Code No:**R164103A** **R16** **Set No. 1**

IV B.Tech I Semester Supplementary Examinations, February- 2020

COMPUTATIONAL FLUID DYNAMICS

(Common to Mechanical Engineering, Automobile Engineering and Aeronautical Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B
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PART–A *(14 Marks)*

1. a) What is error propagation? [3]
   b) What are the direct methods of banded matrix? [2]
   c) Write the applications of finite difference method? [3]
   d) What is difference between explicit and implicit schemes? [2]
   e) Explain 1st order Upwind scheme. [2]
   f) How Finite Volume Method Works? Explain in brief. [2]

PART–B *(4x14 = 56 Marks)*

2. a) Explain the term consistency in numerical schemes. [7]
   b) Explain the direct method for matrix inverse. [7]

3. a) Solve the following system by using the Gauss-Jordan elimination method.
   $x + y + z = 5$
   $2x + 3y + 5z = 8$
   $4x + 5z = 2$ [7]
   b) Briefly explain partial pivoting and LU decomposition used in direct method. [7]

4. a) How the pressure gradient term is eliminated from the momentum equations using Vorticity – Stream Function method? [7]
   b) Explain Implicit scheme in transient heat conduction. [7]

5. a) Explain about basic fundamentals of fluid flow modeling. [7]
   b) Explain in brief about elementary finite difference quotients. [7]

6. a) Derive the upwind differencing schemes properties of discretization schemes? [7]
   b) What are the fundamentals of fluid flow modelling? [7]

7. a) Explain Finite Volume Method for One dimensional Unsteady heat conduction. [7]
   b) Explain finite volume method (FVM) for two dimensional diffusion problems given by, $\frac{\partial}{\partial x}\left(\Gamma\frac{\partial \phi}{\partial x}\right)+\frac{\partial}{\partial y}\left(\Gamma\frac{\partial \phi}{\partial y}\right)+s=0$ [7]

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