R09

Code No: 58093

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year II Semester Examinations, May - 2017
HYPERSONIC AERODYNAMICS
(Aeronautical Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any Five Questions
All Questions Carry Equal Marks

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1.a) Compare the flow characteristics of hypersonic flows with supersonic flows.
b) Define Knudsen number. Explain classification of low density flows based on Knudsen number. [8+7]

2. Derive the basic hypersonic shock relations [15]

3. Explain with sketches the tangent-wedge and tangent-cone prediction methods for hypersonic flows. [15]

4.a) Explain the Mach number independence principle for hypersonic flows
b) Consider an infinitely thin flat plate. Using Newtonian theory, show that the maximum lift coefficient $C_{L,max}$= 0.77 and that it occurs at an angle of attack $\alpha = 54.7^0$ [8+7]

5. Explain the hypersonic blunt body problem with a sketch and discuss its importance [15]

6. Discuss the qualitative physical aspects of a two dimensional shock wave/boundary interaction on a flat plate using a sketch. [15]

7.a) Draw a sketch and explain a gun tunnel, its components and working principle.
b) Draw a sketch and explain Ludweig tube wind tunnel [7+8]

8. Describe the techniques and instrumentation to measure pressure and temperature in hypersonic wind tunnels [15]

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