Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – SUMMER 2016

Subject Code:170106 **Date:05/05/2016**

Subject Name:Viscous and Boundary Layer Theory(Department Elective-I)

Time:02:30 PM to 05:00 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 a short note on relaminarization.	**07**
	(b)	Derive Orr-Sommerfeld equation.	**07**
Q.2	**(a)**	Define boundary layer thickness, momentum thickness and energy thickness.	**07**
	(b)	Explain Prandtl's mixing length theory.	**07**
		OR	
	(b)	Explain boundary layer separations.	**07**
Q.3	**(a)**	Explain Stability of laminar flow.	**07**
	(b)	Explain Couette flow.	**07**
		OR	
Q.3	**(a)**	Derive continuity and momentum equation for the hydrodynamic boundary layer grows over the flat plate.	**07**
	(b)	Derive an equation of Loss of head due to friction in pipe flow Darcy Equation with neat sketch.	**07**
Q.4	**(a)**	Derive an equation of velocity distribution for turbulent flow in Rough pipes.	**07**
	(b)	Derive an equation of Karman prandtl for the velocity distribution near hydrodynamically smooth boundaries.	**07**
		OR	
Q.4	**(a)**	Derive Reynolds stress for turbulent flow.	**07**
	(b)	Explain effect of roughness in pipe flow.	**07**
Q.5	**(a)**	Derive the equation of flow through pipe with neat sketch.	**07**
	(b)	What is critical Reynolds number? Explain in details.	**07**
		OR	
Q.5	**(a)**	Explain boundary layer with pressure gradient and Explain effect of adverse pressure gradient on boundary layer.	**07**
	(b)	Explain in Details 1.Laminar flow 2.Turbulent flow	**07**

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