TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
Department of BUILDING & Civil engineering
UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING
TMC 4214 : FLUID MECHANICS I

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2024
TIME: 2 HOURS

Instructions to Candidates
You should have the following for this examination
-Answer Booklet, examination pass and student ID
This paper consists of **four** questions.
Attempt **question ONE (Compulsory) and any other TWO questions**.
Do not write on the question paper.

QUESTION ONE

a) Define the following terms;

(i) Capillarity

(ii) Specific weight

(iii) Specific gravity **(6 marks)**

b) A house is to be designed to withstand hurricane-force winds. The maximum wind velocity (υ) is 88/m/s. The surface area of the roof (A) is 450m^2. If the density of air (ρ) is 1.029 kg/m^3. Determine the force the roof supports should be able to withstand. **(10 marks)**

c) Determine the Reynolds number, of a fluid having viscosity of 0.4 Ns/m^2 and relative density of 900 Kg/m^3 flowing through a pipe of 20 mm with a velocity of 2.5 m. **(4 marks)**

QUESTION TWO

a) A U - tube manometer is used to measure the pressure of oil of specific gravity 0.85 flowing in a pipe line. Its left end is connected to the pipe and the right limb is open to the atmosphere. The center of the pipe is 100 mm below the level of mercury (specific gravity = 13.6) in the right limb. If the difference of mercury level in the two limbs is 130 mm. Determine the absolute pressure of the oil in the pipe. **(8 marks)**

b) Briefly explain how a venturi meter works. **(2 marks)**

c) Briefly explain the difference between laminar and turbulent flow **(4 marks)**

d) Water is flowing through a tapering pipe having diameters 300 mm and 150 mm at sections 1 and 2 respectively. The discharge through the pipe is 40 litres/sec. section 1 is 10 m above the datum and section 2 is 6 m above datum. Determine the intensity of pressure at section 2 if at section 1 is 400 kN/m^2. **(6 marks)**

QUESTION THREE

a) A pipe 200 m long slopes down at 1 in 100 and tapers from 600 mm diameter at the higher end to 300 mm diameter at the lower end and carries 100 litres/sec of oil (sp. Gravity 0.8). if the pressure gauge at the higher end reads 60 kN/m^2. Neglect all losses. Determine

i) Velocities at the two ends
ii) Pressure at the lower end. **(6 marks)**

b) Water stands at a depth H in a large, open tank whose side walls are vertical. A hole is made in one of the walls at a depth h below the water surface. What is the distance R from the foot of the wall does the emerging stream strike the floor? **(10 marks)**

c) At what depth below the surface of oil, relative density 0.8, will produce a pressure of 120 kN/m^2? What depth of water is this equivalent to? **(4 marks)**

QUESTION FOUR

a) Water is flowing through a pipe having diameters of 20cm and 10cm at sections A and B respectively. The rate of flow through pipe is 35 litres/sec. The section A is 6m above datum and section B is 4m above the datum. If the pressure at section A is 6m above datum and section B is 4m above the datum. If the

pressure at section A is 39.24 N/cm^2. Determine the intensity of pressure at section B. **(10 marks)**

b) Calculate Reynolds number and classify the type of flow, if a fluid having viscosity of 0.4 Ns/m^2 and relative density of 900 Kg/m^3 flows through a pipe of 20 mm with a velocity of 2.5 m/s. **(4 marks)**

c) A fluid with a density of 1,000kg/m^3 is flowing through a pipe with a diameter of 0.1 m at a velocity of 2 m/s. The fluid has a viscosity of 0.001 Pa.s. Determine the Reynolds number for this flow? **(4 marks)**

d) Briefly explain importance of Reynold's number. **(2 marks)**