

**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**

**Q.5 (a)** Differentiate between structured and unstructured grid.

**03**

**(b)** Explain in brief: Staggered grid.

**04**

**(c)** Explain SIMPLE algorithm.

**07**

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