUESTION 3

Pressure intensity of a plane surface immersed in water at depth x is given as ρgx . Prove that total pressure is given as $wA\bar{x}$ (where $w=\rho g$) and that this pressure is similar for (i) a horizontally immersed plane surface, (ii) a vertically immersed plane surface and (iii) an inclined plane surface

(20 marks)

QUESTION 4

a) A rectangular plate $2\text{m} \times 3\text{m}$ is immersed in water in such a way that its greatest and least depths are 6m and 4m respectively from the water surface. Calculate the total pressure on the plate

(8 marks)

b) Using a sketch diagram of a curved surface immersed in water, generate mathematical expressions for (i) total pressure on curved surfaces and (ii) angle of inclination of the resultant pressure

(12 marks)

QUESTION 5

a) State the three laws of physics from which dynamics of fluid flow are derived **(6 marks)**

b) In reference to a control volume of pipe flow, derive Bernoulli's equation from the principle of conservation of energy

(14 marks)

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