Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –I Examination Feb. - 2012

Subject code: 711201N **Date: 11/02/2012**

Subject Name: Advanced Fluid Mechanics

Time: 10.30 am – 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.**

Q.1	**(a)**	Write briefly a classifications of open channel flows	**07**
	(b)	Develop the gradually varied flow equation $dy/dx = (S_o - S_f)/(1-Q^2T/gA^3)$ where the terms have their usual meaning.	**07**
Q.2	**(a)**	Explain briefly classification of flow profiles with sketch.	**07**
	(b)	Sketch the possible GVF profiles in the following serial arrangement of channels and controls. The flow is from left to right:- 1) Mild-Steeper-Steep. 2) Steep-Horizontal-Mild Slope and 3) Steep-Steeper-Mild-Milder slope	**07**
		OR	
	(b)	Sketch the GVF profiles produced on the upstream and downstream of sluice gate introduced in a 1) steep slope 2) mild slope and 3) horizontal-bed channel.	**07**
Q.3	**(a)**	Discuss with sketches the various types of hydraulic jump.	**07**
	(b)	A spillway discharges a flood flow at a rate of 7.75 cubic m/sec per metre width. At the downstream horizontal apron the depth of flow was found to be 0.50 m. What tail water depth is needed to form a hydraulic jump ? If jump is formed, find its (a) type (b) length (c) head loss and (d) energy loss as percentage of initial energy.	**07**
		OR	
Q.3	**(a)**	Derive the differential equation of spatially-varied flow for decreasing discharge.	**07**
	(b)	Explain uniformly progressive wave.	**07**
Q.4	**(a)**	Briefly explain and sketch the types of bed forms.	**07**
	(b)	A discharge of 16.0 cu m/sec flows with a depth of 2.0 m in a rectangular channel 4.0 m wide at a downstream section the width is reduced to 3.5 m and the channel bed is raised by 0.35 m. Analyze the water-surface elevation in the transitions.	**07**
		OR	
Q.4	**(a)**	What are the methods of preventing the separation of boundary layer flow	**07**
	(b)	Oil with a free stream velocity of 2 m/s flows over a thin plate 2 m wide and 2 m long. Calculate the boundary layer thickness and the shear stress at the tailing end point and determine the total surface resistance of the plate. Take specific gravity as 0.96 and kinematic viscosity as 10^{-5} cum/sec	**07**

Q.5	**(a)**	Explain significant of each term in Navier-stocks equation	**07**
	(b)	The water is flowing with a velocity of 15.0 m/sec in a pipe of length 2500 m diameter 500 mm and thickness is 10 mm and the valve is closed in 2 seconds at the end of the pipe. Find the rise in pressure if the pipe is considered to be elastic. Take E = 19.62×10^{10} N/m^2 and K = 19.62×10^{10} N/m^2	**07**

OR

Q.5	**(a)**	Write a short note on hydraulically smooth and rough pipes	**07**
	(b)	Explain Prandtl's mixing length theory.	**07**

****