



## End Term (Odd) Semester Examination November 2025

Roll no.....

Name of the Course and semester: B. Tech (Civil Engineering), III Semester

Name of the Paper: Fluid Mechanics

Paper Code: TCE 301

Time: 3 hour

Maximum Marks: 100

### Note:

- (i) All the questions are compulsory.
- (ii) Answer any two sub questions from a, b and c in each main question.
- (iii) Total marks for each question is 20 (twenty).
- (iv) Each sub-question carries 10 marks.

### Q1

(2 x 10 = 20 marks)

- (a) Define surface tension and capillarity and derive the expression for capillary rise in a circular tube.
- (b) State and prove Pascal's Law and discuss its applications.
- (c) A 90 N rectangular solid block slides down a  $30^\circ$  inclined plane. The plane is CO1 lubricated by a 3 mm thick film of oil of relative density 0.90 and viscosity 8.0 Poise. If the contact area is  $0.3\text{m}^2$ , estimate the terminal velocity of the block.

### Q2

(2 x 10 = 20 marks)

- (a) What do you mean by Flow Net? Write the uses and limitations of Flow Net.
- (b) Derive Bernoulli's equation from Euler's equation for inviscid flow along a streamline stating assumptions. CO2
- (c) A wooden block of width 1.25 m, depth 0.75 m and length 3.0 m is floating in water. Specific weight of wood is  $6.4\text{ kN/m}^3$ . Find the volume of water displaced and position of centre of buoyancy.

### Q3

(2 x 10 = 20 marks)

- (a) What do you mean by ventilation of weirs? Explain why ventilation of suppressed rectangular weir is necessary.
- (b) Derive equation for discharge over a Right angled Triangular Notch. CO3
- (c) Water flows through an orifice of diameter 50 mm under head  $H = 1.2\text{ m}$ . Take  $C_d = 0.62$  and compute discharge.

### Q4

(2 x 10 = 20 marks)

- (a) Explain laminar and turbulent flow regimes and discuss physical mechanisms that trigger transition. Mention Reynolds experiment and its practical importance.
- (b) Oil of mass density  $800\text{ kg/m}^3$  and dynamic viscosity 0.02 poise flows through 50 mm diameter pipe of length 500 m at the rate of 0.19 liter/s. Determine (i) Reynolds number of flow, (ii) Maximum velocity, (iii) Pressure gradient, (iv) Loss of pressure in 500 m length and (v) wall shear stress. CO4
- (c) Two fixed parallel plates kept 8 cm apart have laminar flow of oil between them with a maximum velocity of 1.50 m/sec. Taking dynamic viscosity of oil to be  $2.0\text{ Ns/m}^2$ , compute the discharge per meter width, shear stress at the plates, pressure difference between two points 25 m apart and velocity at 2 cm from the plate.



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**Q5**

**(2 x 10 = 20 marks)**

- (a) What is a compound pipe? How good you determine the equivalent size of a compound pipe?
- (b) Derive pressure rise expression for sudden valve closure in elastic pipe.
- (c) Calculate pressure rise due to sudden closure for pipe length 500 m,  $D = 250$  mm, wave speed  $c = 1000$  m/s,  $V = 2.0$  m/s. Use  $\rho = 1000$  kg/m<sup>3</sup>.

**CO5**