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

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, December 2021

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: a. Steady and unsteady flow b. Uniform and non-uniform flow c. Laminar and turbulent flow d. Compressible and non-compressible flow	**CO1**
Q 2	Explain the effect of temperature on viscosity of water and that of air.	**CO2**
Q 3	How pressure force is related with surface tension on a hollow liquid bubble?	**CO2**
Q 4	Describe the relationship between Bulk modulus and Pressure of a gas for adiabatic process.	**CO2**
Q 5	Describe the principles of floatation and stability	**CO1**

SECTION B

Each Question carries 10 Marks

Q 6	A fluid flow field is given by $$V = x^2yi + y^2zj - (2xyz + yz^2)k$$ Prove that it is a case of possible steady incompressible fluid flow. Calculate velocity and acceleration at the point (2, 1, 3).	**CO4**
Q 7	If, cross sectional area of pipe and throat of a venturimeter are a_1 and a_2 respectively. Then, 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 "C_d" is coefficient of discharge.	**CO3**
Q 8	Derive Euler's equation of motion: $$\frac{dp}{\rho} + gdz + vdv = 0$$	**CO3**
Q 9	Derive the equation for Minor energy (head) loss in pipe flow due to sudden enlargement.	**CO3**

	Section C **Each Question carries 20 Marks.**	
Q 10	A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter id suddenly enlarged to 300 mm. the height of water level in the tank is 8 m above the Centre of the pipe. Considering all losses of head which occur, determine the rate of flow. Take, coefficient of friction is 0.01 for both section of pipe.	**CO5**
Q 11	Find the convective acceleration at the middle of a pipe which converges uniformly from 0.4 m diameter to 0.2 m over 2 m length. a. If the rate of flow is 20 L/s. 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.	**CO4**