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. Explain the differences between slip, transition, continuum and free molecular flow regimes occurring rarefied gas dynamics? [16]

2. Explain the different concepts of Propulsion systems which can be used in hypersonic vehicle design? [16]

3. With neat sketches write a brief note on:

   (a) High Temperature flows

   (b) Entropy layer

   (c) Low density flows. [16]

4. Show the similarities between hypersonic aerodynamic heating and exact solution? [16]

5. Describe the effects of Shock wave/ Boundary Layer interactions over a flat plate at Mach 3 flow, with respect to pressure and shear stress distribution? [16]

6. Explain the blasius equation for incompressible flow over a flat plate with respect to its self-similar nature. [16]

7. Assuming the laminar flow at sea level conditions. Calculate the momentum thickness for the flow over a flat plate, if the boundary layer thickness is 1.21×10^{-2}m [16]

8. In a hypersonic wind tunnel, the flow Mach number is 25 and operating pressure is 3atm. If the flow encounters an expansion corner of 14^0, calculate the Mach number after the expansion, pressure. Assume that Mach number is very large. [16]

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