Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2023
Subject Code:3160113   **Date:11-12-2023**
Subject Name:Advance Aerodynamics
Time:02:30 PM TO 05:00 PM   **Total Marks:70**
Instructions:
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

			MARKS
Q.1	**(a)**	**1. For which of these Mach numbers is flow considered to be hypersonic?** **a) M < 1** **b) M = 1** **c) M > 5** **d) 1 < M < 5** **2. How is the shock layer in case of hypersonic flow?** **a) Thin** **b) Thick** **c) Nonexistent** **d) Increases with increasing Mach number** **3. In hypersonic flow, the shock waves often merge with the viscous boundary layer.** **a) True** **b) False**	03
	(b)	Define Aerothermodynamics.	04
	(c)	Explain flow over a flat plate for hypersonic case.	07
Q.2	**(a)**	What is viscous dissipation?	03
	(b)	How does viscous dissipation affect temperature inside the boundary layer? Explain in short.	04
	(c)	Justify statement "Hypersonic boundary layers grow more rapidly compared to subsonic and supersonic boundary layers".	07
		OR	
	(c)	What is viscous interaction? Explain in brief	07
Q.3	**(a)**	Define Hypersonic flow.	03
	(b)	Write a note on entropy layer with sketch.	04
	(c)	Explain Tangent cone method with sketch.	07
		OR	
Q.3	**(a)**	What is Fanno flow?	03
	(b)	Explain compressible flow and incompressible flow.	04
	(c)	Explain Prandtl-Glauert Compressibility correction.	07

Q.4	**(a)**	What is Rayleigh flow?	**03**
	(b)	Derive linearized velocity potential equation.	**04**
	(c)	Explain supersonic flow over a cone with sketch.	**07**

OR

Q.4	**(a)**	How hypersonic flows differ to subsonic flow? Explain	**03**
	(b)	What is the difference between Modified Newtonian flow and Newtonian flow?	**04**
	(c)	Draw "Recapitulation" for hypersonic case.	**07**
Q.5	(a)	Define sound barrier.	**03**
	(b)	Define Aerodynamic heating.	**04**
	(c)	Derive an equation on "Hypersonic shock relation in terms of hypersonic similarity parameters".	**07**

OR

Q.5	**(a)**	Importance of Shock expansion theory in hypersonic flow.	**03**
	(b)	Write a note on Supersonic airfoil drag.	**04**
	(c)	Derive the equation of linearized supersonic flow over an airfoil.	**07**

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