UPES Name: **Enrolment No:** UNIVERSITY WITH A PURPOSE UNIVERSITY OF PETROLEUM AND ENERGY STUDIES **Online End Semester Examination, December 2020 Course: Fluid Mechanics** Semester: III **Program: B. Tech. FSE** Time 03 hrs. **Course Code: MECH 2023** Max. Marks: 100 **SECTION A Each Question carries 5 Marks** S. No. Question CO **Q** 1 Define: **CO1** a. Steady and unsteady flow b. Uniform and non-uniform flow c. Laminar and turbulent flow d. Compressible and non-compressible flow Write short note on: Q2 **CO1** a. Vena-contracta b. Temperature-Lapse-Rate Explain the effect of temperature on viscosity of water and that of air. Q3 **CO2** How pressure force is related with surface tension on a hollow liquid bubble? Q4 **CO2** Describe the relationship between Bulk modulus and Pressure of a gas for adiabatic process. O5 **CO2** Describe the principles of floatation and stability 06 **CO1 SECTION B Each Question carries 10 Marks** Q 7 A fluid flow field is given by **CO4**  $V = x^2 yi + y^2 zj - (2xyz + yz^2)k$ Prove that it is a case of possible steady incompressible fluid flow. Calculate velocity and acceleration at the point (2, 1, 3). If, cross sectional area of pipe and throat of a venturimeter are  $a_1$  and  $a_2$  respectively. Then, Q 8 **CO3** derive the expression of actual flow rate:  $Q_{act} = C_d * \frac{a_1 a_2}{\sqrt{a_1^2 - a_2^2}} * \sqrt{2gh}$ Where, "h" is difference of pressure head and "Cd" is coefficient of discharge. Find the convective acceleration at the middle of a pipe which converges uniformly from 0.4 Q 9 **CO4** m diameter to 0.2 m over 2 m length. a. If the rate of flow is 20 L/s.

	<ul> <li>b. If the rate of flow changes uniformly from 20 L/s to 40 L/s in 30 seconds, find the total acceleration at the middle of the pipe.</li> </ul>	
Q 10	Derive Euler's equation of motion: $\frac{dp}{\rho} + gdz + vdv = 0$	CO3
Q 11	Derive the equation for Minor energy (head) loss in pipe flow due to sudden enlargement.	CO3
	Each Question carries 20 Marks.	
Q12	A horizontal pipe line 40 m long is connected to a water tank at one end and discharges	CO5