Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI (NEW) EXAMINATION – WINTER 2024

Subject Code:3161915 Date:12-12-2024

Subject Name: Computational Fluid Dynamics

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	What are the important applications of CFD in engineering?	**03**
	(b)	How do you classify boundary conditions?	**04**
	(c)	What are the different types of Partial Differential Equations (PDE)? Explain the physical Behavior of PDE.	**07**
Q.2	**(a)**	List down the advantages of CFD over experimental methods.	**03**
	(b)	Explain the features of TDMA method.	**04**
	(c)	Explain SIMPLE algorithm.	**07**
		OR	
	(c)	Compare upwind, central and blended difference approximations for convection- diffusion problems.	**07**
Q.3	**(a)**	What is grid transformation? Why it is required?	**03**
	(b)	What are the advantages and disadvantages of κ -ε model ?	**04**
	(c)	Derive an expression for 2-D steady state heat conduction equation in Cartesian coordinates by finite volume method. State the stability criteria.	**07**
		OR	
Q.3	**(a)**	Differentiate between structured and unstructured mesh.	**03**
	(b)	Explain the features of Crank-Nicolson scheme.	**04**
	(c)	Explain the method of solving an incompressible flow problem using stream function vorticity formulation.	**07**
Q.4	**(a)**	Explain factors affecting grid generation.	**03**
	(b)	Differentiate FDM, FEM and FVM.	**04**
	(c)	Derive energy equation in non conservation form.	**07**
		OR	
Q.4	**(a)**	Explain Reynolds transport theorem.	**03**
	(b)	Derive the expression for substantial derivative.	**04**
	(c)	Derive Navier-Stokes equation.	**07**
Q.5	**(a)**	List out difference types of error. Explain any one	**03**
	(b)	Differentiate between explicit and implicit approach.	**04**
	(c)	Explain Lax-Wendroff Method briefly.	**07**
		OR	
Q.5	**(a)**	Difference between One and Two equation models in turbulence modeling.	**03**
	(b)	Explain the momentum equation in no conservation form.	**04**
	(c)	Using Taylor's series expansion 1st order forward, backward and 2nd order central difference formulas.	**07**

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