Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER I - EXAMINATION – SUMMER 2017

Subject Code: 2711103 **Date:10/05/2017**

Subject Name: Advanced Fluid Mechanics

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.**

Q.1	**(a)**	How do the Langrangian and Eulerian methods differ? Explain path line and streak line.	**07**
	(b)	Distinguish between: (i) uniform and non uniform flow (ii) laminar and turbulent flow	**07**
Q.2	**(a)**	Define the continuity equation. Obtain an expression for continuity equation for a 3-D flow.	**07**
	(b)	Describe the use and limitations of the flow nets. Under what conditions can one draw flow net?	**07**
		OR	
	(b)	What do you understand by the terms: total acceleration, convective acceleration and local acceleration?	**07**
Q.3	**(a)**	Explain with sketch the following flow patterns: (i) Source and Sink (ii) Source and sink pair (iii) Doublet.	**07**
	(b)	Derive from first principles, the condition for irrotational flow. Prove that, for potential flow, both the stream function and velocity potential function satisfy the Laplace equation.	**07**
		OR	
Q.3	**(a)**	Derive the Navier-Stokes equation for viscous compressible fluid with constant viscosity.	**07**
	(b)	Write a short note on Principle of Superposition.	**07**
Q.4	**(a)**	Define and compare Creeping flows and Nonviscous Flows.	**07**
	(b)	Derive an expression for shear stress on the basis of Prandtl's Mixing Length theory	**07**
		OR	
Q.4	**(a)**	Obtain an expression for velocity distribution for turbulent flow in smooth pipes.	**07**
	(b)	Explain the Reynolds theory of turbulence.	**07**
Q.5	**(a)**	In a compressible flow through a convergent divergent nozzle, explain with the aid of sketches how the mass rate of flow and pressure vary along the nozzle axis.	**07**
	(b)	Establish relation between maximum velocity and critical velocity of sound.	**07**
		OR	
Q.5	**(a)**	Distinguish between (i) attached and detached shocks and (ii) compression and expansion shocks.	**07**
	(b)	Derive the basic differential for isothermal flow in long ducts.	**07**

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