

# CBCS SCHEME

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18AE72

**Seventh 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.**

### Module-1

- 1 a. What are CFD ideas to understand? (15 Marks)
- b. Describe physical boundary condition. (05 Marks)

OR

- 2 a. Derive momentum equation for finite control volume fixed in space. (15 Marks)
- b. What is form of governing equations particularly suited for CFD works? (05 Marks)

### Module-2

- 3 a. Explain mathematical behavior of PDEs. (06 Marks)
- b. Explain Cramer Rule technique for determining of classification of PDEs. (14 Marks)

OR

- 4 Explain the impact of classification on physical and computational fluid dynamics with case studies. (20 Marks)

### Module-3

- 5 a. Explain features of structured and unstructured grids. (08 Marks)
- b. Describe Delaunay – Voronoi method for unstructured grid generation. (12 Marks)

OR

- 6 a. What are the structured grid adaptive methods? (10 Marks)
- b. What are unstructured grid adaptive methods? (10 Marks)

### Module-4

- 7 a. Describe the explicit and implicit approach for solution of PDEs through finite difference discretisation. (10 Marks)
- b. Explain time marching and space marching techniques in finite difference solutions. (10 Marks)

OR

- 8 a. Explain matrices technique for transforming grids from physical plane to computational plane. (10 Marks)
- b. Explain Jacobian technique for transforming of grids form physical plane to computational plane (10 Marks)

### Module-5

- 9 a. Describe the essence of finite volume discretisation. (10 Marks)
- b. Explain flux vector splitting. (10 Marks)

OR

- 10 a. Describe cell centered scheme in finite volume discretisation. (10 Marks)
- b. Explain the finite volume solution to diffusion problem below :

$$\frac{d}{dx} \left( K \frac{dT}{dx} \right) = 0.$$

(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.