

**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.

		<b>MARKS</b>
<b>Q.1</b>	(a) Differentiate between Gradually varied flow and Rapidly varied flow.	<b>03</b>
	(b) Explain various types of channels.	<b>04</b>
	(c) Derive the expressions for critical depth in channels of circular and trapezoidal sections.	<b>07</b>
<b>Q.2</b>	(a) Define (1) Specific energy (2) Section factor (3) Froude Number.	<b>03</b>
	(b) Obtain the value of first hydraulic exponent (M) for the rectangular and triangular channels.	<b>04</b>
	(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 $50 \text{ m}^3/\text{s}$ of the discharge at a depth of 3.0 m.	<b>07</b>
<b>OR</b>		
	(c) Explain concept of shield's analysis for uniform flow in mobile boundary channels	<b>07</b>
<b>Q.3</b>	(a) Explain the second hydraulic exponent (N).	<b>03</b>
	(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 $y = 0.95 D$	<b>04</b>
	(c) A spillway discharges a flood flow at a rate of $7.75 \text{ m}^3/\text{s}$ 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.	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) Briefly explain incipient motion condition in uniform flow.	<b>03</b>
	(b) Derive the expression for estimating equivalent roughness of a channel.	<b>04</b>
	(c) Explain critical slope and limit slope.	<b>07</b>
<b>Q.4</b>	(a) Draw the typical section of a lined irrigation canal.	<b>03</b>
	(b) Give the classification of flow profiles	<b>04</b>

- (c) A trapezoidal channel is to carry a discharge of  $50 \text{ m}^3/\text{s}$ . 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. **07**
- Take, For lined canal  
 $m=1.0$ ,  $n$  for concrete = 0.013, For  $B/y_0=8.0$ ,  $\phi = 0.03108$   
For unlined canal,  
 $m=1.0$ ,  $n$  for hard soil surface = 0.020, For  $B/y_0=8.0$ ,  $\phi = 0.03108$

**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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