

III B.Tech I Semester Supplementary Examinations, November 2005
AERODYNAMICS-I
(Aeronautical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. (a) Define the terms velocity potential , circulation and vorticity as used in 2-d fluid mechanics. How are these related.
 (b) Write a note on stream function in fluid mechanics. [16]
2. (a) Develop an expression for stream function ψ for a point source. Hence plot stream lines and equipotential lines.
 (b) A sink of $120 \text{ m}^2/\text{s}$ is situated 3m downstream of source of the same strength in stream of uniform flow of 30 m/sec. Find the fineness ratio of the oval formed by $\psi = 0$ stream lines. [16]
3. Show that part of the flow given by complex potential function $\omega = \cos h^{-1} \frac{z}{c}$, represents irrotational flow in a convergent-divergent channel of constant depth. [16]
4. Write Navier-Stokes equations in vector form and in long hand as well.
 Hence
 - (a) Explain each term on LHS and RHS
 - (b) Obtain Euler equation
 - (c) Obtain equation for Stokes Flow , both in vector form & long hand. [16]
5. Consider a doublet in a uniform stream. Which kind of flow it represents?
 Develop an expression for surface pressure distribution over the $\psi = 0$ stream lines. Compare the same with that from a wind tunnel test. [16]
6. (a) Write a note on Blasius theorem.
 (b) Elaborate the term Kutta condition. [16]
7. A thin airfoil has a camber line defined by $y = kx(x-1)(x-2)$, x & y are non-dimensionalized with chord C, with origin at the leading edge. Consider maximum camber to be 2%. Determine C_m at $\alpha = 3^\circ$. [16]
8. (a) Explain the formation of Horse shoe vortex on a lifting wing.
 (b) Write a note on Biot-Savart's law. [16]
