8. Write notes on the following :

    (a)   Iterative solvers

    (b)   Post processing

    (c)   Parallel computing

    (d)   H-type topologies.

G341

B. Tech. EXAMINATION, May 2019

(Seventh Semester)

(B. Scheme) (Re-appear Only)

(AER)

AER401B

COMPUTATION FLUID DYNAMICS

Time : 3 *Hours*]   [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. The temperature ratio for an isentropic flow is given by :

$$\frac{T_0}{T} = 1 + \frac{\gamma - 1}{2} M^2$$

The value of T_0/T at M = 2.0 is 1.8 find the value at M = 2.5 using finite differences and find the error w.r.t. exact value.

2. Take an example of ID flow in a pipe. Temperature of air rises as it moves downstream. Calculate the temperature difference analytically and numerically.

Unit II

3. What is finite volume ? How is it being used in CFD ? Show the descritization of any volume by finite volume method and show the different elements and the computational nodes ?

4. For a convergent divergent nozzle having a shock wave in the diverging section, describe the shock capturing procedure.

Unit III

5. (a) What is the use of finite element method ? How many types of elements are used in the process of FEM.

   (b) What are the characteristics of bi-linear and tri-linear elements ? Explain how linear elements can create errors in the solution ?

6. What are the common classical models based on RANS for turbulence modeling. Explain $k\text{-}\in$ model in detail.

Unit IV

7. What are the different methods of grid generation ? What are structured and unstructured grids ? Take flow over an airfoil and generate a grid for the purpose of flow analysis.