A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 99705

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Elective

Mechanical Engineering

19UME905– COMPUTATIONAL FLUID DYNAMICS

(Regulations 2019)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Flow in which each particle of fluid follows an irregular path is CO1- U

   (a) laminar flow (b) turbulent flow (c) mixed flow (d) cross flow

2. When a direct computation of dependent variables can be made in terms of known quantities, computation is said to be CO1- U

   (a) implicit (b) explicit (c) unique (d) dependent

3. Navier-stokes equation is useful in analysis of CO1- U

   (a) viscous flow (b) non viscous flow (c) Turbulent flow (d) None of these

4. Quadrilateral mesh is most common in CO1- U

   (a) Structured mesh (b) unstructured mesh

   (c) Dirichlet mesh (d) None of these

5. Discretization technique is CO1- U

   (a) Finite volume (b) Finite difference (c) Finite element (d) All of these

6. Triangular mesh is common in CO1- U

   (a) Structured mesh (b) unstructured mesh (c) Dirichlet mesh (d) None of these

7. Ratio of flow inertia to external field is called CO1- U

   (a) Froude number (b) Mach number

   (c) Reynolds number (d) cavitation number

8. Representation of finite difference derivative is based on CO1- U

(a) Taylor series expansion (b) Newton's 2nd law

(c) Fredrick law (d) None of these

9. Inverse of Euler number is CO1- U

(a) Reynolds number (b) Mach number

(c) Ruark number (d) cavitation number

10. Bernoulli's equation is applicable for CO1- U

(a) laminar flow (b) turbulent flow

(c) Both laminar and turbulent (d) None of these

PART – B (5 x 2= 10Marks)

11. Define control volume. CO1- U

12. How to improve the accuracy of Finite Difference solutions? CO1- U

13. Define Discretization. CO1- U

14. Define Froude Number CO1- U

15. Define Staggered Grid. CO1- U

PART – C (5 x 16= 80Marks)

16. (a) Derive the momentum equation for a 3D compressible flow CO3 -App (16)

Or

(b) Identify the nature of the following systems of partial differential equations $\partial u/\partial x=\partial v/\partial y=\partial u/\partial y=$where u and v are the two dependent variables CO3 -App (16)

17. (a) Develop the Elliptic equations using Finite Difference Solution methods. CO3- App (16)

Or

(b) Derive the Accuracy of Finite Difference Solutions CO3 -App (16)

18. (a) Derive the FVM for 1D Steady State Diffusion. CO3 -App (16)

Or

(b) Clarify Implicit method for 2D and 3D scheme and derive the discretization for transient convection diffusion equation. CO3- App (16)

19.	(a)	Discuss in detail about the role of QUICK scheme and its variants in numerical analysis	CO4 -App	(16)
		Or		
	(b)	Derive and explain Steady 1D Convection and Diffusion.	CO4- App	(16)
20.	(a)	Discuss and derive SIMPLE Algorithm.	CO5 -App	(16)
		Or		
	(b)	Derive Strain Sensitivity: RNG k-€ model.	CO5 -App	(16)