

**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  $(\partial^2 u / \partial x \partial y)_{ij}$ . **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**

\*\*\*\*\*