



CBCS SCHEME

17AE72

Seventh Semester B.E. Degree Examination, June/July 2023

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. Derive the momentum equation in integral and differential form using control volume approach. Write the equations which are applicable based on models of flow. (12 Marks)
- b. Write about requirement of computing power for CFD. Explain about PRAM concept and types of parallel computers. (08 Marks)

OR

- 2 a. Obtain the relation for energy equation in Integral form using control volume approach and write the applicable equations based on models of flow. (10 Marks)
- b. Draw and explain the shock fitting and shock capturing techniques used in CFD. (10 Marks)

Module-2

- 3 a. Using Cramer rule, narrate the method to determine the classification of Quasi-linear PDE. Solve the small perturbation equation and justify. (12 Marks)
- b. Explain parabolic equation and its impact on physical and CFD.
 - (i) Steady boundary layer flows
 - (ii) Unsteady thermal conduction(08 Marks)

OR

- 4 a. Using Eigen value method, narrate the method to determine the classification of quasilinear PDE. (10 Marks)
- b. Explain hyperbolic equation and its impact on physical and CFD:
 - (i) Steady inviscid supersonic flow
 - (ii) Unsteady inviscid flow(10 Marks)

Module-3

- 5 a. With the help of relevant sketch, explain the elliptical grid generation. (10 Marks)
- b. Describe Dealaunay-Voronoi method for unstructured grid generation method. (10 Marks)

OR

- 6 a. Discuss the Lagrange polynomial and obtain its relation. (10 Marks)
- b. Discuss the important parameters of grid quality. (10 Marks)

Module-4

- 7 a. Compare and differentiate between numerical viscosity and artificial viscosity. (10 Marks)
- b. Obtain the relation for Lax-Wendroff technique. (10 Marks)

OR

- 8 a. Differentiate between explicit and implicit approach of finite difference equation with neat sketch. (10 Marks)
- b. Obtain the relation for matrices and Jacobians in the transformations. (10 Marks)

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-5

9 Draw neatly and explain about:

- (i) Cell centred scheme
- (ii) Cell vertex scheme with dual control volume
- (iii) Cell vertex scheme with overlapping control volume
- (iv) Upwinding scheme

(20 Marks)

OR

- 10 a. Write about temporal discretization techniques and its methods.
b. What is flux vector splitting technique and obtain the relation?

(10 Marks)

(10 Marks)

* * * * *