Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II (OLD) – • EXAMINATION – SUMMER 2016

Subject Code: 1721005 Date:20/05/2016

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.**

Q.1	**(a)**	What are the important applications of CFD in engineering? Explain.	**07**
	(b)	Derive integral form of momentum conservation equation along x-direction.	**07**
Q.2	**(a)**	Write a brief note on "Numerical versus analytical solutions".	**07**
	(b)	Explain following discretization properties. (i) Consistency (ii) Stability and (iii) Order	**07**
		OR	
	(b)	Derive the general energy conservation equation with stating assumptions.	**07**
Q.3	**(a)**	Explain classification of quasilinear partial differential equations. What is its importance associated with CFD?	**07**
	(b)	What are Neumann and Dirichlet boundary conditions? Explain various types of boundary conditions.	**07**
		OR	
Q.3	**(a)**	Discretize the 1D unsteady heat conduction equation in an explicit finite difference scheme and discuss its stability.	**07**
	(b)	Discuss the advantages and limitations of finite difference method and finite element method.	**07**
Q.4	**(a)**	What do you mean of validation? Why it is needed?	**07**
	(b)	Explain central differencing and up wind differencing.	**07**
		OR	
Q.4	**(a)**	Write a note on structured and unstructured grid in finite volume method for complex geometry.	**07**
	(b)	Explain essential aspects of turbulent model used in CFD.	**07**
Q.5	**(a)**	Write one dimensional scalar transport equation and explain advection, diffusion and source.	**07**
	(b)	State and explain various types of errors that occur during CFD simulation.	**07**
		OR	
Q.5	**(a)**	Explain the four basic rules of SIMPLE (Semi Implicit Method for Pressure Linked Equations) method in detail.	**07**
	(b)	Give brief introduction of MAC (Marker & Cell) method to solve the unsteady Navier-Stokes equations.	**07**

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