



KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

**SECOND YEAR FIRST SEMESTER
SUPPLEMENTARY EXAMINATIONS**

**FOR THE DEGREE OF B.SC (RENEWABLE ENERGY AND BIOFUELS
TECHNOLOGY)**

COURSE CODE: REN 215

COURSE TITLE: BASIC FLUID MECHANICS

DATE: 21/7/2022

TIME: 2:00PM-4:00PM

INSTRUCTIONS TO CANDIDATES

TIME: 2 Hours

Answer question ONE and any TWO of the remaining

KIBU observes ZERO tolerance to examination cheating

Question One (Compulsory)

- a) Define the following terms: (4 marks)
- i) Fluid mechanics
 - ii) Fluids
- b) Define the following terms: (4 marks)
- i) Laminar flow
 - ii) Steady flow
- c) State any four properties of a fluid. (4 marks)
- d) Define the following terms as used in fluid mechanics. (4 marks)
- i) System
 - ii) Control volume
- e) State Bernoulli's equation and list the practical applications of the equation. (4 marks)
- f) List for assumptions/limitations of Bernoulli's equation. (4 marks)
- g) Name any two devices which are used to measure the rate of flow of a fluid. (2 marks)
- h) What is Reynold's number and give its significance in fluid mechanics. (4 marks)

Question Two

- a) A garden hose attached with a nozzle is used to fill a 27.854-litre bucket. The inner diameter of the hose is 2cm, and it reduces to 0.8cm at the nozzle exit. If it takes 50 seconds to fill the bucket with water, determine; (8 marks)
- i) Volume and mass flow rates of water through the hose.
 - ii) The mean velocity of water at the nozzle exit.
- b) Water is flowing through a pipe having diameter 20cm at one end of it A and on the other end B its diameter is 10cm. the rate of flow through the pipe is 35liters/second and section A of the pipe is 6cm above the datum line and at section B it is 4m above the datum. If the pressure at cross section A is 29.24N/cm², find out the intensity of pressure at section B. (12 marks)

Question Three

- a) Define the following coefficients: (6 marks)
- Coefficient of velocity
 - Coefficient of contraction
 - Coefficient of discharge
- b) The head of water over an orifice of diameter 40mm is 10m. Find the actual discharge and actual velocity of jet at vena-contracta. Take $C_d = 0.6$ and $C_v = 0.98$. (6 marks)
- c) A horizontal venturimeter 160mm by 80mm is used to measure the flow of an oil of specific gravity 0.8. determine the deflection of the oil-mercury gauge, if the discharge of the oil is 50litres/sec. (8 marks)

Question Four

- a) Distinguish and name the major and minor losses of head during flow of liquid through a pipe. (4 marks)
- b) Water is flowing in a pipe 400m long and 15cm diameter at the rate of 35.4 litres/sec. Determine the loss of head due to friction, taking the coefficient of friction as 0.05. (6 marks)
- c) Water flows in a steel pipe ($d = 40$ mm, $k = 0.045 \times 10^{-3}$ m, $\mu = 0.001$ k/ms) with a rate of 1lit/s. Determine the friction coefficient and the head loss due to friction per meter length of the pipe using: (10 marks)
- Moody chart
 - Smooth pipe formula.

Question Five

- a) A jet of 10cm diameter, moving with a velocity of 18m/sec impinges on a series of vanes moving with a velocity of 12m/sec. Determine; (8 marks)
- Force on the plate
 - Work done per sec
 - Efficiency

- b) A jet of water of diameter 50mm strikes a fixed plate in such a way that the angle between the plate and jet is 30° . The force exerted in the direction of jet is 1471.5N. Determine the rate of flow of water. (12 marks)