**Seat No.: _____** **Enrolment No._____**

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–IV (OLD) - EXAMINATION – SUMMER 2017**

**Subject Code: 140102** **Date: 08/06/2017**

**Subject Name: Aerodynamics-1**

**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.**

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|---|---|---|---|
| **Q.1** | **(a)** | Define: Mach Number, Uniform Flow, Chord Line, Trailing Edge, Reynolds Number and Angle of Attack. | **07** |
| | **(b)** | What is airfoil? Explain characteristics of airfoil with a neat sketch. | **07** |
| **Q.2** | **(a)** | Derive Continuity Equation. | **07** |
| | **(b)** | Explain airspeed measurement in supersonic aircraft. Derive equation for airspeed in supersonic flow. | **07** |
| | | **OR** | |
| | **(b)** | Write a short note on flow over an airfoil. | **07** |
| **Q.3** | **(a)** | What is Potential flow? Prove that scalar function velocity potential exist only for potential flow. | **07** |
| | **(b)** | Write a short note on vortex flow with a neat sketch. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Classify the NACA series standard for airfoils with a neat sketch. | **07** |
| | **(b)** | Derive θ-β-M relation for inviscid, adiabatic flow with no body forces. | **07** |
| **Q.4** | **(a)** | Prove that shock is irreversible in nature. | **07** |
| | **(b)** | Show that free vortex is an example of irrotational motion. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Draw and explain coefficient of lift vs angle of attack for symmetrical airfoil and cambered airfoil. | **07** |
| | **(b)** | Explain with the help of diagram shockwave interaction and reflection. | **07** |
| **Q.5** | **(a)** | Prove that, the product of flow velocities upstream and downstream of a normal shock wave is equal to the square of critical velocity of sound. | **07** |
| | **(b)** | Explain basic elementary flows in terms of stream function and potential function. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Differentiate between normal shock wave, oblique shock wave and expansion wave with neat sketch. | **07** |
| | **(b)** | Explain with neat sketches the forces and moments acting on an aircraft. | **07** |

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