Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:2181925 Date:13/05/2019

Subject Name:Computational Fluid Dynamics

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)**	Explain three different approaches of fluid dynamics?	**03**
	(b)	Discuss the analogy between the steady state and unsteady state, Laplace equation using proper physical interpretation.	**04**
	(c)	What is partial derivative and substantial derivative? Derive continuity equation for any of the models.	**07**
Q.2	**(a)**	Explain the models of fluid flow.	**03**
	(b)	What are conservation and non conservation forms of governing equations?	**04**
	(c)	Derive momentum equation for viscous flows.	**07**
		OR	
	(c)	Derive the governing equations for the velocity boundary layer.	**07**
Q.3	**(a)**	Write Euler's model in generic form.	**03**
	(b)	Write Navier stokes model in generic form	**04**
	(c)	What is Descretization? Why it is required? List the basic descretization techniques.	**07**
		OR	
Q.3	**(a)**	Explain the different boundary conditions applied to fluid flow domain.	**03**
	(b)	Derive Reynolds Transport Theorem.	**04**
	(c)	Explain in detail basic steps for Mac-Cormark Technique.	**07**
Q.4	**(a)**	Explain how to find a second-order-accurate finite-difference at the boundary using a polynomial approach.	**03**
	(b)	Derive an exact analytic solution for Prandtl – Meyer expansion wave.	**04**
	(c)	Write a short note on error and stability. And define the stable equation	**07**
		OR	
Q.4	**(a)**	Differentiate FDM, FEM and FVM.	**03**
	(b)	Explain the concept of transformation of the grid.	**04**
	(c)	Write a short note on implicit approach and explicit approach.	**07**
Q.5	**(a)**	What is a Grid? What are the factors affecting the grid?	**03**
	(b)	Explain grid terminology with a neat sketch	**04**
	(c)	Explain the steps for CFD preprocessing.	**07**
		OR	
Q.5	**(a)**	What is CFD? Why it is required? List the areas where it is applicable?	**03**
	(b)	Explain structured and Unstructured grid.	**04**
	(c)	Derive the generic form for CFD for the complete flow system.	**07**