Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (New) EXAMINATION – WINTER 2015

Subject Code:2140107 **Date:28/12/2015**

Subject Name: Computational Fluid Dynamics I

Time: 2:30pm to 5:00pm **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)**	Explain FVM for one dimensional steady state diffusion problem.	**07**
	(b)	Using Polynomial approach derive one sided 2nd order accurate difference quotient at the boundary.	**07**
Q.2	**(a)**	What is Descretization? Why it is required? List the basic descretization techniques.	**07**
	(b)	Derive Continuity equation for any two models of fluid flow.	**07**
		OR	
	(b)	Derive momentum equation in conservation form.	**07**
Q.3	**(a)**	Derive the generic form for CFD for the complete flow system.	**07**
	(b)	Write a short note on substantial derivative.	**07**
		OR	
Q.3	**(a)**	Write a short note on error and stability. And define the stable equation.	**07**
	(b)	Derive the Prandtl-Mayer function for expansion waves.	**07**
Q.4	**(a)**	Write a short note on Maccormark Technique.	**07**
	(b)	Write a short note on structured grid and unstructured grid.	**07**
		OR	
Q.4	**(a)**	Derive 2nd order derivative terms of Laplace equation in difference terms.	**07**
Q.4	**(b)**	Write a short note on Lax-Wendroff technique	**07**
Q.5	**(a)**	Write a short note on implicit approach and explicit approach.	**07**
	(b)	Why CFD is required? Explain the applications for the same.	**07**
		OR	
Q.5	**(a)**	Explain the concept of plane transformation with the example of Prandtl Mayer expanded flow.	**07**
	(b)	Explain the difference between FDM, FEM and FVM.	**07**

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