USN [A Y 1 7 A E 0 4 8]   17AE/AS72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Computational Fluid Dynamics

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Elaborate philosophy of CFD and what are the applications of CFD related to aeronautical engineering. **(10 Marks)**
   b. What are the governing equations in CFD? Explain them with their conservation form using integral form and differential form. **(10 Marks)**

OR

2 a. What is the essence of discritization? Explain with neat diagram. **(08 Marks)**
   b. Explain: (i) Dirichlet and Neumann Boundary Condition (ii) No slip boundary conditions (iii) Viscous flow and inviscid flow **(12 Marks)**

Module-2

3 a. What is Taylor series approach for the construction of finite difference quotients of a partial derivative term $\left(\dfrac{\partial u}{\partial x}\right)$. **(10 Marks)**
   b. Write short note on stability properties of explicit scheme on CFD. **(10 Marks)**

OR

4 a. Explain Lax-Wandroff technique with artificial viscosity. **(08 Marks)**
   b. Glimpse on Jacobean, Gauss Seidal and SLDR techniques. **(12 Marks)**

Module-3

5 a. Explain the difference between structured and unstructured grids with neat sketches. **(08 Marks)**
   b. Elaborate on surface grid generation. **(12 Marks)**

OR

6 a. With any of the grid generation technique. Explain unstructured grid generation in detail. **(16 Marks)**
   b. Explain the role of grid control functions. **(04 Marks)**

Module-4

7 a. Explain multi block adaptive structured grid generation. **(16 Marks)**
   b. Define mesh refinement method. **(04 Marks)**

OR

8 a. Describe general transformation of equation from a physical plane to computational plane with neat sketches. **(16 Marks)**
   b. Define parallel processing. **(04 Marks)**

Module-5

9 a. Briefly explain finite volume technique with neat diagram. **(10 Marks)**
   b. Write short notes on cell Vertex formulation. **(10 Marks)**

OR

10 a. Explain flux vector splitting. **(10 Marks)**
    b. Elaborate on : (i) Numerical dissipation (ii) Numerical dispersion **(10 Marks)**

*****