

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEMESTER-IV • EXAMINATION – SUMMER-2015

Subject Code: 140102

Date: 03/06/2015

Subject Name: Aerodynamics I

Time: 10.30am-01.00pm

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) Derive the Energy equation. **07**
 (b) What is airfoil? Explain characteristics of airfoil with neat sketch. **07**
- Q.2** (a) Draw and explain coefficient of lift vs angle of attack for symmetrical airfoil. **07**
 (b) How the shock waves are generated into the flow field? Differentiate between Normal shock wave, oblique shock wave and expansion waves. **07**
- OR**
- (b) Define the following terms. Control Volume, Control Surface, Reynolds Number and Mach Number with equations. **07**
- Q.3** (a) Write a short note on measurement of air speed at low speeds and high speeds. **07**
 (b) Classify the NACA series standard airfoils. **07**
- OR**
- Q.3** (a) Derive the expression for Prandtl Mayer function for the expansion waves. **07**
 (b) What is Potential flow? Prove that scalar function velocity potential exist only for potential flow. **07**
- Q.4** (a) Explain basic elementary flow in terms of stream function and potential function. **07**
 (b) Derive algebraic form of fundamental lift equation using potential flow theory and show that lift is directly proportional to circulation **07**
- OR**
- Q.4** (a) Explain the terms bound vortex, trailing vortex and explain why Prandtl's single horse theory failed. **07**
 (b) Define the terms: aspect ratio, taper ratio, angle of incidence, upwash, downwash, lift and drag. **07**
- Q.5** (a) With a neat sketch derive the Navier – Stokes momentum equation in Cartesian coordinates. **07**
 (b) Derive Bernoullie's equation. **07**
- OR**
- Q.5** (a) Write a short note on vortex flow with neat sketch. **07**
 (b) Explain flow over a Airfoil for subsonic flow with neat sketch. **07**
