

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – II • EXAMINATION – WINTER 2012

Subject code: 1721005**Date: 02-01-2013****Subject Name: Computational Fluid Dynamics****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) Explain CFD analysis process in brief. **07**
(b) Give Classification of the 2nd order partial differential equation and discuss the physical boundary conditions. **07**

- Q.2** (a) Derive all types of finite difference approximations for 1st order, 2nd order and 2nd order mixed partial derivatives. **07**
(b) Derive forward time central space explicit scheme for the 1D unsteady heat conduction equation and discuss its stability. **07**

OR

- (b) Discuss the differences between Explicit and Implicit finite difference scheme in brief. **07**

- Q.3** (a) Write a note on isoperimetric elements. **07**
(b) Explain Galerkin finite element method using any one example. **07**

OR

- Q.3** (a) Discuss the advantages and limitations of finite difference method and finite element method. **07**
(b) Formulate the 1D linear element, 1D quadratic element, 2D linear triangular elements of finite element method. **07**

- Q.4** (a) Write a note on structured and unstructured grid in finite volume method for complex geometry. **07**
(b) Write notes on upwind difference scheme of finite volume method. **07**

OR

- Q.4** (a) Write notes on central difference scheme of finite volume method. **07**
(b) Formulate two dimensional incompressible viscous flow equations using MAC method. **07**

- Q.5** (a) Write a note on Cell-Centered and Cell-Vertex Schemes of finite volume method. **07**
(b) Give brief introduction of MAC (Marker & Cell) method to solve the unsteady Navier-Stokes equations. **07**

OR

- Q.5** (a) Explain the four basic rules of SIMPLE (Semi Implicit Method for Pressure Linked Equations) method in detail. **07**
(b) Discuss advantages and disadvantages of stream function- vorticity formulation approach for solving viscous incompressible flows. **07**
