Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:2140107 **Date:15/05/2019**

Subject Name: Computational fluid dynamics I

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.**

			MARKS
Q.1	**(a)**	Define CFD? Why it is widely used as a research tool now days?	**03**
	(b)	State applications of CFD in various fields.	**04**
	(c)	Derive Continuity equation for any model of finite control volume fixed in space.	**07**
Q.2	**(a)**	Define Substantial derivative.	**03**
	(b)	What are the three approaches used to study fluid flow problems? Explain in detail.	**04**
	(c)	Define Discretization. Explain different discretization methods.	**07**
		OR	
	(c)	Using Taylor's series expansion 1st order forward, backward and 2nd order central difference formulas.	**07**
Q.3	**(a)**	What is physical significance of CFL number?	**03**
	(b)	Explain Eigen value method for determining the classification of PDEs.	**04**
	(c)	Explain Finite volume method for 1-D diffusion problem.	**07**
		OR	
Q.3	**(a)**	Define: Truncation error Round-off error	**03**
	(b)	What do you mean by order of accuracy? Explain with example.	**04**
	(c)	Using Taylor's series expansion derive: • Second order central second difference w.r.t x & y • Second order central second difference for mixed derivative	**07**
Q.4	**(a)**	What are the factors affecting the grid?	**03**
	(b)	Write a note on Structured and unstructured grids.	**04**
	(c)	What is Grid Transformation? Explain with an example.	**07**
		OR	
Q.4	**(a)**	What is Boundary Condition? State its importance in solving fluid flow problem.	**03**
	(b)	Explain Predictor and Corrector steps of Mac-Cormack technique.	**04**
	(c)	Derive expressions to transform first derivatives w.r.t x, y & t to ξ, η & τ.	**07**
Q.5	**(a)**	Truncation error can be reduced by considering more number of grid points. True or False? How?	**03**
	(b)	Discuss: Explicit vs. Implicit approach.	**04**
	(c)	Write a short note on ADI scheme.	**07**
		OR	
Q.5	**(a)**	What are the three basic principles of fluid dynamics?	**03**
	(b)	Write a note on stretched grid.	**04**
	(c)	Write a note on Lax-wendroff technique.	**07**

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