Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–III • EXAMINATION – WINTER • 2014

Subject Code: X30604 **Date: 02-01-2015**

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)**	Derive an expression for gradually varied flow and state the assumptions made in it.	**07**
	(b)	Write a note on characteristics and utility of Flownet.	**07**
Q.2	**(a)**	Derive the equation of continuity for three dimensional flow.	**07**
	(b)	A smooth plate 1 m wide and 1.5 m long is towed in oil having specific gravity as 0.8 at a velocity of 1.5 m/s along its length. Work out the thickness of boundary layer at the end of plate, $v_{oil} = 10^{-4}$ m^2/s	**07**
		OR	
	(b)	Explain the concept of boundary layer. Derive the expression for displacement thickness.	**07**
Q.3	**(a)**	What do you understand by the hydrodynamically smooth and rough boundaries?	**07**
	(b)	Derive an expression for velocity for the laminar flow through circular pipe	**07**
		OR	
Q.3	**(a)**	Explain Prandtle's mixing length theory.	**07**
	(b)	Derive the expression of head loss in viscous flow due to friction.	**07**
Q.4	**(a)**	State and prove Buckingham's π – theorem.	**07**
	(b)	Discuss the specific energy curve with a neat sketch.	**07**
		OR	
Q.4	**(a)**	A concrete lined circular channel of 3 m diameter has a bed slope of 1 in 1000. Determine the velocity and discharge for the conditions of maximum discharge. Take, Chezy's constant, C = 65	**07**
	(b)	i) Explain "Dimensional Homogeneity" ii) State the limitations of Dimensional analysis	**07**
Q.5	**(a)**	Explain formation of boundary layer with neat sketch and also explain separation of boundary layer.	**07**
	(b)	Explain Hardy cross method with an example	**07**
		OR	
Q.5	**(a)**	What is the difference between a laminar flow and a turbulent flow. Describe Reynold's experiment.	**07**
	(b)	List out methods of determination of coefficient of viscosity. Explain any one in detail.	**07**

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