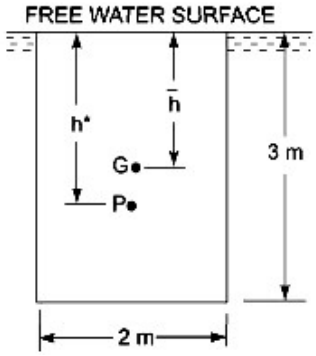
BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2025)

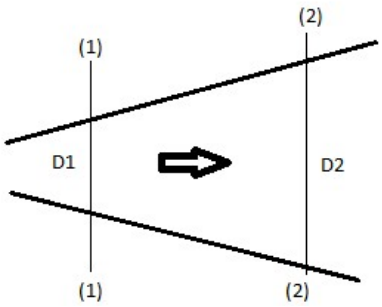
CLASS: BTECH **SEMESTER : III /ADD**
BRANCH: MECHANICAL ENGINEERING **SESSION : MO/2025**

SUBJECT: ME24203 / ME203 FLUID MECHANICS AND HYDRAULIC MACHINES
TIME: 02 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Discuss the concept of continuum in fluid flow practices.	[2]	1	L
Q.1(b)	A plate of 0.025 mm distant from a fixed plate, moves at 0.6 m/s and requires a shear force per unit area of 2 N/m^2 to maintain this speed. Determine the dynamic viscosity of the flowing fluid between the plates.	[3]	2	M
Q.2(a)	With suitable sketch discuss the following: (i) Piezometer (ii) Differential U Tube manometer.	[2]	1	L
Q.2(b)	A rectangular plane surface of 2 m wide and 3 m deep. It lies in a vertical plane in water. Determine the total pressure and position of center of pressure at the plate surface when its upper edge is horizontal as shown in the Figure. Given that $h^* = \frac{I_G}{A\bar{h}} + \bar{h}$, Where I_G is the moment of inertia about an axis passing through C.G. and parallel to base.	[3]	2	M
Q.3(a)	Distinguish between : (i) Steady and unsteady flow (ii)One, two and three dimensional Flow	[2]	1	L
Q.3(b)	The diameter of a pipe at the section 1 and 2 are D1 = 10 cm and D2 = 15 cm respectively. Determine the discharge through the pipe, if the velocity of the water flows through the pipe at section 1 is 5 m/s as shown in the Figure. Also determine the velocity of water at section 2.	[3]	3	M





PTO

Q.4(a)	Discuss the various forces present in a fluid flow when the fluid is real one.	[2]	1	L
Q.4(b)	Using Navier –Stokes equation for inviscid, incompressible, irrational and steady flow, develop (derive) the Bernoulli's equation for total energy along a streamline.	[3]	4	H
Q.5(a)	Using Bernoulli's equation, develop a relation for the theoretical discharge through a horizontal Venturi meter.	[2]	4	H
Q.5(b)	A horizontal Veturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The readings in the differential U tube manometer (mercury as monomeric fluid) connected to the inlet and throat shows 20 cm mercury. Assume the coefficient of discharge as 0.98, determine the rate of flow.	[3]	3	M

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