Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(NEW) EXAMINATION – WINTER 2022

Subject Code:3140611 Date:17-12-2022

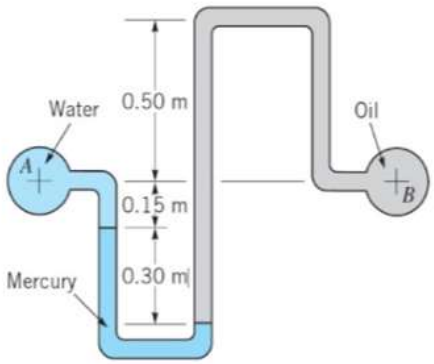
Subject Name:Fluid Mechanics & Hydraulics

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: Dynamic Viscosity, Surface tension, Capillarity	**03**
	(b)	Explain Buoyancy and Centre of Buoyancy	**04**
	(c)	State and prove Pascal's law.	**07**
Q.2	**(a)**	Define the terms metacentre, metacentric height and absolute pressure	**03**
	(b)	Differentiate between: (a) Compressible and incompressible flow (b) Uniform and Non Uniform flow	**04**
	(c)	Derive the expression for total pressure for a vertical plate submerged in the liquid.	**07**
		OR	
	(c)	The mercury manometer shown below indicates a differential reading of 0.3m when a pressure in Pipe A is 30 mm of mercury (Hg) vacuum. Determine the pressure in pipe B (in Pa.)	**07**



Q.3	**(a)**	Classify different types of orifices according to its shapes, size, discharge.	**03**
	(b)	Explain the importance of the parameters contained in the Reynolds number to categorize the flow as laminar and turbulent flow.	**04**
	(c)	Explain the components of a venturimeter with a neat proportionate sketch.	**07**
		OR	
Q.3	**(a)**	Differrentiate between small & large orifice.	**03**
	(b)	State Bernoulli's equation. What are the practical applications of Bernoulli's equation?	**04**
	(c)	Derive an expression for the discharge through triangular notch	**07**
Q.4	**(a)**	Define: (i) Total energy line (ii) Hydraulic gradient line	**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 rapid varied flow and gradually varied flow.	**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)**	Explain method of selecting repeating variables.	**03**
	(b)	Derive the Hagen-Poiseuille equation for laminar flow in the circular pipe.	**04**
	(c)	The pressure drop (ΔP) in a pipe depends upon the mean velocity of flow (v), length of pipe (l), diameter of pipe (d), viscosity of fluid (μ), average height of roughness projections on the inside surface (k) mass density of fluid (ρ). By using Buckingham's pi-theorem, obtain a dimensionless expression ΔP.	**07**

OR

Q.5	**(a)**	Define super critical flow, Froude's number and hydraulic jump.	**03**
	(b)	What is Dimensional Homogeneity? What are the applications of Dimensional Homogeneity?	**04**
	(c)	Explain the Buckingham's π-theorem in dimensional analysis	**07**

****