

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