Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3160618 Date:14-07-2023

Subject Name:Open Channel flow

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)**	Differentiate between pipe flow and open channel flow.	**03**
	(b)	In the measurement of discharge in the river, it was found that the depth increases at a rate of 0.75m per hour. If the discharge in a river at that section is 20 m^3/sec and the surface width of the river is 20m. estimate the discharges at a section 1.4 km upstream.	**04**
	(c)	A trapezoidal channel of 12m bottom width, side slope 1.5H:1V, has a bed slope of 0.0003. The value of n is 0.012, If the depth of flow is 4m, compute average velocity, discharge, and bed shear.	**07**
Q.2	**(a)**	Explain various factors affecting Manning's roughness coefficient.	**03**
	(b)	Derive an expression showing a relation between alternate depths and Froude number for a hydraulic jump in a horizontal rectangular channel.	**04**
	(c)	Show that the critical depth y_c is related to alternate depths y_1 and y_2 in a rectangular channel by the equation, $$y_c = \left(\frac{2y_1^2 y_2^2}{y_1 + y_2}\right)^{1/3}$$	**07**
		OR	
	(c)	A 5.5m wide channel conveys water at a depth of 2.0m. The bed slope of the channel is 0.001. Find the width to be provided in the transition so as to obtain critical depth. Alternately with the same width of 5.5m, find the rise in bed level required to produce critical flow in the channel. Take Manning's coefficient N = 0.018	**07**
Q.3	**(a)**	Differentiate between Kennedy's theory and Lacey's regime the theory.	**03**
	(b)	A circular channel of 2.50m diameter carries water at a depth of 1.1m. If the bed slope of the channel is 1700, find the discharge through the channel. Take Chezy's constant C = 60.	**04**
	(c)	Derive conditions for most economic (i) Rectangular Section (ii) Trapezoidal Section.	**07**
		OR	
Q.3	**(a)**	Differentiate between the back water curve and drop-down curve.	**03**
	(b)	A Rectangular channel conveys a discharge of 2.25 m^3/s at a velocity of 0.8 m/s. take Chezy's constant equal to 60 and bed slope equal to 0.00012. Calculate the width and depth of the rectangular channel	**04**
	(c)	Discuss in detail with neat sketch "Specific Energy Curve"	**07**
Q.4	**(a)**	Explain with neat sketch velocity distribution and pressure distribution in open channels.	**03**
	(b)	An ogee weir with a coefficient of discharge equal to 2.60 at a head of 2.40 m. The length of the spillway is 105m. The weir crest is 8.00 m above the bottom of the approach channel having the same width as that of the spillway. Calculate the discharge over the weir by considering the velocity of the approach.	**04**

	(c)	Explain the concept of shield's analysis for uniform flow in mobile boundary channels	**07**

OR

Q.4	**(a)**	Explain the first hydraulic exponent (M) for the rectangular channel.	**03**
	(b)	An irrigation canal has a side slope of 1:1 and bottom width of 3.50m. It runs at a depth of 1.20m with a bed slope of 1 in 2500. Determine whether the canal will be silting or scouring or remain stable. Take Manning's coefficient N = 0.028 in. Use a value of m=1 in Kennedy's theory.	**04**
	(c)	Discuss in detail (i) Standing Wave Flume & (ii) Parshall Flume.	**07**
Q.5	**(a)**	Derive Chezy's equation $V = C\sqrt{RS}$ with usual notations.	**03**
	(b)	Explain with a neat sketch the permissible velocities in rigid boundary channels.	**04**
	(c)	What is a hydraulic jump? How it is formed? What are the different uses of hydraulic jump?	**07**

OR

Q.5	**(a)**	Discuss various characteristics of Rapidly Varied Flow.	**03**
	(b)	Discuss (i) Undular jump, (ii) Weak jump, (iii) Oscillating jump, & (iv) steady jump	**04**
	(c)	Draw M1, M2, and M3 type surface profiles using basic equations of gradually varied flow with examples of their occurrence.	**07**

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