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

CLASS: B.TECH **SEMESTER : III**
BRANCH: CE/C&P **SESSION : MO/19**

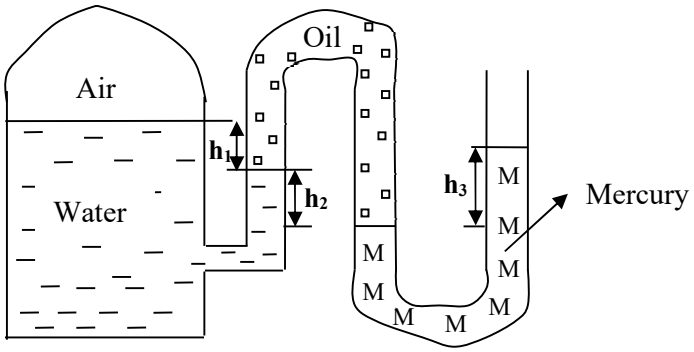
SUBJECT: CL203 FLUID MECHANICS

TIME: 3 HOURS **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

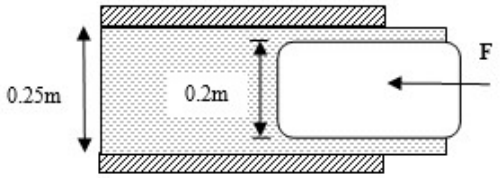
Q.1(a) Define manometer. Determine the pressure variation between two given points in a static fluid. [5]

Q.1(b) The water in a tank is pressurized by air and the pressure is measured by a multifluid manometer as shown. The tank is located on a mountain at an altitude of 1400 m where the atmospheric pressure is 85.6 kPa. Determine the air pressure in the tank if h_1 = 0.1 m, h_2 = 0.2 m, and h_3 =0.35 m. Take the densities of water, oil and mercury to be 1000 kg/m^3, 850 kg/m^3, and 13,600 kg/m^3, respectively. [5]



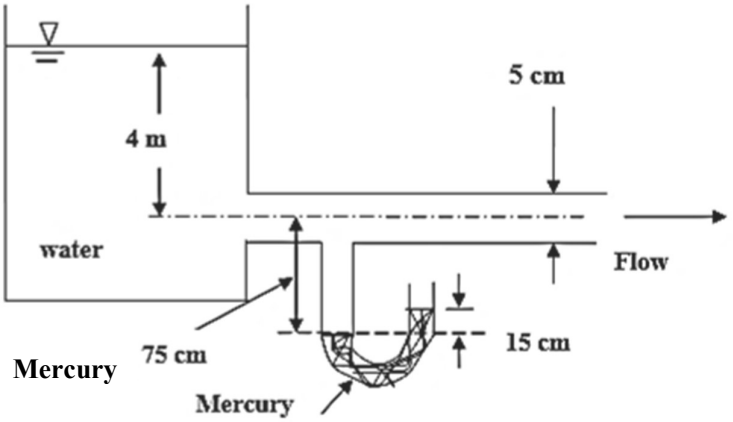
Q.2(a) Compare Newton's law of viscosity and Hooke's law of elasticity. Derive the equation of streamline. [5]

Q.2(b) 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]



Q.3(a) Show that the Hagen-Poiseuille formula is dimensionally consistent. Prove that the maximum velocity in a circular pipe for viscous flow is equal to two times the average velocity of the flow. [5]

Q.3(b) Water flows from a very large tank through a 5-cm diameter tube as shown in the figure. Estimate the velocity in the pipe and the rate of discharge from the tank. (Assume the flow is friction less.) [5]



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Q.4(a) Write five industrial applications of Fluidized bed assembly. Derive an expression to obtain the minimum fluidization velocity in case of a fluidized bed. [5]

Q.4(b) A passenger car with frontal projected area of 1.5 m^2 travels of 56 km/hr. Determine the power required to overcome wind resistance if the drag coefficient of the car is 0.4. Take ρ of air = 1.2 kg / m^3. [5]

Q.5(a) Write the working principle of venturimeter with neat sketch. [5]

Q.5(b) Derive an expression for actual discharge through orifice meter. Be sure to define all symbols you use in your expression. [5]

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