

**B.Tech. AEROSPACE ENGINEERING  
(BTAE)**

**Term-End Examination**

00025

**December, 2014**

**BASE-003 : HIGH SPEED AERODYNAMICS**

*Time : 3 hours*

*Maximum Marks : 70*

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**Note :** Answer any **seven** questions. Use of scientific calculator, steam table and normal shock table is permitted.

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1. Describe the hypersonic flow with respect to twin-shock layer and temperature flows. 10
2. With a neat sketch, explain the concept of boundary layer. 10
3. Describe in detail, the entropy layer effects on aerodynamic heating of hypersonic vehicles. 10
4. Describe the quantitative approach of hypersonic vehicle. 10
5. Describe the relation between Knudsen number, Mach number and Reynolds number.

Prove that  $Kn = 1.2533 \sqrt{\gamma} \frac{M}{Re}$ . 10

6. Explain in detail the viscous interaction and entropy layer in hypersonic flows. 10
7. What are the important parameters governing the re-entry vehicle design ? Explain any two re-entry vehicles. 10
8. Contrast the steady flow over a 2D airfoil and unsteady flow of a 1D piston using the blast wave analogy. 10
9. What are the effects of shock wave/boundary layer interaction on the following : 4+6=10
- (a) Pressure distribution
  - (b) Shear stress for particular Mach number and turbulent flow over a flat plate
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