(Please write your Enrolment number immediately) Enrolment Number :_____

End-Term Examination

B.Tech Seventh Semester,

Paper Code : CADM-401T **Subject :** Computational Fluid Dynamics

Max Marks: 75 **Time** : 1:30 Hrs.

Note: Attempt all questions as directed internal choice is indicated.

Q.1 Attempt any five of the following. **[Marks : 5 x 5 =25]**

(i) Write the Continuity equation for 2-Dimensional Incompressible steady state flow.?

(ii) Explain different types of boundary conditions for solving Partial differential equations.

(iii) Write the unsteady heat conduction equation for the constant specific heat.?

(iv) Draw a flow-chart for the solution algorithm of flow problems using stream function vorticity method.

(v) What are the difficulties in solving the Navier-Stokes equation?

(vi) What is difference between SIMPLE and SIMPLER methods

(vii) What are the advantages and disadvantages of solving a real-world problem using CFD?

(viii) Explain the applications of CFD for enhancing design of electronics components?

Q.2 Derive a finite difference expression of $O(\Delta x)^4$ for $\left(\frac{\partial^2 T}{\partial x^2}\right)_i$ using a stencil comprising points i -2, i -1, i, i+1, i+2 **[Marks : 12.5]**

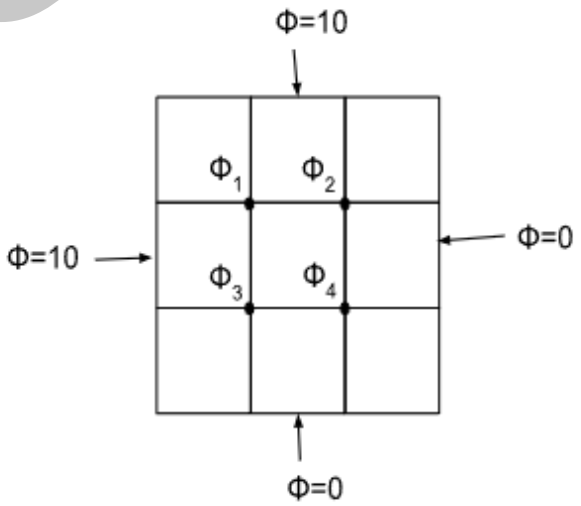
OR

Q.3 What are the common types of errors in CFD? Explain each with suitable examples **[Marks : 12.5]**

Q.4 In a steady state two-dimensional situation, the variable Φ is governed by

$$\text{div}(\rho u \Phi) = \text{div}(\Gamma \text{ grad } \Phi) + a\Phi$$

Where ρ =1 , r =1, The flow field is such that a=1, u = 2 and v =1 everywhere. For the uniform grid shown below Δx = Δy =1. The value of Φ is given at four boundaries. Derive set of algebraic equations to evaluate Φ_1, Φ_2, Φ_3, Φ_4. Suggest methodology to solve these equations to determine the unknown variable. **[Marks : 12.5]**



OR

Q.5 Derive the finite difference scheme for the 1-Dimensional unsteady heat conduction equation using an explicit lime marching technique. Evaluate the stability criterion for the proposed scheme. **[Marks : 12.5]**

Q.6 Explain the sequence of operations for The SIMPLE Algorithm **[Marks : 12.5]**

OR

Q.7 Explain the sequence of operations for solution of flow-field using the stream function vorticity method. **[Marks : 12.5]**

Q.8 Explain the various computer graphic techniques used in CFD. **[Marks : 12.5]**

OR

Q.9 Write a note on 'Future of CFD'. **[Marks : 12.5]**