GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII(NEW) EXAMINATION – SUMMER 2019

Subject Code: 2180105   **Date:13/05/2019**

Subject Name: High Speed Aerodynamics

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)**	Define Hypersonic flow in technical language.	**03**
	(b)	What is the difference between aerothermodynamics and aerodynamics?	**04**
	(c)	Explain construction of subsonic open type wind tunnel with neat sketch.	**07**
Q.2	**(a)**	Prove $C_p = 2\sin^2\theta$ for Newtonian theory.	**03**
	(b)	Consider an infinitely thin flat plate at an angle of attack of 15^0 in a mach 8 flow. Calculate lift to drag ratio.	**04**
	(c)	Explain Solid blockage and wake blockage.	**07**
		OR	
	(c)	Explain Centrifugal force corrections to Newtonian theory with neat sketch.	**07**
Q.3	**(a)**	Define wind tunnel balances.	**03**
	(b)	Air is travelled over the object with 12 Mach flow and shock angle is 2^0(β) free stream pressure consider 101325 pa. Estimate downstream pressure (P_2).	**04**
	(c)	Prove $L/D = Cot\alpha$	**07**
		OR	
Q.3	**(a)**	List out flow visualization techniques.	**03**
	(b)	What is the difference between supersonic and hypersonic wind tunnel?	**04**
	(c)	Explain θ-β-M diagram with neat sketch and prove "Hypersonic limit for a slender wedge, the wave angle is only 20% larger than the wedge angle".	**07**
Q.4	**(a)**	What is Tangent cone method?	**03**
	(b)	Explain Shock expansion method.	**04**
	(c)	Explain Aerodynamic heating.	**07**
		OR	
Q.4	**(a)**	With neat sketch explain thin shock layer.	**03**
	(b)	Define and explain entropy layer.	**04**
	(c)	An object immersed in airflow is described as follows Static pressure = 200 Kpa, Static Temperature = 293 K, Velocity of flow is 250m/s, Estimate stagnation temperature and stagnation pressure.	**07**
Q.5	**(a)**	Define "High temperature flow" characteristic for hypersonic flow.	**03**
	(b)	Explain Low density flow.	**04**
	(c)	Consider a flat plate at a 5^0 angle of attack in a mach 2.2 flow. Using prandtl meyer functions find out exit mach number. Take gama(Υ) = 1.4	**07**
		OR	
Q.5	**(a)**	Explain flow over an airfoil case for hypersonic case.	**03**
	(b)	Difference between supersonic flow and hypersonic flow.	**04**
	(c)	Why car is not fly at Subsoinc, Supersoinc and hypersonic speed?	**07**

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