Elements of Computational Fluid Dynamics
Time:-Three Hours   Full Marks:-100

Answer any **five** Questions

1. a)   The analysis of fluid flow and heat transfer can be done better by CFD tools, explain thoroughly by an example.   (10)

    b)   By a pictorial diagram explain the role of a computer in solving fluid flow and heat transfer problems in CFD.   (10)

2. a) What is the canonical form of a partial difference equation? Explain in details parabolic, elliptic and hyperbolic PDEs.   (15)

    b) What do you understand by discretisation of the domain or the grid generation? How a grid is identified by indices?   (05)

3. Explain thoroughly different types of boundary conditions used in solving PDEs.   (20)

4. Explain thoroughly what do you understand by central, forward and backward different scheme. When they are used? With a neat diagram show the neighboring points (a_p, a_E, a_w, a_N, a_S) used in this schemes.   (20)

5. What is discretisation of PDE equation? Find second order accurate discretisation equations for

$$\frac{\partial \phi}{\partial x} \text{ and } \frac{\partial^2 \phi}{\partial x^2}$$ (20)

6. a) Write down an elliptic equation. With a neat diagram of geometry show how the same can be solved using the boundary conditions.   (10)

    b) Write down the Navier-Stokes equation is a 2-D flow and explain different terms.
                                    (10)

7. Explain different errors in numerical algorithm. What are convergence and stability?   (20)

8. Write down Laplace's equation and the algorithm for solving the same.   (20)