Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2013

Subject code: 1721005 Date: 05-06-2013

Subject Name: Computational Fluid Dynamics

Time: 10.30 am – 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 z-direction.	**07**
Q.2	**(a)**	Explain the K-Ůmodel for turbulent flow modeling.	**07**
	(b)	What is boundary condition? Explain various types of boundary conditions.	**07**
		OR	
	(b)	Define: 1. Round-off error 2. Convergence 3. Stability	**07**
Q.3	**(a)**	Explain all types of finite difference formulations for 1st order partial derivatives and discuss the consistency, stability and convergence of the FDM.	**07**
	(b)	Prove that the vortecity vector is the curl of the velocity vector.	**07**
		OR	
Q.3	**(a)**	Explain various reasons for occurrence of various types of errors found between CFD results and experimental results.	**07**
	(b)	Write a difference between Finite element method and Finite volume method.	**07**
Q.4	**(a)**	Explain MAC algorithm for viscous incompressible flow.	**07**
	(b)	Discuss 1D finite element formulations and stiffness matrix.	**07**
		OR	
Q.4	**(a)**	Derive 2D scalar transport equation.	**07**
	(b)	Write a note on advantages and limitations of finite volume method (FVM).	**07**
Q.5	**(a)**	Derive integral form of general equation of heat conduction in Cartesian co-ordinates.	**07**
	(b)	Explain Advection phenomenon in flow.	**07**
		OR	
Q.5	**(a)**	Explain validation of CFD model.	**07**
	(b)	What types of grids are used in FVM? Explain.	**07**

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