Name.....Roll No.....

Mar Athanasius College of Engineering, Kothamangalam

Second Sessional Examination, October 2026

B24CE2T02 – FLUID MECHANICS & HYDRAULICS –S3 CE B

Time: 1.5 Hours **Marks:40**

Part A (4×3=12 Marks)

1. What is Euler's equation of motion? How will you obtain Bernoulli's equation from it? (CO3)

2. How would you determine the equivalent size of a compound pipe? (CO3)

3. Compare pipe flow and open channel flow. (CO4)

4. Why is the minimization of wetted perimeter important for economical channel design (CO4)

Part B (14 x2=28 Marks)

5. (a) A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the centre of the pipe. Considering all losses of head which occur, determine the rate of flow. Take f = 0.01 for both sections of the pipe. Also draw the Hydraulic Gradient Line and Total Energy Line (10 marks) (CO3)

(b). A pitot-static tube placed in the centre of a 300 mm pipe line has one orifice pointing upstream and the other perpendicular to it. The mean velocity in the pipe is 0.80 of the central velocity. Find the discharge through the pipe if the pressure difference between the two orifices is 60 mm of water. Take the coefficient of pitot tube as Cv =0.98 (4 marks) (CO3)

6 (a) Derive the conditions for a hydraulically most economical trapezoidal channel section. Hence, prove that for the most economical trapezoidal section, the hydraulic radius is equal to half the depth of flow. (10 marks) (CO4)

(b) Find the discharge through a rectangular channel 14 m wide, having depth of water 3 m and bed slope 1 in 1500. Take the value of N=0.03 in the Kutter's formula. (4 marks) (CO4)

Course Outcomes: After the completion of the course the students will be able to

CO1: Apply the fundamental concepts to identify types and characteristics of fluid flow, and to estimate fluid pressure and associated forces in practical situations.

CO2: Use the principles of buoyancy and flotation to evaluate the stability of floating bodies, and apply fundamental hydrodynamic concepts to explain fluid motion.

CO3: Apply the principles of fluid kinetics and Bernoulli equation to analyse flow and compute energy losses and flow characteristics in pipe systems.

CO4: Understand the concepts of open channel flow to examine flow types and velocity distribution, calculate discharge using standard flow equations, and identify flow characteristics.

CO5: Apply the principles of open channel flow to analyse specific energy and hydraulic jump characteristics.

Vision

A department that is proficient in all aspects of civil Engineering education, blending theory and practice.

Mission

- To impart the right combination of civil Engineering fundamentals and use of modern tools to the students.
- To encourage learning with due emphasis given to professional ethics and traditional norms.
- To enhance the knowledge base of students in liaison with practice and research.
- To encourage life-long learning.

Question No.	1	2	3	4	5	6	Total Marks
CO Mapping	CO3	CO3	CO4	CO4	CO3	CO4	
Bloom Taxonomy Level	III	II	II	II	III	III	
Max. Marks	3	3	3	3	14	14	40

	Prepared By	Scrutinized By	Approved By HOD
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