CBCS SCHEME

USN | | | | | | | | | | |

18AS62

Sixth Semester B.E. Degree Examination, July/August 2022
Computational Fluid Dynamics

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Explain about different models of flow used in CFD. Write its substantial derivative and physical meaning of divergence of velocity. **(10 Marks)**

b. Write the governing equations of CFD. Also write the conservation equations in integral and differential form. **(10 Marks)**

OR

2 a. Explain the following:
(i) Dirichlet and Neumann boundary condition
(ii) Shock capturing and shock fitting techniques
(iii) No slip boundary conditions. **(12 Marks)**

b. Explain about essence of descritization with diagram. **(08 Marks)**

Module-2

3 a. Using Cramer's rule, explain about quasi linear partial differential equation and its classification. **(10 Marks)**

b. Explain about Taylor's series approach and construction of finite difference quotients of partial derivative term $\left(\frac{\partial u}{\partial x}\right)$. **(10 Marks)**

OR

4 a. Explain Lax-Wandroff technique with artificial viscosity. **(10 Marks)**

b. With a neat sketch, compare the general behaviors of partial differential equations. **(10 Marks)**

Module-3

5 a. Explain the difference between structured and unstructured grids with neat sketch. **(10 Marks)**

b. Explain about algebraic grid generation and obtain its expression. **(10 Marks)**

OR

6 a. Explain about adaptive grid methods and its types. **(14 Marks)**

b. Write about the role of grid control functions. **(06 Marks)**

Module-4

7 a. Explain the following terms:
(i) Errors and stability analysis
(ii) Time and space marching
(iii) Mesh refinement method
(iv) Parallel processing **(16 Marks)**

b. Using finite difference method approximate the continuity equation, $\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}=0$. **(04 Marks)**

OR

8 a. Explain about general transformation of equation from a physical plane to computational plane with neat sketch and reason for transformation. **(12 Marks)**

b. Explain Matrices and Jacobian determinant and convert the Laplace equation $\frac{\partial^2 T}{\partial X^2} + \frac{\partial^2 T}{\partial Y^2} = 0$ using matrices. **(08 Marks)**

Module-5

9 a. Explain about Finite Volume Technique used in CFD with neat diagram. Also explain about methods with neat sketch. **(12 Marks)**

b. Explain temporal discritization method using explicit and implicit time stepping methods. **(08 Marks)**

OR

10 a. Using finite volume discritization scheme on one dimensional steady heat conduction equation $K\left(\frac{d^2T}{dx^2}\right) + S = 0$ where 'K' is thermal conductivity of the material, 'T' is the temperature and 'S' is source head. **(10 Marks)**

b. Explain about Flux Vector Splitting Scheme. **(10 Marks)**

* * * * *