BAS-012

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

June, 2016

00188

BAS-012 : AERODYNAMICS – I

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks.*

1. (a)   What is the difference between Euler's model and Navier-Stokes model of equations ? Write the generic form of Navier-Stokes model.   **6**

    (b)   Write Bernoulli's equation for incompressible flow.   **4**

2. (a)   Draw and explain the concept of subsonic-supersonic flow through the C-D nozzle and also show the variation in properties along the length of the nozzle.   **6**

    (b)   Explain supersonic flow over the nose of a blunt body.   **4**

3. (a)   Derive the momentum equation in non-dimensional form for nozzle flow.   **4**

    (b)   With a neat sketch, briefly explain the flow in a C-D nozzle.   **6**

4. Answer any *five* of the following questions in brief : 5×2=10

(a) Distinguish between Ideal and Real fluids.

(b) What are the applications of thin airfoil theory ?

(c) Why is it that liquid flows are incompressible ?

(d) Write the general form of energy equation for a two-dimensional flow.

(e) What are the applications of lifting line theory ?

(f) How is horse shoe vortex formed ?

(g) What is meant by complex potential function ?

(h) What is the significance of continuity condition ?

5. (a) What are the characteristics of a vortex flow ? State and prove Kutta-Joukowski's theorem.   *6*

(b) Explain how a flow over a circular cylinder can be transformed into a flow over a flat plate using Joukowski's transformation.   *4*

6. (a) Determine the condition that the velocity components $u = ax + by$, $v = cx + dy$ will satisfy the equation of continuity. Also find the magnitude of vorticity. *6*

(b) Briefly explain the terms substantial derivative, corrective derivative and local derivative. *4*

7. (a) Derive the temperature equation for an incompressible flow in partial differential form. *6*

(b) How is flow over a cone different from flow over a wedge ? *4*

8. (a) Explain how measurements of pressure, velocity and Mach number can be carried out in a supersonic wind tunnel. *6*

(b) How does lift and drag vary with the angle of attack for a supersonic profile ? *4*

9. Write short notes on any *two* of the following : *2×5=10*

(a) Magnus Effect

(b) Boundary Layer

(c) Pitching Moment

(d) Finite Wing