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

Subject Code: 3161915   **Date: 04-06-2025**

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

Q.1	**(a)**	Explain Domain and boundaries for the solution of elliptic equations in two dimensions.	03
	(b)	Differentiate between explicit and implicit approach.	04
	(c)	Derive general integrated form of the transport equation from governing equation.	07
Q.2	**(a)**	What is CFD? Explain the scope of CFD.	03
	(b)	Explain the momentum equation in no conservation form.	04
	(c)	Using Taylor's series derive first-order forward-difference and rearward-difference expressions for $\partial u/\partial y$.	07

OR

	(c)	Explain the classification of quasi-linear partial differential equation by using Cramer's rule.	07
Q.3	**(a)**	Explain any one properties of Discretization scheme.	03
	(b)	Explain Lax – Wandroff technique.	04
	(c)	Explain finite volume method for one dimensional steady state diffusion problem.	07

OR

Q.3	**(a)**	Explain RANS modeling in brief.	03
	(b)	Explain Domain and boundaries for the solution of parabolic equations in two dimensions.	04
	(c)	Using Taylor's series, derive second order central difference for the mixed Derivative expressions for $(\partial^2 u/\partial x \partial y)_{i,j}$.	07
Q.4	**(a)**	Justify: Implicit methods are unconditionally stable.	03
	(b)	Explain advantages and disadvantages of implicit approach.	04
	(c)	Explain Tridiagonal Matrix Algorithm by using one dimensional heat conduction equation.	07

OR

Q.4	**(a)**	Explain inlet and outlet boundary condition.	03
	(b)	Explain grid generation for one dimensional heat diffusion problem for finite volume method.	04
	(c)	Explain the stability requirement for the solution of explicit form of one dimensional steady state heat diffusion equation.	07
Q.5	**(a)**	Differentiate between structured and unstructured grid.	03
	(b)	Explain in brief: Staggered grid.	04
	(c)	Explain SIMPLE algorithm.	07

OR

Q.5	**(a)**	Explain factors affecting grid generation.	03
	(b)	Explain finite volume central differencing scheme.	04
	(c)	Explain PISO algorithm.	07

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2024

Subject Code:3161915   **Date:30-05-2024**
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.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Explain Reynolds transport theorem.	**03**
	(b)	Explain Domain and boundaries for the solution of parabolic equations in two dimensions.	**04**
	(c)	Discuss in detail Navier - Stokes equation.	**07**
Q.2	**(a)**	Define CFD? Why it is widely used as a research tool now days?	**03**
	(b)	Explain Eigen value method for determining the classification of PDEs.	**04**
	(c)	Explain finite volume central differencing scheme.	**07**
		OR	
	(c)	Derive an energy equation in non conservation form.	**07**
Q.3	**(a)**	Explain Domain and boundaries for the solution of elliptic equations in two dimensions.	**03**
	(b)	What is Grid? List out factor affecting of grid generation.	**04**
	(c)	Explain PISO algorithm.	**07**
		OR	
Q.3	**(a)**	Write a short note on Explicit approach.	**03**
	(b)	Discuss ADI scheme.	**04**
	(c)	Solve FVM problem for 1-D heat diffusion.	**07**
Q.4	**(a)**	What is Grid Transformation? Why it is required?	**03**
	(b)	Write a short note on Lax - Wendroff technique.	**04**
	(c)	Explain finite volume method for one dimensional steady state diffusion problem.	**07**
		OR	
Q.4	**(a)**	Explain RANS modeling in brief.	**03**
	(b)	Differentiate between explicit and implicit approach.	**04**
	(c)	Explain SIMPLE algorithm.	**07**
Q.5	**(a)**	Explain inlet and outlet boundary condition.	**03**
	(b)	Write a short note on structured grid.	**04**
	(c)	Discuss in detail Tridiagonal Matrix Algorithm.	**07**

Q.5 **(a)** State applications of CFD in various fields.   **03**

(b) Differentiate FDM, FEM and FVM.   **04**

(c) What is Discretization? Why it is required? List the basic discretization   **07**
techniques.

