# KIBABII UNIVERSITY

## UNIVERSITY EXAMINATIONS
## 2020/2021 ACADEMIC YEAR

### SECOND YEAR FIRST SEMESTER
### MAIN EXAMINATIONS

**FOR THE DEGREE OF RENEWABLE ENERGY**

**COURSE CODE:** REN 215

**COURSE TITLE:** BASIC FLUID MECHANICS

**DATE:** 18/06/2021 **TIME:** 8-10AM

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**INSTRUCTIONS TO CANDIDATES**

TIME: 2 Hours

**Answer question ONE and any TWO of the remaining**

## Section A-Compulsory (30 marks)

## QUESTION ONE

a. State the differences in behaviour between the fluids and solid particles when both are continuously subjected to shear stress of the same magnitude (4mks)

b. Differentiate between laminar and turbulent flows using Reynold's (Re) number concept (2mks)

c. Define the following terms:

   I. Fluid mechanics (2mks)

   II. Fluids (2mks)

d. Using a well labelled diagram, explain the variation fluid velocities moving in a pipe (5mks)

e. A mass m of 50kg acts on a piston of area A $100m^2$. What is the intensity of pressure on water in contact with the underside of the piston? If the piston is in equilibrium (4mks)

f. What do you understand by the following fluid flow patterns:

   i. Steady Uniform flow (2mks)

   ii. Steady non'-uniform flow (2mks)

   iii. Unsteady'-uniform flow (2mks)

g. If the air pressure at sea level is 101.325kPa and the density of air is 1.2kg/m3, calculate the thickness of the atmosphere (m) above the earth. (2mks)

h. What gauge pressure is experienced by the diver at a depth of 10m in sea water of relative density 1.025? Assume g= 9.81m/s2 (3mks)

## Section B –Answer any Two Questions (40marks)

### Question TWO

1. Using Pascal's law principle, with the help of a well labelled diagrams, describe how the following devices work:
   a. Hydraulic brakes (12mks)

   b. Hydraulic lift (8mks)

### Question Three

a. Using the diagrammatic arrangement, describe how a venturi meter operates (8mks)

**b.** Find the head h of water corresponding to intensity of pressure p of 34000N/M2. Take specific weight w of water as $A = 9.81 \times 10^3 N/M^3$. (3mks)

c. A reservoir of water has the surface at 310m above the outlet nozzle of a pipe with diameter 15mm.

What is the

i. Velocity (3mks

ii. The discharge out of the nozzle (3mks)

iii. Mass flow rate. (Neglect all friction in the nozzle and the pipe).(3mks)

30

**Question four**

a. Using a diagram, explain how hydraulic jack works. A Force P of 850N is applied to the smaller cylinder of a hydraulic jack. The area of smaller piston is 15cm$^2$ and the larger piston is 150cm2. What load can be lifted on the larger piston

i. If the pistons are on the same level. **(5mks)**

ii. If the large piston is 0.75m below the smaller. **(7mks)**

Take the mass density of the liquid in the jack to be 1000kg/m3

b. Describe with the use of sketches two methods of measuring atmospheric **(4mks)**

c. The level of mercury in the barometer tube is 760mm above the level of mercury in the bowl. What is the atmospheric pressure in N/m2? The specific gravity of mercury is 13.6 and specific weight of water is 9810N/m2. **(4mks)**

**Question five.**

a. If pipe 1 diameter = 50mm, mean velocity 2m/s, pipe 2 diameter 40mm takes 30% of total discharge and pipe 3 diameter 60mm. What are the values of discharge and mean velocity in each pipe? (10mks)

b. Proof that pressure acts equally in all directions. (10mks)