

# CBGS 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.