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2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS

AERO DYNAMICS-I

(AERONAUTCAL ENGINEERING)

NOVEMBER 2005

TIME – 3 HOUR
MARK - 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.

[8+8]

2. (a) Develop an expression for stream function for a point source. Hence plot stream lines and equipotential lines.

(b) A sink of 120 m2/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 =0 stream lines. *[8+8]*

3. Show that part of the flow given by complex potential function ! = cos h-1 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.

[5+5+6]

5. Consider a doublet in a uniform stream. Which kind of flow it represents? Develop an expression for surface pressure distribution over the =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.

[8+8]

7. A thin airfoil has a camber line defined by y = kx (x - 1) (x - 2) , x & y are nondimentionalized with chord C, with origin at the leading edge. Consider maximum camber to be 2%. Determine Cm at = 3o.

[16]

8. (a) Explain the formation of Horse shoe vortex on a lifting wing.

(b) Write a note on Biot-Savart's law. *[8+8]*