Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2722106 **Date: 27/05/2016**

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)	Give the classification of quasi linear partial differential equation. (Cramer's rule)	07
	(b)	What is CFD? Why it is needed as a tool for research and design of complex problems in the field of thermal science and fluid mechanics?	07
Q.2	(a)	How Computational fluid dynamics techniques are different than traditional methods? What are the benefits of it?	07
	(b)	Derive Integral form of momentum conservation equation along x direction?	07
		OR	
	(b)	Describe elliptic, parabolic and hyperbolic equation in brief.	07
Q.3	(a)	What are Neumann and Dirichlet boundary conditions? Explain various types of boundary conditions.	07
	(b)	Explain Lax Wandroff Technique in brief.	07
		OR	
Q.3	(a)	Derive integral form of general equation of heat conduction in Cartesian co-ordinates.	07
	(b)	Explain in detail NavierStrokes equation and its important forms.	07
Q.4	(a)	Explain in details advantages, disadvantages and source of errors for experiments and numerical simulations.	07
	(b)	Discretize the ID unsteady heat conduction equation in an explicit finite difference scheme and discuss its stability.	07
		OR	
Q.4	(a)	Classify and describe different types of grid for finite volume methodology	07
	(b)	What are the important concepts on which MAC algorithm is based?	07
Q.5	(a)	Write one dimensional scalar transport equation and explain advection, diffusion and source.	07
	(b)	Explain staggered, Unstagerred and partially staggered grid.	07
		OR	
Q.5	(a)	Discuss use of hyperbolic PDE in CFD for (1) steady inviscid supersonic flow, and (2) unsteady inviscid flow.	07
	(b)	Discuss- (1) Shape Function and (2) Order of Differentiation.	07

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