

GUJARAT TECHNOLOGICAL UNIVERSITY**ME - SEMESTER– II (Old course)• REMEDIAL EXAMINATION – SUMMER 2015****Subject Code: 1721005****Date:15/05/2015****Subject Name: Computational Fluid Dynamics****Time: 02:30 pm to 5:00 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? Why it is needed as a tool for research and design of complex problems in the field of thermal science and fluid mechanics? **07**
- (b) Derive step by step expressions of finite element method for Steady one dimensional heat conduction problem. **07**
- Q.2** (a) Differentiate Finite Element Method and Finite Volume Method. **07**
- (b) Explain Galerkin finite element method using any one example. **07**
- OR**
- (b) What are Neumann and Dirichlet boundary conditions? Explain various types of boundary conditions. **07**
- Q.3** (a) Write a brief note on Numerical versus analytical solutions. **07**
- (b) Derive integral form of general equation of heat conduction in Cartesian coordinates. **07**
- OR**
- Q.3** (a) Write a note on Cell-Centred and Cell-Vertex Schemes of finite volume method. **07**
- (b) Derive Integral form of energy conservation equation along X-direction **07**
- Q.4** (a) List out different turbulence models. Explain RANS model for turbulent flow problem. **07**
- (b) Discuss (1) Shape Function, (2) Computational Error, (3) Order of Differentiation. **07**
- OR**
- Q.4** (a) What do you mean of validation? Why it is needed? **07**
- (b) Derive integral form of momentum conservation equation along Y-direction. **07**
- Q.5** (a) Classify and describe different types of grid for finite volume methodology. **07**
- (b) Derive and Prove that the vorticity vector is the curl of the velocity vector. **07**
- OR**
- Q.5** (a) Derive expressions for viscous incompressible flow using MAC algorithm. **07**
- (b) Discuss the advantages and limitations of finite difference method and finite element method. **07**
