Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI(NEW) – EXAMINATION – SUMMER 2019

Subject Code: 2160101 **Date: 10/05/2019**

Subject Name: Aerodynamics II

Time: 10:30 AM TO 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.**

			MARKS
Q.1	**(a)**	Plot Variation of C_L with Re, and aspect ratio.	**03**
	(b)	Define mean aerodynamic chord [MAC] and procedure to find MAC.	**04**
	(c)	Derive expression for classical thin airfoil theory.	**07**
Q.2	**(a)**	Define:- Turbulent flow, Transition and dihedral.	**03**
	(b)	State Kelvin Circulation Theorem.	**04**
	(c)	Explain The Vortex lattice method.	**07**
		OR	
	(c)	Explain Kutta-Joukowsky Transformation and details procedure about transformation of circle into symmetric airfoil.	**07**
Q.3	**(a)**	Write Kutta Condition and explain with sketch.	**03**
	(b)	Differentiate between finite and infinite wing. Derive expression for 'a' (C_L-α slope) and 'a_0.'	**04**
	(c)	What is Transformation? Explain transformation of a circle into a straight line with a neat sketch.	**07**
		OR	
Q.3	**(a)**	What is bound vortex and Horse shoe vortex?	**03**
	(b)	Explain Numerical Nonlinear Lifting Line Method	**04**
	(c)	Explain Prandtle lifting line theory and derive expression for downwash velocity.	**07**
Q.4	**(a)**	Explain Prandtl-Glauert Compressibility correction,	**03**
	(b)	Explain formation of primary and secondary vortex on delta wing.	**04**
	(c)	Derive Linearised Supersonic Pressure Coefficient formula.	**07**
		OR	
Q.4	**(a)**	Explain the area rule with neat sketch.	**03**
	(b)	At a given point on the surface of an airfoil, the pressure coefficient is -0.3 at very low speeds. If the free stream Mach Number is 0.6. Calculate Cp at this point.	**04**
	(c)	Derive expression for induced velocity by finite and infinite ,vortex tube	**07**
Q.5	**(a)**	What is whitcomb airfoil	**03**
	(b)	A straight finite wing has aspect ratio 8 operating at angle of attack 4^0.calculate C_{Di} (induced drag coefficient) and C_L assume that wing identical to flat plate	**04**
	(c)	Using KJT transform cylinder into symmetrical airfoil	**07**

OR

Q.5	**(a)**	State Helmholtz's theorem	**03**
	(b)	Consider flow over the NACA 2412 airfoil where Re_x 3240000. Calculate the boundary layer thickness at 1.5 m from leading edge	**04**
	(c)	Define Critical Mach number and Drag Divergence Mach Number? Explain both the terms in detail with a proper diagram.	**07**

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