**Karunya University**

**(Karunya Institute of Technology and Sciences)**

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

**Supplementary Examinations – June 2016**

**Subject Title: Advanced Aerodynamics Time : 3 hours**

**Subject Code: 14AE3006 Maximum Marks: 100**

**Answer ALL questions (5 x 20 = 100 Marks)**

1. From the first principles derive the momentum equation.

**(OR)**

2. a. Explain in detail Aerodynamic forces and moments acting on a Airfoil. (10)

b. Derive the continuity Equation in differential form for in Compressible flow. (10)

3. A Sink of Strength 20Л m2/s is located 5m upstream of source of Strength 40 Л m2/s. The combination is placed in uniform velocity field along the line joining the source and sink. It is noted that at a point 2.5m equidistant from both source and sink, the velocity is normal to the line joining source and sink.

a. Find the velocity of Uniform flow field (10)

b. Find the velocity at a Point mentioned above (10)

**(OR)**

4. a. State and prove Kutta Joukowski’s Theorem. (10)

b. What are the characteristic of a vortex flow? (10)

5. a. Enumerate the limitations and Application s of Joukowski’s Airfoil. (12)

b. Explain in detail Kutta Condition. (8)

**(OR)**

6. Derive the fundamental equation for Thin Airfoil Theory and give the assumption that are made in Thin Airfoil Theory .

7. Derive Prantl’s Lifting line theory.

**(OR)**

8. a. Derive a relation connecting flow turning angle, Shock angle and free stream Mach number for Oblique shock waves. (14)

b. What is Shock Polar? What is its use in Supersonic Aerodynamics? (6)

9. Explain in detail the elements of Hypersonic flow.