SLOT: D2+TD2

REG. NO.: 24BME0137

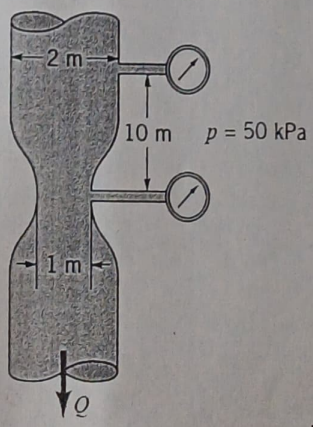
VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF MECHANICAL ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2025-2026

Programme Name & Branch	:	B.Tech (BME, BMA, BMM)
Course Code	:	BMEE204L
Course Name	:	Fluid Mechanics and Machines
Faculty Name(s)	:	Dr. C.G.Mohan, Dr. R. Prakash, Dr. P. Rajesh Kanna, Dr. R. Deepakkumar, Dr. Gaurav Gupta
Class Number(s)	:	VL2025260102043, 2044, 2045, 2046, 2047
Date of Examination	:	8.10.2025
Exam Duration	:	90 minutes Maximum Marks: 50

General instruction(s):

- Answer All Questions
- Use of Moody chart and properties table are permitted
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcome Statements:
  - CO 3. Formulate suitable governing equations to solve fluid flow problems.
  - CO 4. Analyse the viscous flow through pipes and determine various losses.
  - CO 5. Perform dimensional analysis of various flow problems

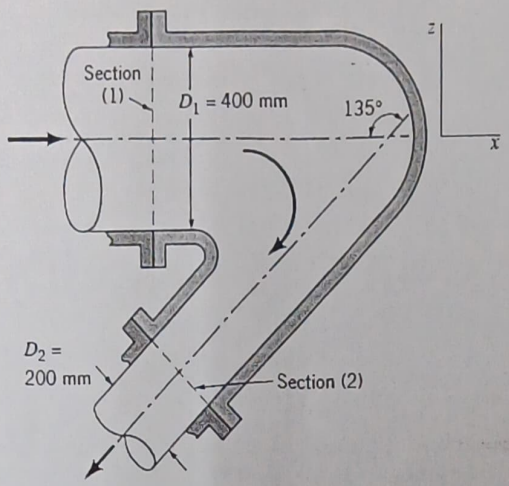
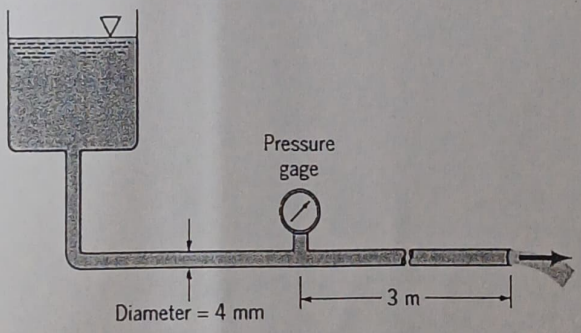
Q. No	Question	M	CO	BL
1.	Water (assumed inviscid and incompressible) flows steadily in the vertical variable-area pipe shown in the figure 1 below. Determine the flow rate if the pressure in each of the gauges reads 50 kPa.  Figure 1	10	3	3
2.	A converging elbow (see Fig. 2) turns water through an angle of in a vertical plane. The flow cross-section diameter is 400 mm at the elbow inlet, section (1), and 200 mm at the elbow outlet, section (2) angle 135°. The elbow flow passage volume is between sections (1) and (2). The water volume flow rate is 0.5 m³/s, and the elbow inlet and outlet pressures are 150 kPa and 90 kPa, respectively. Calculate the horizontal (x direction) and vertical (z direction) anchoring forces required to hold the elbow in place. Assume the weight of the elbow and the water inside the elbow are negligible.	10	3	4

SLOT: D2+TD2

REG. NO.:

VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF MECHANICAL ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2025-2026

	 Fig. 2			
3.	A simple flow system to be used for steady flow tests consists of a constant head tank connected to a length of 4-mm diameter tubing, as shown in the figure 3 below. The liquid has a viscosity of 0.015 N/sm^2 a density of 1200 kg/m^3, and discharges into the atmosphere with a mean velocity of 2 m/s . (a) Verify that the flow will be laminar. (b) Assume the flow is fully developed in the last 3 m of the tube and what is the pressure at the pressure gauge?  Figure 3	10	4	3
4.	Water flows through a horizontal copper pipe with a diameter of 0.2 m at a velocity of 10 cm/s. Determine the pressure drop per meter of pipe using the Moody chart and show the use of the Moody chart in a freehand sketch. Also, calculate the power lost to the friction per meter of pipe.	10	4	4
5.	In a fuel injection system, small droplets are formed due to the breakup of the liquid jet. Assume the droplet diameter, d, is a function of the liquid density, ρ , viscosity, μ, and surface tension σ, and the jet velocity V and diameter, D. Form an appropriate set of dimensionless parameters using these (V, D, and ρ) variables as repeating variables.	10	5	4

****