Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2023

Subject Code:3140611 Date:19-07-2023

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)**	What is capillarity? Explain term cohesion and adhesion.	**03**
	(b)	A plate 0.08 mm apart from fixed plate requires stress of 2.25 N/m^2 to move at a velocity of 1.80 m/s. Determine viscosity of fluid between the plates.	**04**
	(c)	For a most economical trapezoidal channel section, show that half of top width is equals to length of one of the slopping sides.	**07**
Q.2	**(a)**	State Pascal's law and its application.	**03**
	(b)	Calculate pressure intensity at a point 4.00 m below sea water level. Take specific gravity of sea water 10 KN/m^3.	**04**
	(c)	Two pipes A and B laid at same level convey oil of specific gravity 1.35. A differential manometer connected between pipes shows difference in mercury levels as 20 cm. Find difference in pressures at the point. Take specific gravity of mercury 13.60	**07**
		OR	
	(c)	A trapezoidal channel section has a bed width 7.50 m laid at a bed slope of 1 in 3600. Side slope of the channel is 1H : 1V. Depth of flow in the channel is 2.00 m. Find the discharge in the channel. Take Manning's constant 0.015.	**07**
Q.3	**(a)**	Explain different types of Equilibrium of floating body.	**03**
	(b)	Head over the triangular 90^o V-notch is 0.40 m. Find the discharge over the notch. Take $C_d = 0.60$	**04**
	(c)	Show that stream function Ψ always satisfy continuity equation.	**07**
		OR	
Q.3	**(a)**	What is meant by hydraulic coefficient? State the relation between different hydraulic coefficients.	**03**
	(b)	A rectangular uniform wooden body 2.50 m long, 1.25 m wide and 1.00 m deep floats in water. The depth of immersion being 0.75 m. Calculate weight of the body. Also find position of metacenter.	**04**

	(c)	A pipe of diameter 127 mm conveys water. The pressure difference between two points 250 m apart is 3.25 m of water. Calculate discharge through the pipe. Take friction factor f = 0.025	**07**
Q.4	**(a)**	Describe major energy losses and minor energy losses in pipe.	**03**
	(b)	A 4.00 m wide rectangular channel conveys 30.00 m^3/s of water. Find critical depth.	**04**
	(c)	The velocity in x and y direction is given by: u = -2y and v = 2x. Check whether stream function exists or not? If so deduce it and Plot set of stream lines.	**07**
		OR	
Q.4	**(a)**	Develop relationship between maximum velocity and average velocity in case of viscous flow between two parallel plates.	**03**
	(b)	A 6.25 m wide rectangular channel conveys 18.00 m^3/s of water with a velocity of 4.50 m/s. is there a condition for hydraulic jump to occur?	**04**
	(c)	Draw a sketch of venturimeter and show its component. Develop an expression for rate of flow through venturimeter.	**07**
Q.5	**(a)**	Describe different types of fluid flow.	**03**
	(b)	What is meant by dimensional homogeneity? Write dimensions of (1) Specific weight (2) Angular velocity (3) Dynamic viscosity.	**04**
	(c)	A square plate of 2.50 m side is immersed vertically in water such that one side is parallel and lies 2.00 m below the free water surface. Calculate total hydrostatic force and center of pressure on plate.	**07**
		OR	
Q.5	**(a)**	Which flow is said to be open channel flow? Differentiate open channel flow and pipe flow.	**03**
	(b)	Explain different types of similarities between model and its prototype.	**04**
	(c)	A pipe of 20 cm diameter is conveys water at a velocity of 5.00 m/s. Find the velocity and discharge of oil flowing in another pipe of 10 cm diameter. The viscosity of oil and water is 0.03 poise and 0.01 poise resp. Take specific gravity of oil = 0.75. Assume that dynamic similarity is satisfied between two pipes.	**07**

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