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BAS-012

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00403

December, 2018

BAS-012 : AERODYNAMICS – I

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

1. (a) Explain the difference between laminar and turbulent flow.

(b) What is a boundary layer ? Give a brief account of boundary layer separation. *5+5*

2. (a) Discuss briefly the theory of airfoil.

(b) What is meant by lift and drag ? Show the effect of angle of attack on C_L and C_D on a graph. *5+5*

3. (a) What are the two types of nozzles used in aircraft engines ? Briefly explain them.

(b) A flat plate 2 m × 2 m moves at 40 km/hr in a stationary air of density 1·2 kg/m^3. If the coefficient of drag and lift are 0·1 and 0·5 respectively, find

(i) the lift force,

(ii) the drag force, and

(iii) the resultant force. *5+5*

4. (a) Draw a neat sketch of a hypersonic wind tunnel circuit and explain the function of each component.

(b) Draw the pitching moment curve for supersonic profiles. How do pitching moment and centre of pressure vary with angle of attack for a supersonic profile ? *5+5*

5. (a) Define velocity potential and stream function. Show that the streamlines and equipotential lines are perpendicular to each other.

(b) The velocity potential function is given by

$$\phi = 5(x^2 - y^2).$$

Find the velocity component at the point P(4, 5). *5+5*

6. (a) Explain in brief the washin and washout for wings.

(b) In a 2-D incompressible flow, the fluid velocity components are given by

$$u = x - 4y \text{ and } v = -y - 4x.$$

Show that velocity potential exists and find its form. Also find the stream function. *5+5*

7. (a) Briefly explain the terms convective and local acceleration in fluid flow.

(b) Define any ***five*** of the following : *5+5*

(i) Wave drag

(ii) Stall velocity

(iii) Aerodynamic centre

(iv) Neutral point

(v) Centre of pressure

(vi) Mach number

8. Write short notes on any ***two*** of the following : *5+5*

(a) Wake

(b) Steady and Unsteady Flow

(c) Reynolds Number

(d) Newton's Law of Viscosity