BACHELOR OF ENGINEERING (MECHANICAL ENGINEERING) FIFTH YEAR FIRST SEMESTER EXAM 2019 (OLD)

Ref. no. : EX/ME/5/T/513D/2019 (Old)

Computational Fluid Dynamics

Time:-Three Hours   Full Marks:-100

Answer any **five** Questions

Assume any data if not given with proper justification

1. Why Computational Fluid Dynamics (CFD) is so important in solving the fluid flow and heat transfer problems? What is the role of a computer in solving fluid flow and heat transfer problems in CFD?   (10+10=20)

2. a) Write down in details different types of Partial Differential equations used in CFD.   (15)

    b) What do you understand by grid generation? How a grid is identified by indices?   (05)

3. Explain central, forward and backward different scheme. When they are used?   (20)

4. What is discretization of equation? Find second order accurate discretization equations for $\partial \phi / \partial x$.   (20)

5. Explain different types of boundary conditions.   (20)

6. Explain different types of errors. On what factors truncation error is dependent? Show the grids and boundary conditions pictorially for elliptic equations.   (20)

7. Write a FORTRAN computer program for solving Laplace's equation.   (20)

8. Write short note on any two.   (20)
    a) Uniform and non-uniform grid
    b) Navier-stokes equation
    c) Parabolic equation
    d) Convergence
    e) No-slip boundary condition