Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2180105 **Date: 06/05/2017**

Subject Name: High Speed Aerodynamics(Department Elective III)

Time: 10:30 AM to 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** 1. The Mach angle for a flow at Mach 7.9 is……. **07**

2. Define Aerothermodynamics
3. Define Shock wave
4. When Mach no. is decreases, thickness of the shock layer is……
5. Define hypersonic flow. What is it?
6. Why entropy layer is formed over the body?
7. Write an equation of Newtonian sine squared law for pressure coefficient.

(b) Derive L/D = Cot α for flat plate using aerodynamic forces. **07**

Q.2 **(a)** Draw and explain in brief, variation of stagnation pressure coefficient (C_{pmax})with Mach number and gamma (γ) **07**

(b) Prove "Hypersonic limit for a slender wedge, the wave angle is only 20% larger than the wedge angle **07**

OR

(b) Explain with neat sketch physical effects characteristics of hypersonic flow **07**

Q.3 **(a)** Explain with neat sketch High temperature Flows. **07**

(b) Using Oblique shock wave geometry, derive Temperature ratio relation for hypersonic case. **07**

OR

Q.3 **(a)** Derive Hypersonic expansion wave relations using centered expansion wave geometry. **07**

(b) Prove $C_p/\ \Theta^2 = f\ (K/Y)$ for hypersonic shock relations in terms of the hypersonic similarity parameter **07**

Q.4 **(a)** Explain with neat sketch 1.Entropy layer 2.Viscous Interaction **07**

(b) Explain Centrifugal force corrections to Newtonian theory with neat sketch. **07**

OR

Q.4 **(a)** Consider a supersonic stream at a Mach number M=2, undergoing a gradual expansion. The stream is turned by an angle of 3 degree due to the expansion. The following data is given, to find out Mach number downstream of the expansion. **07**

Mach Number	V (Prandtl-Meyer function)
1.8	20.73
1.9	23.59
2.0	26.38
2.1	29.10
2.2	31.73

(b) Explain Tangent Wedge method. **07**

Q.5 **(a)** Explain Shock Expansion method. **07**

(b) What is wind tunnel? Explain subsonic wind tunnel using neat sketch. **07**

OR

Q.5 **(a)** Write a short note on Solid blockage & Wake blockage **07**

(b) Explain Flow visualization technique. **07**

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