Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

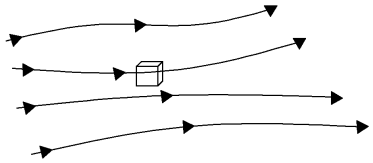
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End term Examination, April/May 2020

Course: Computational Fluid dynamics **Semester: VIII**
Program: (ADE / Mechanical) **Time : 03 hrs.**
Course Code: GNEG403 **Max. Marks: 100**

Instructions:

SECTION A (15*2=30 marks)
(Answer of each question)

S. No.		Marks	CO
Q1	In a one-dimensional flow, the volume integral becomes _____ a) a line integral b) an area integral c) a surface integral d) a surface integral and the Gauss divergence theorem	**2**	**CO1**
Q2	Which of these terms need a volume integral while modelling steady flows? a) Convection term b) Diffusion term c) Source term d) Rate of change term	**2**	**CO1**
Q3	The stability of the Crank-Nicolson scheme for finite volume approach is constrained by ____ a) CFL number b) Peclet number c) Time-step size d) Spatial grid size	**2**	**CO1**
Q4	Which of these terms cause instability in the Crank-Nicolson scheme when used for finite volume approach? a) Anti-diffusion term b) Anti-dispersive term c) Diffusion term d) Dispersive term	**2**	**CO1**
Q5	How many numerical diffusion terms does the second-order upwind Euler scheme have? a) Infinity b) No diffusion term c) One term d) Two terms	**2**	**CO1**

Q6	The numerical dispersion term of the second-order upwind Euler scheme is of ____ a) third-order b) second-order c) first-order d) no dispersion	**2**	**CO1**
Q7	An equation modelled using infinitesimally small element leads to _____ a) Partial differential equation b) Integral equation c) Differential equation d) Linear differential equation	**2**	**CO1**
Q8	If this model is used to get the governing equations, what type of equation will be obtained?  computational-fluid-dynamics-questions-answers-models-flow-q7 a) Non-conservative differential b) Conservative differential c) Conservative integral d) Non-conservative integral	**2**	**CO1**
Q9	Truncation error is the difference between _____ a) the exact solution of the partial differential equation and the discretized equations b) the exact partial differential equation and the discretized equations c) the exact solution and the numerical solution of the partial differential equations d) the exact partial differential equation and its solution	**2**	**CO1**
Q10	Which is the major error occurring due to the finite difference approximations? a) Discretization error b) Round-off error c) Iteration error d) Modelling errors	**2**	**CO1**
Q11	What is the need of constructing a model for analysing fluids? a) Fluids are not stationary but they have the same velocity in different parts b) Fluids are stationary and they have the same velocity in different parts c) Fluids are not stationary and they have different velocities in different parts d) Fluids are not stationary but they have the same velocity in different parts	**2**	**CO1**
Q12	A triangular plane stress element has ……degree's of freedom a) 3 b) 5 c) 7 d) 6	**2**	**CO1**
Q13	In weighted residual technique, the methods adopted are a) Galerkin's method b) b)least square method c) c)none of the above	**2**	**CO1**

	d) d) none of the above		
Q14	The triangular node element is used in a) One dimensional problem b) Two dimensional element c) Three dimensional element d) None of the above	**2**	**CO1**
Q15	In Galerkin's weighted residual method the shape function or interpolation function may be --- a) Same b) Different c) May be same or different d) Depends on the type of equation solved	**2**	**CO1**
	SECTION B (10*5=50 marks) **(Answer of each question should be below 150 words)**		
Q 16	Explain why CFD is both a powerful and a dangerous tool.	**5**	**CO1**
Q 17	Discuss the nature of dispersive and dissipative error in context of numerical discretization.	**5**	**CO2**
Q 18	Explain the types of boundary conditions used in FDM.	**5**	**CO3**
Q 19	Differentiate between the FDM, FVM and FEM.	**5**	**CO1**
Q 20	Give and explain the five errors in CFD and give examples	**5**	**CO!**
Q 21	Discuss about the Burger equation used in Finite difference method	**5**	**CO2**
Q 22	Differentiate between explicit and implicit methodology using one dimensional wave equation	**5**	**CO2**
Q 23	Define the terms consistency and convergence for numerical simulation.	**5**	**CO1**
Q 24	Emphasis on the advantages and limitation of Finite Difference, Finite Element and Finite Volume Method.	**5**	**CO2**
Q 25	Discuss the stability criteria and how it is achieved in numerical solution	**5**	**CO3**
SECTION C (1*20 = 20 marks)			
Q 26	Explain the steps to solve an equation (given in differential form) using Finite volume method. OR Explain the steps to solve an equation (given in differential form) using Finite element method.	**20**	**CO4**