Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV (NEW SYLLABUS) EXAMINATION- SUMMER 2016

Subject Code: 2140107 **Date:01/06/2016**

Subject Name: Computational Fluid Dynamics-I

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		**Short Questions**	**14**
	1	Could you remember the definition of CFD?	
	2	What do you mean by Control Volume?	
	3	Can you write two dimensional continuity equation for Steady incompressible flow?	
	4	Compare Incompressible flow with compressible flow.	
	5	How would you define Round-off error?	
	6	What do you mean by CFL condition?	
	7	Define Grid generation.	
	8	Which one is more complex approach, Explicit or Implicit? Why?	
	9	What do you mean by stable solution?	
	10	How truncation error can be reduced?	
	11	How would you define Order of Accuracy?	
	12	Can you list three applications of CFD?	
	13	Draw the stencil diagram for First order forward difference with respect to x.	
	14	How would you define Convergence?	
Q.2	**(a)**	What is Descretization? Why it is required?	**03**
	(b)	Apply Taylor's series expansion to derive 1st order forward difference, 1st order backward difference.	**04**
	(c)	Apply Polynomial approach to derive one sided 2nd order accurate difference quotient at the boundary.	**07**
		OR	
	(c)	Explain FVM for one dimensional steady state diffusion problem.	**07**
Q.3	**(a)**	Explain substantial derivative.	**03**
	(b)	Compare implicit approach with explicit approach.	**04**
	(c)	Explain three different approaches of fluid dynamics? State the advantages of CFD over Experimental fluid dynamics?	**07**
		OR	
Q.3	**(a)**	Draw the stencil diagram for following finite modules: (i) Second order central second difference with respect to x (ii) First order rearward difference with respect to y (iii)Second order central difference with respect to y	**03**
	(b)	Explain basic difference between FDM and FVM.	**04**
	(c)	Explain FVM for one dimensional steady state diffusion problem.	**07**
Q.4	**(a)**	What is Grid Transformation? Why it is required?	**03**

	(b)	Apply Taylor's series expansions to derive 2nd order central second difference	**04**
	(c)	Apply Polynomial approach to derive one sided 2nd order accurate difference quotient at the boundary.	**07**
		OR	
Q.4	**(a)**	Explain in brief error and stability.	**03**
	(b)	Derive Continuity equation for any one model of fluid flow.	**04**
	(c)	Explain short note on Mac-cormack technique.	**07**
Q.5	**(a)**	Explain grid terminology with a neat sketch.	**03**
	(b)	Using Taylor's series expansions derive 2nd order central difference for the mixed derivative.	**04**
	(c)	Explain Lax-Wendroff technique	**07**
		OR	
Q.5	**(a)**	What is Grid? What are the factors affecting the grid?	**03**
	(b)	Explain structured and Unstructured grid.	**04**
	(c)	Derive an exact analytic solution for Prandtl – Meyer expansion wave.	**07**

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