GALGOTIAS UNIVERSITY

ADMISSION NUMBER												

School of Engineering

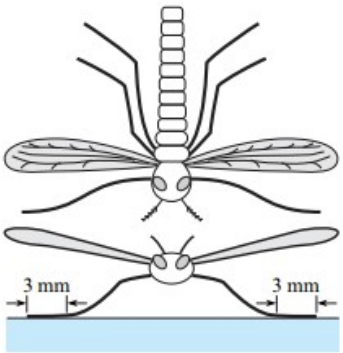
B.TECH Mechanical Engineering
Mid Term Examination - May 2024

Duration : 90 Minutes
Max Marks : 50

Sem IV - G3UB402C - Fluid Mechanics PBL

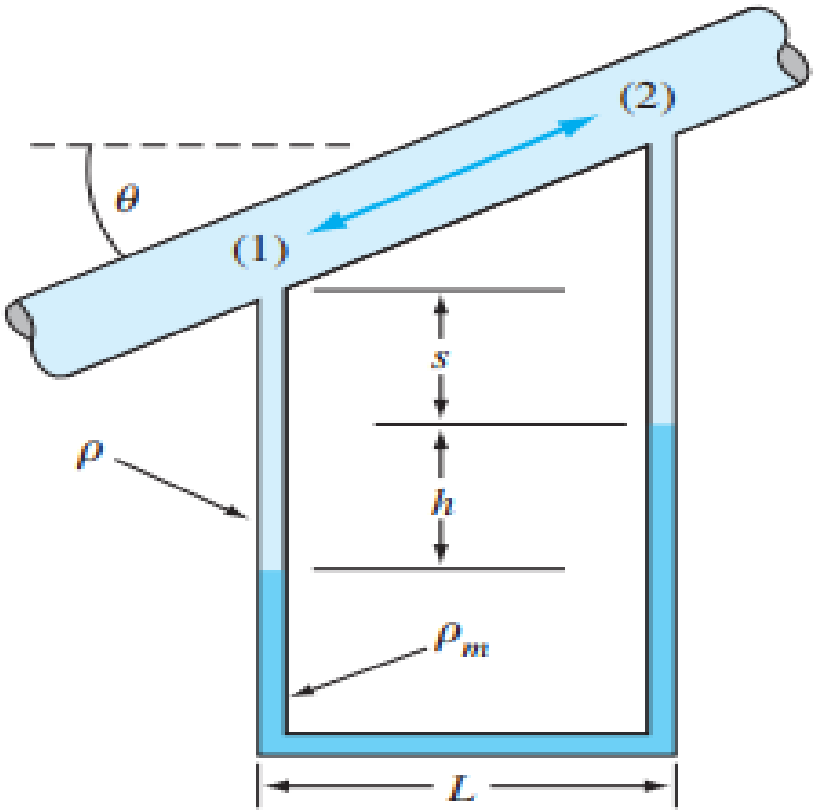
General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1)	What is the Eulerian description of fluid motion? How does it differ from the Lagrangian description?	K2	(2)
2)	Sand, and other granular materials, appear to flow; that is, you can pour them from a container or a hopper. Therefore, is sand a fluid? Explain.	K1	(3)
3)	Contrary to what you might expect, a solid steel ball can float on water due to the surface tension effect.Apply this knowledge to find the maximum diameter of a steel ball that would float on water at 20°C. The surface tension of water at 20°C is 0.073 N/m. The contact angle is taken to be 0 What would your answer be for an aluminum ball? Take the densities of steel and aluminum balls to be 7800 kg/m3 and 2700 kg/m3, respectively.	K2	(4)
4)	Explain metacentric height and its relation with stability of floating bodies.	K2	(6)
5)	A water bug is suspended on the surface of a pond by surface tension (water does not wet the legs). The bug has six legs, and each leg is in contact with the water over a length of 3 mm. Determine the maximum mass (in grams) of the bug if it is to avoid sinking? neglect bouyancy.	K3	(6)



6)	Explain geometric similarity with example.	K3	(9)

7) In a certain industrial process, oil of density ρ flows through the inclined pipe in Fig. A U-tube manometer, withfluid density ρm, measures the pressure difference between points 1 and 2, as shown. The pipe flow is steady, so thatthe fl uids in the manometer are stationary. (a) develop analytic expression for p1 -p2 in terms of the system parameters. (b) Discuss the conditions on h necessary for there to be no flow in the pipe. (c) What about flow up,from 1 to 2. (c) What about flow down, from 2 to 1? K4 (8)



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8) A crane is used to lower weights into the sea (density 1025 kg/m3) for an underwater construction project. Analyze free body diagram and find the tension in the rope of the crane due to a rectangular 0.4mx0.4mx3m concrete block (density 2300 kg/m3) when it is (a) suspended in the air and (b) completely immersed in water K4 (12)

OR

Analyze the stability of floating bodies and its relation with metacentre. K4 (12)