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

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, July 2020

Course: Introduction to Fluid Mechanics **Semester: IV**
Program: B Tech Civil Engineering **Time: 3 Hours**
Course Code: CIVL 2006 **Max. Marks: 100**

Instructions:
a) Attempt all the questions
b) Strictly follow the time limit prescribed

SECTION A

S. No.		Marks	CO
Q1	Plot the variation of viscosity vs rate of shear strain for a) Toothpaste b) Blood	**4**	**CO1**
Q2	Differentiate between the path line and streak line for the fluid flow study.	**4**	**CO2**
Q3	Explain constructional details of Venturimeter.	**4**	**CO3**
Q4	A dam 15m long is to discharge water at the rate of 100 cumecs under a head of 5m. Design the model head, if the supply available in lab is 50 cumecs.	**4**	**CO4**
Q5	Give example of laminar flow and the turbulent flow. Your example should be **from your surroundings and supported by a picture in a .jpg format**	**4**	**CO4**
	SECTION B		
Q6	A solid cone of radius R and vortex angle 2Θ is to rotate at an angular velocity, ω. An oil of dynamic viscosity 'μ' and thickness 't' fills the gap between the cone and the housing. Determine the expression for required Torque to maintain this angular velocity.	**10**	**CO1**
Q7	Calculate the specific gravity required over a flat plate, if 1.5N force is required to pull a thin plate of surface area $1m^2$ at constant velocity. Thin plate is 0.5m apart from the flat plate. Kinematic viscosity of fluid is 6 Stokes and velocity profile generated is $v = 3y-y^2$.	**10**	**CO1**
Q8	A pitot tube is a device which is used to measure velocity of a flowing fluid and functions on the principle of Bernoulli's Theorem. Demonstrate the working of pitot tube from everyday life example.	**10**	**CO3**
Q9	A pipe carrying water tapers from cross section $0.3m^2$ at A to $0.14m^2$ at B. The average velocity at A is 1.8m/s and pressure is $441kN/m^2$ (gauge). If the frictional effects are negligible, determine the pressure at B, which is 5.5m above the level at A	**10**	**CO3**
	SECTION-C		
Q10	The velocity components in a 2-D flow field for an incompressible flow are expressed as: $u= y^3/3+2x-x^2y$; $v= xy^2-2y-x^3/3$. Then,	**20**	**CO2**

	a) Show that these functions represent a possible case of an irrotational flow b) Obtain an expression for stream function c) Obtain an expression for velocity potential d) Sketch the stream function using suitable assumed values.		
Q11	The pressure difference ΔP in a pipe of diameter D and length l due to the turbulent flow depends upon velocity V, viscosity μ, density ρ and roughness k. Solve it using Buckingham's π theorem to obtain an expression for ΔP.	**20**	**CO4**