No. of Printed Pages : 2

BASE-003

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

June, 2015

00206

BASE-003 : HIGH SPEED AERODYNAMICS

Time : 3 hours *Maximum Marks : 70*

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

1. Make a comparative study of 2D and 3D shock wave/boundary layer interaction. *10*

2. Explain the Mach number independence principle with respect to hypersonic flows. *10*

3. Derive the governing equations for viscous flow. *10*

4. What are the different rarefied gas dynamics flow regimes ? How does Knudsen number influence these flow regimes ? *10*

5. Explain in detail the Thin-Shock layer and High-Temperature flows in hypersonic flows. *10*

6. In a hypersonic wind tunnel, the flow Mach number is 15 and operating pressure is 2 atm. If the flow encounters an expansion corner of 8°, calculate the Mach number after the expansion and pressure. Assume that Mach number is very large. *10*

7. Contrast Supersonic and Hypersonic flow with the help of neat sketches. Use the example of supersonic and hypersonic flow over a wedge. *10*

8. (a) What is rarefied gas dynamics ? Explain in detail. *5*

   (b) Explain the gas surface interaction in rarefied flow regimes. *5*

9. Derive the hypersonic small disturbance equation. *10*