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BASE-003

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

June, 2019

BASE-003 : HIGH SPEED AERODYNAMICS

Time : 3 hours *Maximum Marks : 70*

Note : *(i) Attempt **any seven** questions.*

*(ii) **All** questions carry **equal** marks.*

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

2. Explain with neat sketches how shock waves are produced in supersonic flow. **10**

3. Derive the differential equations of motion for steady compressible supersonic flow. **10**

4. Explain in detail the Thin-shock layer and High temperature flows in Hypersonic flows. **10**

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

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

6. Explain with a neat sketch, the working and construction of a supersonic wind tunnel. **10**

7. Show that **10**

$$M^2 = \frac{1 + \frac{\gamma - 1}{2} M_1^2}{\gamma M_1^2 - \frac{\gamma - 1}{2}}$$

where the symbols have their usual meaning.

8. Explain the conical flow method treatment for swept back wings. **10**

9. Explain the construction and working of a supersonic nozzle with a neat sketch. **10**

10. Write short notes on **any four** of the following : **4x2.5=10**

(a) Lift Effect

(b) Mach Waves

(c) Airfoils

(d) Pitching Moment

(e) Transonic Flow

(f) Mach Number
