Code No: 07A42101 | **R07** | **Set No. 4**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**II B.TECH II SEM–REGULAR/SUPPLEMENTARY EXAMINATIONS MAY - 2010**
**AERODYNAMICS - I**
**Aeronautical Engineering**

Time: 3 hours                                                                 Max Marks: 80

**Answer any FIVE Questions**
**All Questions carry equal marks**
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1. (a) Starting with the definition of circulation, derive Kelvin's circulation theorem.

   (b) State and explain Kutta condition.                                    [8+8]

2. Explain with neat sketch potential flow over a circular cylinder.          [16]

3. (a) Express the velocity potential at a point in the flow field due to the vortex sheet in terms of circulation.

   (b) Hence prove that the local jump in tangential velocity across the vortex sheet is equal to the local sheet strength.

   (c) Derive the fundamental equation of thin airfoil theory.               [4+4+8]

4. Explain with neat sketch vertex flow over a symmetrical air foil.          [16]

5. Explain the three ways of visualizing the generation of induced drag and explain its effect on the flow over a wing.                                          [16]

6. (a) State and explain Kutta - Joukowski theorem

   (b) State and explain Kelvins circulation theorem.                        [8+8]

7. Compare and contrast the pressure distribution over a symmetric airfoil and a sphere.                                                                      [16]

8. Consider a planar wing of aspect ratio 5, taper ratio unity, and swept aft by $45^o$ in the plane of symmetry. Develop the Vortex Lattice Method to calculate lift coefficient for this wing. Take the uniform chord of the wing as c = 1.0 unit. Divide the wing into 4 panels.                                               [16]

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