BAS-015

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00333

June, 2018

BAS-015 : AERODYNAMICS – II

Time : 3 hours   *Maximum Marks : 70*

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

1. (a)   Derive an expression for the speed of sound in air.

    (b)   Air flows isentropically through a convergent passage of inlet area 10 cm^2. If inlet conditions are M_1 = 0·4, P_1 = 1 atm, T_1 = 27°C, and exit Mach number M_2 = 0·8, compute

    (i)   the mass flow rate,

    (ii) exit pressure, and

    (iii) exit area.   *5+5*

2. (a)   Why is a golf ball dimpled ?

    (b)   What is Helmholtz's theorem ?   *5+5*

3. (a)   Discuss in brief the forces on an airfoil.

(b)   Explain the lifting line theory of Prandtl.   *5+5*

4.   Derive the relationship for the ratios of stagnation pressure to static pressure and Mach number for an isentropic flow. Derive the similar relations for temperature and density ratio.   *10*

5.   With the help of a graph, explain the viscous interaction effect on a hypersonic flow.   *10*

6. (a)   What is a detached shock wave ? When is it formed ?

(b)   How is a laminar flow airfoil geometry different from a conventional airfoil ?   *5+5*

7.   Explain boundary layer for a laminar flow and turbulent flow with neat sketches.   *10*

8.   Explain in brief :   *5+5*

(a)   Biot-Savart law

(b)   Downwash

9.   Explain in detail, the procedure to be followed for the analysis of a supersonic nozzle using method of characteristics.   *10*

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