Code No: R05422104 **R05** **Set No. 3**

IV B.Tech II Semester Regular/Supplementary Examinations,May 2010
HYPERSONIC AERODYNAMICS
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Describe the kinetic theory of gases in rarified flow regimes with neat illustrations and examples? [16]
2. Write a short notes on:
   (a) Newtonian impact model
   (b) Hypersonic flow over a flat plate. [8+8]
3. Contrast Supersonic & Hypersonic Flow. With neat sketches use the example of Supersonic and Hypersonic flow over a wedge. [16]
4. What are the effects of shock wave/boundary layer interaction on
   (a) Pressure distribution
   (b) Shear stress for particular Mach number and turbulent flow over a flat plate. [16]
5. What are the Aerodynamic and Thermodynamic properties governing any hypersonic vehicle design? Explain with Neat diagrams and support your answer? [16]
6. Compare the Space Shuttle wind-ward ray heat transfer distributions using Entropy layer effects of hypersonic aerodynamic heating? [16]
7. If the displacement thickness for the flow over a flat plate is 0.35×10^{-2} m, calculate the boundary layer thickness. Assume laminar flow and sea-level conditions. [16]
8. In a hypersonic wind tunnel, the flow Mach number is 5 and operating pressure is 2 atm. If the flow encounters an expansion corner of 12^0, calculate the Mach number and pressure after the expansion. [16]

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