Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–III EXAMINATION – WINTER 2015

Subject Code:X30604 **Date:29/12/2015**

Subject Name: Advanced Fluid Mechanics

Time: 10:30pm to 01:00pm **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)**	Derive continuity equation in Cartesian coordinates for three dimensional flow.	**07**
	(b)	Enlist various methods for measuring the coefficient of viscosity of liquids and explain any one method in detail.	**07**
Q.2	**(a)**	Derive an expression for most economical section for a rectangular section.	**07**
	(b)	Describe Reynold's experiment and discuss the laminar and turbulent flow in pipe.	**07**
		OR	
	(b)	Discuss the specific energy curve with a neat sketch.	**07**
Q.3	**(a)**	Derive Bernoulli's equation of motion. State the assumptions made. Explain briefly limitations of the equation.	**07**
	(b)	Explain the terms Stream function and Potential function.	**07**
		OR	
Q.3	**(a)**	Derive an expression for gradually varied flow and state the assumptions made in it.	**07**
	(b)	A concrete lined circular channel of 3.6 m diameter has a bed slope of 1 in 600. Determine the velocity and flow rate for the condition of maximum discharge. Take, Chezy's constant, C = 50	**07**
Q.4	**(a)**	If the velocity distribution in boundary layer is given by $u/U= y/\delta$, determine the displacement thickness, momentum thickness and energy thickness.	**07**
	(b)	A smooth plate 2 m wide and 2.5 m long is towed in oil (specific gravity = 0.8) at a velocity of 1.5 m/s along its length. Find the thickness of boundary layer at the end of plate, $v_{oil} = 10^{-4}$ m^2/s	**07**
		OR	
Q.4	**(a)**	Explain the concept of boundary layer. Derive the expression for displacement thickness.	**07**
	(b)	Write a short note on Flownet.	**07**
Q.5	**(a)**	Derive an expression for velocity for the laminar flow through circular pipe.	**07**
	(b)	Explain the Buckingham's Pi theorem method for dimensional analysis.	**07**
		OR	
Q.5	**(a)**	Derive Darcy-Weisbach equation for loss of head due to friction.	**07**
	(b)	Find an expression for the drag force on smooth sphere of diameter D moving with a uniform velocity V in a fluid density ρ and dynamic viscosity μ.	**07**

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