Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– I (New course)• REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: 2713303 **Date:14/05/2015**

Subject Name: ADVANCED FLUID MECHANICS

Time: 10:30 am to 1:00 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)**	Explain Mild and Steep slope profiles with neat sketch.	**07**
	(b)	For turbulent flow in pipes, compute the distance from the pipe wall at which the velocity is equal to the average velocity of flow.	**07**
Q.2	**(a)**	Describe Reynolds experiments to demonstrate the laminar and turbulent fluid flow.	**07**
	(b)	Show that the discharge per unit width between two parallel plates distance b apart, when one plate is moving at velocity V while the other one is held stationary, for the condition of zero shear stress at the fixed plate is : q = bV/3.	**07**
		OR	
	(b)	What do you understand by the boundary layer? Illustrate with reference to flow over a flat plate. Also cite some examples of boundary layer formation.	**07**
Q.3	**(a)**	Describe back water curve and draw down curve with examples.	**07**
	(b)	Describe direct step method of calculating the length of back water curve.	**07**
		OR	
Q.3	**(a)**	Describe specific force and its use in hydraulic jump.	**07**
	(b)	A 12 m wide rectangular channel carries a discharge of 30 m3/s with a bed slope of 1 in 5000. The depth of flow at a section is 1.5 m. Find the type of water surface profile. (n = 0.015)	**07**
Q.4	**(a)**	Derive the differential equation of gradually varied flow.	**07**
	(b)	Hydraulic jump occurs in a rectangular channel corresponding to F = 3.5 with initial depth equal to 0.6 m . Calculate critical depth and energy loss.	**07**
		OR	
Q.4	**(a)**	Derive the Hagen ï Poiseuille equation for laminar flow in the circular pipe.	**07**
	(b)	Derive differential equation of SVF with decreasing discharge.	**07**
Q.5	**(a)**	Derive the expression for displacement and Momentum thickness.	**07**
	(b)	A pipeline 12 cm diameter and 100 m long conveys water at the rate of 0.075 m3/s. the average height of the surface protrusions is 0.012 cm and the co-efficient of friction is 0.005. calculate the loss of head, wall shearing stress, centre line velocity and nominal thickness of laminar sublayer. Assume g=0.01 stokes.	**07**
		OR	
Q.5	**(a)**	Explain Dash-pot mechanism and its utility.	**07**
	(b)	What are the different methods of preventing the separation of boundary layer.	**07**