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

Question Paper Code: 59706

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Elective

Mechanical Engineering

15UME906- COMPUTATIONAL FLUID DYNAMICS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. For partial differential equation, if $b^2 - 4ac = 0$ then equation is called CO1- R

   (a) Hyperbolic (b) Parabolic (c) Elliptic (d) None of these

2. Measure of circulation of fluid is called CO1- R

   (a) Stability (b) Vorticity (c) Mixed flow (d) None of these

3. If flow across boundary is zero, normal velocities are set to be CO2- R

   (a) Maximum (b) Zero (c) Minimum (d) values of nearest node

4. A space of interest where mass can cross boundary is CO2- R

   (a) Control volume (b) Control surface (c) Control system (d) Control boundary

5. For compressible, two-dimensional flows, the minimum number of partial differential equations (pde) to be solved is CO3- R

   (a) 3 (b) 4 (c) 5 (d) 6

6. In steady flow of a fluid, acceleration of any fluid particle is CO3- R

   (a) Constant (b) Zero (c) Variable (d) Non zero

7. If Pu is upstream pressure and Pd is downstream pressure, Euler number is equal to CO4- R

   (a) $Pd - Pu/pV^2$ (b) $Pu - Pd/pV^2$ (c) $Pu - Pd/pV^3$ (d) $Pu - Pd/Pv$

8. Representation of finite difference derivative is based on CO4- R

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

(c) Fredrick law (d) None of these

9. Froude number indicates influence of CO5- R

(a) Gravity (b) Velocity (c) Pressure (d) Temperature

10. Inverse of Euler number is CO5- R

(a) Reynolds number (b) Mach number

(c) Ruark number (d) Cavitation number

PART – B (5 x 2= 10 Marks)

11. Define control volume. CO1- R

12. What are time marching problems? CO2- U

13. Write the Equation of unsteady one dimensional heat conduction. CO3- U

14. What is meant by Boundedness? CO4-U

15. Summarize the advantages of k-€ model. CO5- U

PART – C (5 x 16= 80 Marks)

16. (a) Derive the momentum equation for a 3D compressible flow. CO1- App (16)

Or

(b) Derive the energy equation for a 3D compressible flow. CO1- App (16)

17. (a) Explain the finite difference expressions for first order derivative with forward, backward and central reference approximation using Taylor series expansions. CO2- U (16)

Or

(b) Explain the Accuracy of Finite Difference Solutions CO2- U (16)

18. (a) Explain Two-dimensional heat conduction is governed through Explicit scheme, crank-Nicolson scheme and the fully implicit scheme CO3- U (16)

Or

(b) Explain briefly about Burger's Equation. CO3- U (16)

19.	(a)	Discuss in detail about the role of QUICK scheme and its variants in numerical analysis.	CO4- U	(16)
		Or		
	(b)	Discuss in detail about the Central Difference scheme.	CO4- U	(16)
20.	(a)	Compare the general comments on SIMPLE, SIMPLER, SIMLEC and PISO algorithm.	CO5- Ana	(16)
		Or		
	(b)	Develop k-€ model equation for the turbulence flow.	CO5- Ana	(16)