

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 1 st order forward, backward and 2 nd 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: <ul style="list-style-type: none">• 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
