



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° 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 0.3m^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.
- (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 kN/m^3 . Find the volume of water displaced and position of centre of buoyancy.

CO2

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.
- (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.

CO3

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 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.
- (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 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/m³.

CO5