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BAS-015

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00173

December, 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. Describe in brief the Expansion hodograph. What is its use in supersonic aerodynamics ? *10*

2. (a) A thin plate of length 1 m and width 1 m is moving in air along its length at a speed of 100 m/s. Calculate the total skin friction drag on the plate assuming sea level conditions. $\gamma = 1{\cdot}460 \times 10^{-5}$ m^2/s.

(b) Explain the formation of wing tip vortices. *6+4*

3. (a) Show with suitable derivation that flow behind the normal shock is always subsonic.

(b) Explain in brief the theory of detached shock wave in front of a blunt body. *5+5*

4. (a) What is Mach number ? What do you understand by choking in nozzle flows ?

   (b) What is a Fanno line ? Why do the end states of a normal shock lie on the Fanno line ? *5+5*

5. (a) Show that the sonic velocity in an ideal gas depends on the temperature and nature of the gas.

   (b) What is a shock ? Where does it occur in a nozzle ? *5+5*

6. (a) Bring out any two important differences between shock waves and expansion waves in a supersonic flow.

   (b) Show that for an elliptical lift distribution, the downwash is constant over the span of wing. *5+5*

7. Explain in detail (i) Displacement thickness, (ii) Momentum thickness, and (iii) Energy thickness of a boundary layer with neat sketches. *10*

8. (a) Derive fundamental equation of Prandtl's lifting-line theory.

   (b) Discuss the effect of pressure gradient on boundary layer separation. *5+5*

9. Write short notes on the following : *5+5*

   (a) Induced Drag

   (b) Turbulent Boundary Layer