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BASE-003

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00423 **December, 2016**

BASE-003 : HIGH SPEED AERODYNAMICS

Time : 3 hours *Maximum Marks : 70*

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

1. Derive the differential equations of motion for steady compressible supersonic flow. *10*

2. (a) Define strong shock wave and weak shock wave in a compressible flow.

   (b) Develop the famous Prandtl relation for normal shock waves. *3+7=10*

3. Explain in detail the properties of hypersonic flow with neat sketches. *10*

4. Discuss in detail 'Transonic Area Rule'. *10*

5. Derive the Prandtl-Glauert equation using linearised subsonic compressible flow theory. *10*

6. Deduce the following relation :

$$M_2^2 = \frac{1 + [(\gamma - 1)/2]M_1^2}{\gamma M_1^2 - (\gamma - 1)/2}$$

where M_1 and M_2 are values of Mach number ahead and behind the shock respectively. $\gamma = C_p \mid C_v$. *10*

7. What is hypersonic flow ? Discuss the viscous interaction effect on hypersonic flows. *10*

8. Explain with a neat sketch, the working and construction of a supersonic wind tunnel. *10*

9. Discuss flow past forward swept wing. Also elaborate the effect of forward swept wing on stall characteristics and yaw motion. *10*