GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– IV (New) EXAMINATION – WINTER 2019

Subject Code: 2140107   **Date: 12/12/2019**

Subject Name: Computational fluid dynamics I

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.

			MARKS
Q.1	**(a)**	What is partial derivative and substantial derivative?	03
	(b)	Derive continuity equation in Cartesian.	04
	(c)	Derive momentum equation for viscous flows.	07
Q.2	**(a)**	What is conservation and non conservation forms of governing equations?	03
	(b)	Write a short note on Lax-Wendroff technique.	04
	(c)	Derive 1st order derivatives of forward difference, backward difference and central difference schemes.	07
		OR	
	(c)	What is descretization? Why it is required? List the basic descretization techniques.	07
Q.3	**(a)**	Differentiate FDM, FEM and FVM.	03
	(b)	Explain in detail the different types of fluid flow.	04
	(c)	Discuss Relaxation technique in detail.	07
		OR	
Q.3	**(a)**	Explain the concept of transformation of grid	03
	(b)	Write a short note on error and stability. And define the stable equation.	04
	(c)	Discuss Mac-Cormarck technique.	07
Q.4	**(a)**	Write Euler's model in generic form.	03
	(b)	Explain the steps for CFD post processing.	04
	(c)	Derive energy equation in nonconservation form.	07
		OR	
Q.4	**(a)**	Enlist the basic steps involved in CFD solutions.	03
	(b)	Differentiate FDM and FEM.	04
	(c)	Explain steps for CFD Preprocessing and CFD Post Processing.	07
Q.5	**(a)**	Discuss an implicit approach.	03
	(b)	Explain the Eigen value method in short.	04
	(c)	Write a short note on structured and non structured grid.	07
		OR	
Q.5	**(a)**	What is grid transformation? Why it is required?	03
	(b)	Convert non conservation form of continuity equation in a conservation form.	04
	(c)	Derive the energy equation for 3-Dimensional, viscous flow.	07

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