

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019****Subject Code: 2160101****Date: 04/12/2019****Subject Name: Aerodynamics II****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) Define Airfoil. Difference between Airfoil and Wing. **03**
 (b) With neat sketch explain Airfoil nomenclature. **04**
 (c) Explain Airfoil characteristics with appropriate graph. **07**

- Q.2** (a) Define Vortex filament. **03**
 (b) Consider NACA 2414 airfoil with a chord of 0.64 m in an airstream at standard sea level conditions. The freestream velocity is 70 m/s. The lift per unit span is 1254 N/m. Calculate the co-efficient of lift. **04**
 (c) Derive Linearized velocity potential equations. **07**

OR

- (c) Prove the relation ‘Local jump in tangential velocity across the vortex sheet is equal to the local sheet strength’ using vortex sheet. **07**

- Q.3** (a) What is the physical phenomena of $V_1=V_2$ in Kutta Condition?. **03**
 (b) Without friction could we have Lift? Explain properly **04**
 (c) Explain with neat sketch Kelvin’s circulation theorem. **07**

OR

- Q.3** (a) Define Downwash and Induced drag. **03**
 (b) Explain stream function with equations. **04**
 (c) Prove the relation “Camber line is a streamline of the flow” in thin airfoil theory. **07**

- Q.4** (a) Define Biot-Savart Law with equation. **03**
 (b) Draw and explain an elliptic lift distribution. **04**
 (c) Explain with appropriate equation Prandtl’s Classical Lifting Line theory. **07**

OR

- Q.4** (a) Define 1. Aspect ratio 2. Compressible flow **03**
 (b) Explain General lift distributions with appropriate equations. **04**
 (c) Explain with “Lift Curves for an infinite wing versus a finite elliptic wing”. **07**

- Q.5** (a) Difference between subsonic and supersonic flow. **03**
 (b) Define Critical Mach number with appropriate equation. **04**
 (c) Derive Prandtl Glauert Compressibility corrections rule. **07**

OR

- Q.5** (a) Using Linearized theory, calculate the lift coefficient for a flat plate at a 5° angle of attack in a Mach 3 flow. **03**
 (b) Draw “Linearized supersonic flow over an airfoil”. **04**
 (c) Derive with neat sketch “Numerical vortex panel method equation”. **07**
