R09

Code No: C7606

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I SEMESTER EXAMINATIONS, APRIL/MAY-2012
AERODYNAMICS OF FLIGHT VEHICLES
(AEROSPACE ENGINEERING)

Time: 3 hours **Max. Marks: 60**

Answer any five questions
All questions carry equal marks
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1. Prove that the velocity induced in the region surrounding a doubly infinite vortex sheet of constant strength satisfies equation of continuity everywhere in that region.

2.a) Derive the fundamental equation of finite wing theory.
b) State and explain Biot - Savart law and Helmholtz's theorem.

3.a) Derive velocity potential equation for a subsonic flow over an airfoil.
b) Explain, briefly, the concept of critical Mach number for an airfoil. Derive the expression for the coefficient of pressure over an airfoil, $C_p = C_{p_1}\sqrt{\frac{1-M_{\infty_1}^2}{1-M_\infty^2}}$.

Explain all the terms used, clearly.

4. Write Notes on:
a) Prandtl - Glauert transformation,
b) Area rule for transonic flow,
c) Effect of sweep back angle.

5.a) Explain the flow in the boundary layer including entropy gradient.
b) Compare the incompressible and compressible boundary layers.

6.a) Explain transition in the context of boundary layers. What are the different methods available for experimentally detecting transition?
b) Describe Tollmien – Schlichting instability.

7. What is a turbulent flow? What are its properties?

8.a) Define and explain 'vorticity' and 'streamwise vorticity'.
b) Derive an expression for the velocity over a sphere.

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