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

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End term Examination, May/June 2021

Course: Computational fluid dynamics **Semester: VIII**
Program: BT / ADE & ME **Time : 03 hrs.**
Course Code: ASEG 4005 **Max. Marks: 100**

Instructions:

SECTION A

S. No.		Marks	CO
Q 1	Enlist the source of error in solving an equation using computation methodology.	6	CO1
Q 2	State the merits and demerits of computational tools.	6	CO1
Q 3	Enlist any four types of element used in FEM along with the interpolation function	6	CO1
Q4	Explain the terms consistency, convergence, stability for numerical simulation	6	CO2
Q5	Explain the LAX method for solving one dimensional wave equation with the CFL condition	6	CO3
Q6	Brief the methodology involved in solving a PDE's equation using numerical method with proper notation system used in space and time domain.	6	CO2

SECTION B

Q 5	Using Taylor series expansion, deduce the discretization for $\partial^2 u / \partial x \partial y$	10	CO3
Q 6	Enlist the different types of boundary conditions and their discretization method used in CFD	10	CO2
Q7	Develop the tri-diagonal matrix for one dimensional heat conduction equation solved using implicit scheme Or Compute the stability analysis for one dimensional heat conduction equation for implicit scheme.	10	CO3
Q8	Develop an algorithm to solve 2-D unsteady heat conduction equation given below using BTCS scheme. $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = \alpha \frac{\partial T}{\partial t}$	10	CO4
Q9	Discuss about the wave equation and its similarity to Navier Stokes equation.	10	CO3

SECTION C

Q 10	Discretize and deduce the FVM equations for orthogonal structural mesh to solve steady state heat conduction equation with heat generation for a cell volume P with unit thickness in direction perpendicular to the paper plane. The boundary conditions are constant temperature, constant heat flux, convection and radiation. Or Discretize and deduce the FVM equations for structure curved mesh to solve first order equation $\frac{\partial E}{\partial t} + \frac{\partial F}{\partial x} + \frac{\partial G}{\partial y} = 0$ for the cell volume P with unit thickness in direction perpendicular the paper plane. The boundary conditions are constant temperature, constant heat flux, convection and radiation	**20**	**CO4**