

CBCS SCHEME

17AE/AS72



USN

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024

Computational Fluid Dynamics

Max. Marks: 100

Time: 3 hrs.

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

Module-1

- 1 a. Derive an equation for substantial derivative and quote its physical significance. (12 Marks)
b. Explain Shock fitting and Shock capturing technique. (08 Marks)

OR

- 2 a. Derive divergent form of 3d momentum equation with a neat sketch. (14 Marks)
b. Explain different models of flow. (06 Marks)

Module-2

- 3 a. Explain parabolic, hyperbolic and elliptic forms of equations. (10 Marks)
b. Explain Cramer Rule and Eigen Value methods for classification of partial differential equations. (10 Marks)

OR

- 4 a. Explain the impact of partial differential equation classification on steady in viscid supersonic flow. (10 Marks)
b. Describe the general behaviour of the different classes of partial differential equations. (10 Marks)

Module-3

- 5 a. Explain different types of Grids. (14 Marks)
b. Explain essential properties of Grids. (06 Marks)

OR

- 6 a. Define Grid quality and also explain factors which effect Grid quality. (08 Marks)
b. Explain structured Grid generation techniques. (12 Marks)

Module-4

- 7 a. Explain Time marching and Space marching. (10 Marks)
b. Explain Reflection boundary condition and Relaxation techniques. (10 Marks)

OR

- 8 a. Explain Explicit and Implicit approaches of Finite difference equations. (10 Marks)
b. Explain Upwind scheme and Numerical viscosity. (10 Marks)

Module-5

- 9 a. What is Finite Volume Scheme? Explain. (10 Marks)
b. Explain Cell centered and Cell Vertex techniques. (10 Marks)

OR

- 10 a. Explain Explicit and Implicit time stepping. (10 Marks)
b. Explain Flux vector splitting and Upwind biasing. (10 Marks)

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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.