GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–VI EXAMINATION – WINTER 2025

Subject Code:3161915   **Date:29-11-2025**

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)**	Define CFD. Briefly explain various steps involve in CFD analysis?	**03**
	(b)	What do you mean by result validation in CFD analysis? Why it is needed?	**04**
	(c)	Explain theoretical, experimental and numerical approach in CFD.	**07**
Q.2	**(a)**	List out basic fundamental principal utilized for CFD analysis. Explain conservation of mass principal briefly.	**03**
	(b)	Differentiate between structured and unstructured grids.	**04**
	(c)	Explain the classification of quasi-linear partial differential equation by using Cramer's rule.	**07**

OR

	(c)	Explain Navier-Stokes equation.	**07**
Q.3	**(a)**	Explain various types of boundary condition.	**03**
	(b)	Differentiate between explicit and implicit approach.	**04**
	(c)	List out various computational errors. Explain rounding error with examples.	**07**

OR

Q.3	**(a)**	Justify – "Implicit methods are unconditionally stable".	**03**
	(b)	Explain ordinary and partial differential equation with its physical significance.	**04**
	(c)	Explain Tridiagonal Matrix Algorithm by using one dimensional heat conduction equation.	**07**
Q.4	**(a)**	Differentiate between finite difference and finite element method.	**03**
	(b)	Explain finite volume central differencing scheme.	**04**
	(c)	Using Taylor's series derive second order central for the mixed derivative expressions for $\left(\dfrac{d^2u}{dxdy}\right)_{i,j}$.	**07**

OR

Q.4	**(a)**	Compare One and Two equation turbulence models.	**03**
	(b)	Explain RANS turbulence modeling in brief.	**04**
	(c)	Explain different types of grid elements. List out the factors of grid element selection.	**07**
Q.5	**(a)**	Compare SIMPLE and SIMPLEC algorithm.	**03**
	(b)	List out advantages and disadvantages of explicit approach.	**04**
	(c)	Write a note on application of CFD in automobile engineering.	**07**

OR

Q.5	**(a)**	Why grid generation is needed in CFD? Explain it.	**03**
	(b)	Explain stretched grid.	**04**
	(c)	Write a note on requirement of grid independence study in CFD.	**07**

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