

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – SUMMER • 2014****Subject Code: 150104****Date: 17-06-2014****Subject Name: Computational Fluid Dynamics - I****Time: 10.30 am - 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.

- Q.1** (a) Justify CFD is a research tool. Write and explain the steps involved in CFD process. **07**
- (b) What is the difference between the Euler's model and Navier Stokes model of equations? Write the generic form of Navier Stokes model. **07**
- Q.2** (a) Derive the momentum equation used in computational fluid dynamics **07**
- (b) Explain the general methods of determining the classification of PDEs. **07**
- OR**
- (b) Explain the domain and boundaries for the solution of hyperbolic equations for 2-D and 3-D steady flows. **07**
- Q.3** (a) Compare the different discretization techniques. Explain the finite volume method **07**
- (b) Write a short note on adaptive grids and compressed grids **07**
- OR**
- Q.3** (a) Explain discretization error and round off error and discuss its significance in numerical solutions. **07**
- (b) Explain in detail the implicit and explicit approaches applied to PDEs. **07**
- Q.4** (a) Explain the Rich Mayer method for the numerical approach to solve fluid flow equations **07**
- (b) Write a short note on a one sided finite difference alternative approach **07**
- OR**
- Q.4** (a) Explain Lax Wendroff scheme and explain the concepts of consistency and stability. **07**
- (b) Define substantial derivative and partial derivative also describe the relation between the two. **07**
- Q.5** (a) Write a short note on shock fitting and shock capturing methods **07**
- (b) Derive the difference equation for one dimensional heat conduction equation. **07**
- OR**
- Q.5** (a) Draw and explain the subsonic-supersonic flow through the C-D nozzle and also show the variation in properties along the length of nozzle **07**
- (b) Derive the momentum equation for the 2-D subsonic supersonic flow through C-D nozzle. **07**
