

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.
