Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Supplementary Examination, July 2020

Programme Name: B.Tech/Mechanical **Semester : VIII**
Course Name : Computational Fluid Dynamics **Time : 03 hrs**
Course Code : GNEG403 **Max. Marks: 100**
Nos. of page(s) : 02
Instructions: Attempt all the questions as directed. Assume suitable data if required.

SECTION A

S. No.		**Marks**	**CO**
Q 1	Computational fluid dynamics is the method to calculate heat transfer and fluid flow (a) numerically (b) experimentally (c) instantaneously (d) None	**5**	**CO1**
Q 2	Discretization technique is (a) Finite volume (b) Finite difference (c) Finite element (d) All of these	**5**	**CO1**
Q 3	For partial differential equation, if b2-4ac = 0 then equation is called (a) Hyperbolic (b) Parabolic (c) Elliptic (d) None	**5**	**CO1**
Q 4	Truncation error becomes zero as mesh spacing tends to (a) maximum (b) minimum (c) zero (d) none	**5**	**CO2**
Q 5	When a direct computation of the dependent variables can be made in terms of known quantities, the computation is said to be (a) implicit (b) explicit (c) unique (d) dependent	**5**	**CO2**
Q 6	For highly refined mesh, computational time required is (a) low (b) high (c) near to zero (d) none	**5**	**CO2**

SECTION B			
Q 7	Classify the second order partial differential equations.	**10**	**CO1**
Q 8	Differentiate between Finite difference methods, Finite volume method.	**10**	**CO1**
Q 9	Explain the following. a) Truncation error b) Round off error c) Discretization error	**10**	**CO2**
Q 10	Explain the following. a) Stability b) Consistency c) Convergence	**10**	**CO2**
Q 11	Distinguish between : a) Steady flow and un-steady flow, b) Uniform and non-uniform flow, c) Compressible and incompressible flow d) Rotational and irrotational flow e) Laminar and turbulent flow. (OR) (i) Explain finite volume method for one-dimensional steady state diffusion problems. (ii) Discuss in detail the advantages and disadvantages of FVM.	**10**	**CO1**
SECTION-C			
Q 12	Formulate the 1D steady heat conduction with constant heat generation in finite element method. Find out the shape functions and stiffness matrix. Boundary conditions are constant temperature at both the ends . (OR) (i) Differentiate between implicit and explicit finite difference method. (ii) How computational Fluid Dynamics is different from analytical technique? Write its advantages and limitations. (iii) Why forward and backward difference expressions are not more accurate than central difference expressions?	**20**	**CO3**