GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2021

Subject Code:3140611   **Date:04/01/2022**
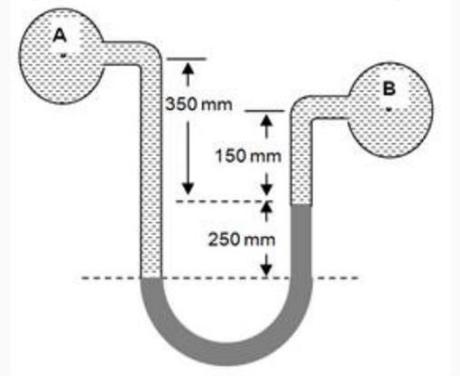
Subject Name:Fluid Mechanics & Hydraulics

**Time:10:30 AM TO 01:00 PM**   **Total Marks: 70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define: Fluid statics, Fluid Kinematics, Kinematic viscosity	**03**
	(b)	State the Newton's law of viscosity.	**04**
	(c)	Derive the expression for total pressure for a vertical plate submerged in the liquid.	**07**
Q.2	**(a)**	Explain equilibrium in floating bodies.	**03**
	(b)	Differentiate between: (a) Steady and Unsteady flow (b) Uniform and Non Uniform flow	**04**
	(c)	A U-tube differential manometer is connected to two pipes at A and B shown in figure . Pipe A Contains oil of Specific Gravity 0.92 and pipe B is carrying water. If the pressure at point A is 125 kN/m2 find the pressure at point B.	**07**

OR

	(c)	A triangular plate of 1 metre base and 1.5 metre altitude is immersed in water shown in figure . The plane of plate is inclined at 300 with free water surface and the base is parallel to and at a depth of 2 meters from water surface. Find the total pressure on the plate and position of centre of pressure.	**07**
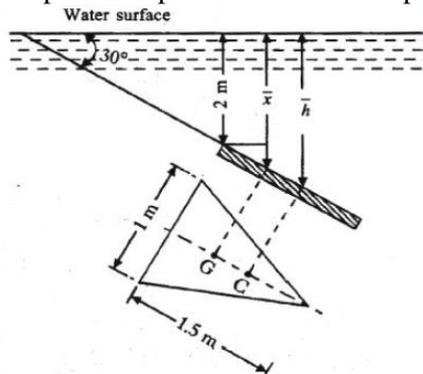
Q.3	**(a)**	Define coefficient of contraction, coefficient of velocity and coefficient of discharge for the orifice.	**03**

	(b)	Give classification of Orifices. Give the difference between an orifice and a mouthpiece.	**04**
	(c)	State Bernoulli's theorem for steady flow of an incompressible fluid. Derive Bernoulli's expression	**07**

OR

Q.3	**(a)**	Which are the assumptions made in Bernoulli's theorem ?	**03**
	(b)	What are the advantages of triangular notch over a rectangular notch?	**04**
	(c)	A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure rate of water. The reading of differential manometer connected to the venturimeter is 20 cm of mercury. Determine the rate of flow. Take coefficient of discharge equal to 0.98	**07**

Q.4	**(a)**	Draw velocity distribution in pipe flow and open channel flow.	**03**
	(b)	Explain Prandtl's mixing length theory.	**04**
	(c)	Enlist the major and minor loses in pipes. Derive the Darcy-Weisbach equation for calculating head loss due to friction.	**07**

OR

Q.4	**(a)**	Define: (i) Total energy line (ii) Hydraulic gradient line	**03**
	(b)	Explain with diagram the Specific Energy Curve.	**04**
	(c)	Derive for the most economic a trapezoidal channel section is: "Half of the top width is equal to one of the sloping sides"	**07**

Q.5	**(a)**	Differentiate between pipe flow and open channel flow.	**03**
	(b)	Derive the Hagen-Poiseuille equation for laminar flow in the circular pipe.	**04**
	(c)	Fluid of density ρ and viscosity μ flows at an average velocity V through a circular pipe diameter d. show by dimensional analysis that the shear stress of the pipe wall.	**07**

$$\tau_o = \rho V^2 f\left[\frac{\rho V d}{\mu}\right]$$

OR

Q.5	**(a)**	Explain hydraulically smooth and rough boundaries.	**03**
	(b)	Discuss briefly various similarities between the model and the prototype.	**04**
	(c)	Explain the Buckingham's π-theorem in dimensional analysis	**07**

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