

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-V • EXAMINATION – WINTER 2013

Subject Code: 150104**Date: 02-12-2013****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) What is CFD? Justify CFD is an advanced research tool. Compare it with the wind tunnels. **07**
(b) Explain in brief the steps involved to solve a problem using CFD software. **07**
- Q.2** (a) Derive the momentum and continuity equation in non conservation form for 3-D unsteady inviscid flow. **07**
(b) Obtain the conservation form of the equations derived in Q2 (a). **07**
- OR**
- (b) Derive the energy equation for the 3-D, unsteady inviscid flow in conservation and non-conservation forms. **07**
- Q.3** (a) Consider a small perturbed flow and get the roots of such equations by the Cramer's rule. **07**
(b) Explain the Mac-cormark Technique in detail. **07**
- OR**
- Q.3** (a) Explain in general the parabolic and hyperbolic nature of the partial differential equations. **07**
(b) Write a short note on shock fitting and shock capturing method. **07**
- Q.4** (a) Explain in brief the concept of adaptive grid and compressed grid. **07**
(b) Explain in detail the Lax Wandroff Technique to handle the PDEs. **07**
- OR**
- Q.4** (a) Explain in detail the implicit and explicit approaches applied to PDEs. **07**
(b) Compare the different discretization techniques. Explain the different finite difference schemes. **07**
- Q.5** (a) Write a short note on Method of Relaxation. **07**
(b) Explain the boundary conditions for subsonic inflow and supersonic outflow for convergent divergent nozzle. **07**
- OR**
- Q.5** (a) With an example explain the finite volume method. **07**
(b) Derive the momentum equation for 1-D subsonic-supersonic convergent divergent nozzle. **07**
