Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI (NEW) EXAMINATION – WINTER 2021

Subject Code:3160618 Date:04/12/2021

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.**

Q.1	**(a)**	Define gradually varied and rapidly varied flow.	**03**
	(b)	What is surge in fluid? What is the difference between positive surge and negative surge?	**04**
	(c)	Draw definition sketch for energy equation	**07**
Q.2	**(a)**	Explain with sketch: critical depth.	**03**
	(b)	Write about subcritical flow in a width construction, transition width a change in width.	**04**
	(c)	Show that in triangular channel the froude number corresponding to alternate depth are given by F1/F2 = $(4+F_2^2)^{5/2} / (4+ F_2^2)^{5/2}$	**07**
		OR	
	(c)	In rectangular channel F1 and F2 are froude nos. Corresponding to the alternative depth of variation discharge show that $(F2/F1)^{2/3}=(2+f2^2) / (2+F1^2)$	**07**
Q.3	**(a)**	What is open channel? Why bed slope is provided in open channel? Explain various types of open cahnnels with sketch.	**03**
	(b)	Explain different types of shear theories for turbulent flow.	**04**
	(c)	Find the width and depth of a rectangular channel to convey a discharge of 1.5 m^3/s at a velocity of 0.5 m/s. Take Chezy's constant equal to 60 and the bed slope equal to 0.00012.	**07**
		OR	
Q.3	**(a)**	Write advantages and disadvantages of shear theories.	**03**
	(b)	Explain various types of open cahnnels with sketch.	**04**
	(c)	A concrete lined trapezoidal channel has to discharge 600 cumecs. The side slopes are 1 in 1 and the bed slope is 1 in 4000. The permissible velocity is 2.5 m/s. Determine the bottom	**07**

width and depth of the channel. Take Manning's N=0.014.

Q.4	**(a)**	What is Hydraulic jump? How it is formed?	**03**
	(b)	Explain about mobile boundary channels.	**04**
	(c)	Derive differentiate equation of gradually varied flow with assumptions made in it.	**07**

OR

Q.4	**(a)**	Write the the different end conditions on the flow in Gradually-varied flow and explain any one case.	**03**
	(b)	Obtain the value of N for (a) a wide rectangular channel and (b) a triangular channel.	**04**
	(c)	Draw M1, M2, and M3 type surface profiles using basic equatior gradually varied flow.	**07**
Q.5	**(a)**	Write about sharp crested weir.	**03**
	(b)	Explain contractions on the Spillway.	**04**
	(c)	Derive the equation for uniformly progressive wave.	**07**

OR

Q.5	**(a)**	What are the limitations of Kennedy's theory?	**03**
	(b)	Explain in brief Lacey's regime theory.	**04**
	(c)	Write short note on: Shield's diagram.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2022

Subject Code:3160618 Date:10/06/2022

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 Gradually varied flow and Rapidly varied flow.	**03**
	(b)	Explain various types of channels.	**04**
	(c)	Derive the expressions for critical depth in channels of circular and trapezoidal sections.	**07**
Q.2	**(a)**	Define (1) Specific energy (2) Section factor (3) Froude Number.	**03**
	(b)	Obtain the value of first hydraulic exponent (M) for the rectangular and triangular channels.	**04**
	(c)	A trapezoidal channel is 10 m wide and has a side slope of 1.5(H) : 1(V). The bed slope is 0.0003. The channel is lined with smooth concrete of n=0.012. Compute the mean velocity and discharge for a depth of flow of 3.0 m. Also find the bottom slope necessary to carry only 50 m^3/s of the discharge at a depth of 3.0 m.	**07**
		OR	
	(c)	Explain concept of shield's analysis for uniform flow in mobile boundary channels	**07**
Q.3	**(a)**	Explain the second hydraulic exponent (N).	**03**
	(b)	A square conduit of side s, placed with its diagonal vertical acts as an open channel. Show that the channel carries maximum discharge when y = 0.95 D	**04**
	(c)	A spillway discharges a flood flow at a rate of 7.75 m^3/s per metre width. At the downstream horizontal apron, the depth of flow was found to be 0.50 m. What tailwater depth is needed to form a hydraulic jump? If a jump is formed, find its (a) type, (b) length, (c) head loss, (d) energy loss as a percentage of the initial energy.	**07**
		OR	
Q.3	**(a)**	Briefly explain incipient motion condition in uniform flow.	**03**
	(b)	Derive the expression for estimating equivalent roughness of a channel.	**04**
	(c)	Explain critical slope and limit slope.	**07**
Q.4	**(a)**	Draw the typical section of a lined irrigation canal.	**03**
	(b)	Give the classification of flow profiles	**04**

	(c)	A trapezoidal channel is to carry a discharge of 50 m^3/s. The maximum slope that can be used is 0.004. The soil is hard. Design the channel as (a) a lined canal with concrete lining and (b) an unlined non-erodible channel. Take, For lined canal m=1.0, n for concrete = 0.013, For B/y0=8.0, ω = 0.03108 For unlined canal, m=1.0, n for hard soil surface = 0.020, For B/y0=8.0, ω = 0.03108	**07**

OR

Q.4	**(a)**	Distinguish between direct step method and standard step methods for computation of flow profiles.	**03**
	(b)	Describe the flow profiles in divided channels.	**04**
	(c)	Write the steps to design lined channel using different empirical equations.	**07**
Q.5	**(a)**	Draw the schematic sketch of Gradually varied flow.	**03**
	(b)	Discuss the characteristics of jump in rectangular channel.	**04**
	(c)	Explain (1) Parshall Flume (2) Standing Wave Flume.	**07**

OR

Q.5	**(a)**	Discuss positive surge and negative surge.	**03**
	(b)	Describe the characteristics of Sluice-Gate flow.	**04**
	(c)	Derive the equation of motion for Gradually Varied Unsteady Flow (GVUF) in a prismatic channel.	**07**

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