Seat No.

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OCT-NOV 2025 WINTER EXAMINATION

1154 B.Tech. CBCS

Sub. Name: Fluid Mechanics

Sub. Code: 63354/73207/77738

Day and Date: Wednesday,10-12-2025 **Total Marks: 70**

Time: 02:30 PM To 05:00 PM

Instructions:
1. **All questions are compulsory**
2. **Assume suitable data wherever necessary and mention it boldly**
3. **Draw neat labelled diagrams wherever necessary**
4. **Use of Scientific calculator is allowed**

Q1) a) Discuss types of fluid with help of Newton's law of viscosity [5] **[10]**

b) Explain stability of floating bodies with neat sketches [5]

OR

a) Define and explain briefly the following:

(i) Velocity potential; (ii) Stream function. [6]

b) Define steady, non-steady, uniform and nonuniform flows [4]

Q2) a) Derive Euler's equation of motion [6] **[10]**

b) Why is co-efficient of discharge of an orifice-meter much smaller than that of venturimeter? [4]

Q3) **a)** A 300 mm × 150 mm venturimeter is provided in a vertical pipeline carrying oil of specific gravity 0.9, flow being upward. The difference in elevation of the throat section and entrance section of the venturimeter is 300 mm. The differential U-tube mercury manometer shows a gauge deflection of 250 mm. Calculate: **(i)** The discharge of oil, and **(ii)** The pressure difference between the entrance section and the throat section. Assume Cd = 0.98. [8] **[15]**

b) The velocity components in a fluid flow are given by: u = 2xy; $v = a^2 + x^2 - y^2$

(i) Show that the flow is possible.

(ii) Derive the relative stream function [7]

OR

b) In order to form a stream of bubbles, air is introduced through a nozzle into a tank of water at 20°C. If the process requires 3.0 mm diameter bubbles to be formed, by how much the air pressure at the nozzle must exceed that of the surrounding water? What would be the absolute pressure inside the bubble if the surrounding water is at 100.3 kN/m^2? Take surface tension of water at 20°C = 0.0735 N/m. [7]

Q4) **a)** Derive an expression for force exerted by flowing fluid on a pipe bend. [5] **[10]**

b) Derive an expression for velocity distribution for viscous flow through parallel

plate. Also sketch the velocity distribution across the section of parallel plates. [5]

OR

a) Explain the following terms

i) pressure drag and friction drag ii) streamlined body [5]

b) Define Boundary layer thickness and obtain expression for same [5]

Q5) a) What are the different minor energy losses in pipes ? Explain with formula . **[5]** **[10]**

b) Derive Darcy Weisbach equation for Frictional losses in pipe flows. **[5]**

Q6) a) In a pipe of 300mm diameter and 800mm length an oil of specific gravity 0.8 is flowing at the rate of 0.45 m^3/s. Find head lost due to friction and power required to maintain the flow. (take kinematic viscosity of oil 0.3 stoke) [8] **[15]**

b) On a flat plate of 2m (length) x 1m (width), experiments were conducted in a wind tunnel with a wind speed of 50 km/h. The plate is kept at such an angle that the coefficients of drag and lift at 0.18 and 0.9 respectively .Determine drag force ,lift force ,resultant force (take density of air =1.15 kg/m^3). [7]

OR

b) A fluid of density 1200 kg/m^3 and viscosity 0.5 poise is flowing at a rate of 5 m^3/min in a circular pipe of cross section of 1 m^2. Is the flow laminar or turbulent? [7]

End Of Question Paper

Important Note for Chief Exam Officer / SRPD Coordinator / Sr Supervisor/ Student -

This Question Paper may be distributed for following Subjects as common code.

सदरची प्रश्नपत्रिका खालील विषयांकरिता वितरित करता येईल.

1] (1154) B.Tech. CBCS (73207) Fluid Mechanics Part 2 SEM 3

2] (101) Bachelor of Engineering (77738) Fluid Mechanics Part 2 SEM 3

3] (101) Bachelor of Engineering (63354) Fluid Mechanics Part 2 SEM 3