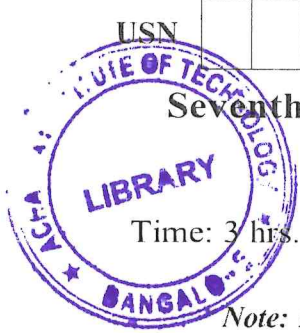




Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026
Computational Fluid Dynamics

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. M : Marks, L: Bloom's level, C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Derive the momentum equation considering an infinitesimally small fluid element moving with the flow, for an unsteady, three-dimensional compressible and viscous flow with visual notations.	10	L3	CO1
	b.	Explain why Computational Fluid Dynamics (CFD) is considered a research tool. Discuss its importance in aerospace and non-aerospace applications.	10	L2	CO1
OR					
Q.2	a.	Derive an equation for substantial derivative and explain its physical significance.	10	L3	CO1
	b.	Define boundary conditions and explain the physical boundary conditions commonly used in Computational Fluid Dynamics (CFD).	10	L2	CO1
Module – 2					
Q.3	a.	Explain the general behavior of hyperbolic equations with the help of a neat sketch.	10	L2	CO1
	b.	Derive and describe the eigen value method used to classify partial differential equations.	10	L3	CO1
OR					
Q.4	a.	Explain the case study of steady inviscid supersonic flow in classification of partial differential equations.	10	L2	CO2
	b.	Explain the impact of partial differential equation classification on unsteady thermal conduction phenomenon.	10	L2	CO2
Module – 3					
Q.5	a.	Explain elliptic grid generation with the help of a relevant sketch.	10	L2	CO3
	b.	Define grid quality and explain the measures used to assess grid quality.	10	L2	CO3

OR

Q.6	a.	Explain the advantages and disadvantages of structured and unstructured grids.	10	L2	CO3
	b.	Explain the concept of : i) Adaptive grid ii) Meshless grids with suitable examples	10	L2	CO3

Module – 4

Q.7	a.	Explain the concept of discretization and describe how a finite difference quotient is obtained using the Taylor series approach.	10	L3	CO4
	b.	Explain the transformation of governing partial differential equations from the physical domain to the computational domain.	10	L3	CO4

OR

Q.8	a.	Explain the differences between explicit and implicit finite difference approaches.	10	L3	CO4
	b.	Explain the concepts of time marching and space marching techniques.	10	L3	CO4

Module – 5

Q.9	a.	Explain the cell-centered and cell-vertex techniques used in spatial discretization.	10	L2	CO5
	b.	Explain explicit and implicit time-stepping methods used in temporal discretization.	10	L2	CO5

OR

Q.10	a.	Explain the finite volume technique with the help of a neat diagram.	10	L2	CO5
	b.	Explain the concepts of artificial dissipation and flux limiters.	10	L2	CO5
