Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – SUMMER • 2015

Subject Code: 170106 **Date: 06/05/2015**

Subject Name: VISCOUS & BOUNDARY LAYER THEORY

Time:02.30pm-05.00pm **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)**	Explain Couette flow	**07**
	(b)	Explain flow transition from laminar to turbulent in pipe flow and flow over flat plate	**07**
Q.2	**(a)**	Write note on stability of laminar flow	**07**
	(b)	Explain exact solution to boundary layer flow over flat plate at zero incidence	**07**
		OR	
	(b)	Explain Vonkarman solution for flow over flat plate at zero incidence	**07**
Q.3	**(a)**	Define non-dimensional numbers and its importance governing boundary layer flow	**07**
	(b)	Explain exact solution to boundary layer flow over flat plate with heat transfer	**07**
		OR	
Q.3	**(a)**	Explain boundary layer flow with pressure gradient	**07**
	(b)	Explain effect of real flow over an airfoil and show boundary layer separation and its effect.	**07**
Q.4	**(a)**	Define turbulent flow and list the characteristics of turbulent flow	**07**
	(b)	What is Reynolds stress? Derive Reynolds stress for turbulent flow	**07**
		OR	
Q.4	**(a)**	Show relation between velocity distribution and law of friction	**07**
	(b)	Why it is necessary to control boundary layer separation? What are the various techniques to control separation? Explain any one technique with suitable diagram.	**07**
Q.5	**(a)**	Explain effect of roughness in pipe flow	**07**
	(b)	Explain approximate solution to boundary layer flow with heat transfer	**07**
		OR	
Q.5	**(a)**	Explain critical Reynolds number and its importance in stability	**07**
	(b)	Define boundary layer thickness. Also define and derive equation for displacement thickness, momentum thickness and energy thickness.	**07**

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