GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2024

Subject Code: 3160618   **Date:24-05-2024**
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)	Differentiate between Kennedy's theory and Lacey's regime the theory	**04**
	(c)	What is hydraulic jump? How it is formed? What are the different uses of hydraulic jump?	**07**
Q.2	**(a)**	Explain with neat sketch velocity distribution and pressure distribution in open channels.	**03**
	(b)	Define normal depth, critical depth, alternate depth and conjugate depths.	**04**
	(c)	Explain importance and prediction of regimes of flow in detail.	**07**
		OR	
	(c)	Explain in details with neat sketch "Specific Energy Curve"	**07**
Q.3	**(a)**	Derive Chezy's equation $V = C\sqrt{RS}$ with usual notations.	**03**
	(b)	Define critical flow. Derive an expression for minimum energy in terms of critical depth.	**04**
	(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**
		OR	
Q.3	**(a)**	Explain various factors affecting Manning's roughness coefficient.	**03**
	(b)	Derive an expression showing relation between Y_1 and Y_2 and F_r for hydraulic jump in horizontal rectangular channel.	**04**
	(c)	Compute the discharge over an ogee weir with coefficient of discharge equal to 2.40 at a head of 2.20 m. The length of spillway is 110m. The weir crest is 8.20 m above the bottom of the approach channel having same width as that of spillway. Consider velocity of approach	**07**
Q.4	**(a)**	Define wave. Explain different types of waves.	**03**
	(b)	Find the width and depth of rectangular channel to convey a discharge of 2.0 m^3/s at a velocity 0.6 m/s. take Chezy's constant equal to 60 and bed slope equal to 0.00012.	**04**
	(c)	Derive conditions for most economic (i) Rectangular Section (ii) Trapezoidal Section.	**07**
		OR	
Q.4	**(a)**	Explain Shield's analysis for critical tractive force.	**03**

(b) A circular channel of 2.20m diameter carries water at a depth of 0.9m. If the bed slope of the channel is 1600, find the discharge through the channel. Take Chezy's constant C = 60. **04**

(c) An irrigation canal has side slope 1:1 and bottom width 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 value of m=1 in Kennedy's theory. **07**

Q.5 **(a)** Define (i) Gradually Varied Flow and (ii) Rapidly Varied Flow. **03**

(b) Differentiate between back water curve and drop down curve. **04**

(c) Draw S1, S2, and S3 type surface profiles using basic equations of gradually varied flow with examples of their occurrence. **07**

OR

Q.5 **(a)** Explain positive and negative surge moving downstream. **03**

(b) If the grain size of a bed material of an alluvial channel is 1mm, specific gravity is 2.65, bed slope of channel is 0.0001, find the depth in wide rectangular channel when sediment just begin to move. **04**

(c) Derive differential equation of Gradually varied flow with assumption made in it. **07**

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