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

CLASS: BE **SEMESTER: III**
BRANCH: CE/C&P **SESSION : MO/2019**

SUBJECT : CL203 FLUID MECHANICS

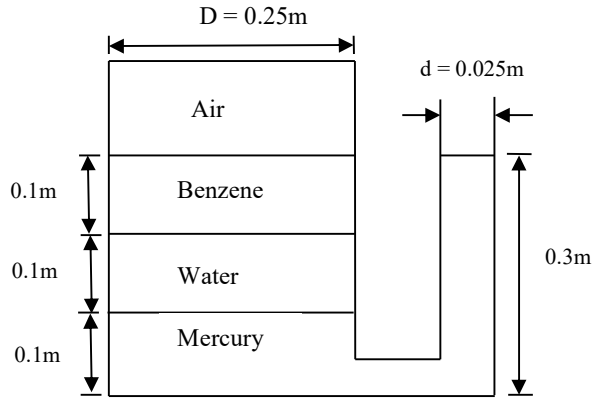
TIME: 2 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates may attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.

Q1 (a) Write the name of four scientists and mention their contribution for the development of fluid mechanics. [2]

Q1 (b) When will centre of pressure and centre of gravity of an immersed plane surface coincide? [3]

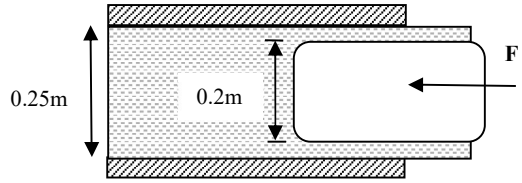
Q2 Consider a tank containing mercury, water, benzene, and air as shown. Find the air pressure (gage). If an opening is made in the top of the tank, find the equilibrium level of the mercury in the manometer. ρ_{H20} = 999 kg/m^3, SG_{Hg} = 13.55 and $SG_{Benzene}$ = 0.879. [5]



Q3 (a) How are viscous stress tensor related to the velocity gradient in the fluid? [2]

Q3 (b) Derive the general equation for conservation of mass in cartesian coordinates. [3]

Q4 Find the force required to hold the plug in place at the exit of the water pipe. The flow rate is 1.5m^3/s, and the upstream pressure is 3.5 MPa. [5]



Q5 (a) Verify that "momentum per unit area per unit time" has the same dimensions as "force per unit area". CO2, Bloom's Taxonomy (Understanding) [2]

Q5 (b) Derive an expression for the velocity distribution for viscous flow through a circular pipe. Also sketch the velocity distribution and shear stress distribution across a section of the pipe. CO3, Bloom's Taxonomy (Understanding) [3]

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