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2023

Subject Code:3161915   **Date:20-07-2023**
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.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	(a)	What is CFD? Explain the scope of CFD.	03
	(b)	Explain the momentum equation in no conservation form.	04
	(c)	Derive general integrated form of the transport equation from governing equation.	07
Q.2	(a)	Explain Domain and boundaries for the solution of elliptic equations in twodimensions.	03
	(b)	Differentiate between explicit and implicit approach.	04
	(c)	Using Taylor's series derive first-order forward-difference and rearward-difference expressions for $\partial u/\partial y$.	07

OR

	(c)	Explain the classification of quasi-linear partial differential equation by using Cramer's rule.	07
Q.3	(a)	Explain RANS modeling in brief.	03
	(b)	Explain Domain and boundaries for the solution of parabolic equations in two dimensions.	04
	(c)	Using Taylor's series, derive second order central difference for the mixed Derivative expressions for $(\partial^2 u/\partial x \partial y)_{i,j}$.	07

OR

Q.3	(a)	Explain any one properties of Discretization scheme.	03
	(b)	Explain Lax – Wandroff technique.	04
	(c)	Explain finite volume method for one dimensional steady state diffusion problem.	07
Q.4	(a)	Explain inlet and outlet boundary condition.	03
	(b)	Explain grid generation for one dimensional heat diffusion problem for finite volume method.	04
	(c)	Explain the stability requirement for the solution of explicit form of one dimensional steady state heat diffusion equation.	07

OR

Q.4	(a)	Justify: Implicit methods are unconditionally stable.	03
	(b)	Explain advantages and disadvantages of implicit approach.	04
	(c)	Explain Tridiagonal Matrix Algorithm by using one dimensional heat conduction equation.	07
Q.5	(a)	Explain factors affecting grid generation.	03
	(b)	Explain finite volume central differencing scheme.	04

	(c)	Explain PISO algorithm.	**07**

OR

	(a)	Differentiate between structured and unstructured grid.	**03**
Q.5	**(b)**	Explain in brief: Staggered grid.	**04**
	(c)	Explain SIMPLE algorithm.	**07**

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2022

Subject Code:3161915   **Date:16/06/2022**
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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define CFD? Why it is widely used as a research tool now days?	03
	(b)	Explain Eigen value method for determining the classification of PDEs.	04
	(c)	Derive an energy equation in non conservation form.	07
Q.2	**(a)**	Explain Reynolds transport theorem.	03
	(b)	Explain Domain and boundaries for the solution of parabolic equations in two dimensions.	04
	(c)	Explain finite volume central differencing scheme.	07

OR

	(c)	Discuss in detail Navier-Stokes equation.	07
Q.3	**(a)**	State applications of CFD in various fields.	03
	(b)	Differentiate FDM, FEM and FVM.	04
	(c)	What is Discretization? Why it is required? List the basic discretization techniques.	07

OR

Q.3	**(a)**	Explain inlet and outlet boundary condition.	03
	(b)	Write a short note on structured grid.	04
	(c)	Discuss in detail Tridiagonal Matrix Algorithm.	07
Q.4	**(a)**	Write a short note on Explicit approach.	03
	(b)	Discuss ADI scheme.	04
	(c)	Solve FVM problem for 1-D heat diffusion.	07

OR

Q.4	**(a)**	Explain Domain and boundaries for the solution of elliptic equations in two dimensions.	03
	(b)	What is Grid? List out factor affecting of grid generation.	04
	(c)	Explain PISO algorithm.	07
Q.5	**(a)**	Explain RANS modeling in brief.	03
	(b)	Differentiate between explicit and implicit approach.	04
	(c)	Explain SIMPLE algorithm.	07

OR

Q.5	**(a)**	What is Grid Transformation? Why it is required?	03
	(b)	Write a short note on Lax-Wendroff technique.	04
	(c)	Explain finite volume method for one dimensional steady state diffusion problem.	07

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