Ex/ME/T/326C/2018 (Old)

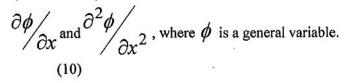
Elements of Computational Fluid Dynamics

Time:-Three Hours

Full Marks:-100

Answer any five Questions

- 1. Explain the importance of CFD in solving the fluid flow and heat transfer problems by an example. (20)
- 2. Classify the Partial Differential equations and explain thoroughly how they can be solved with different boundary conditions. (20)
- 3. a) Explain thoroughly what you understand by forward and backward different schemes. When they are used? (10)
 - b) Find by forward difference scheme the second order accurate expressions for



- 4. What do you understand by the grid generation? What are uniform and non-uniform mesh systems? When they are used? Show a typical grid in cylindrical coordinate. (20)
- 5. Explain different types of errors and convergence, stability. On what factors truncation error is dependent? Show the grids and boundary conditions pictorially for elliptic equations. (20)
- 6. Find the expression for the truncation error related with the unsteady heat equation as:

$$\frac{\partial T}{\partial t} = \alpha \frac{\partial^2 T}{\partial x^2}, \text{ where } T \text{ is the temperature and } \alpha \text{ is the thermal diffusivity.}$$
 (20)

- 7. Explain different boundary conditions used in solving PDEs. (20)
- 8. Write short note on any two. (20)
 - a) Upwinding scheme b) Central different scheme c) Use of Order of Magnitude for N-S equations d) Importance of Computer in CFD