Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Fluid Mechanics **Semester: III**
Program: B. Tech. (ADE, AMNT) **Time : 03 hrs.**
Course Code: MECH 2023 **Max. Marks: 100**

Instructions: Attempt all questions. Assume suitable value if any, missing.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Differentiate between free and forced vortex flow along with suitable examples.	**5**	**CO1**
Q 2	Distinguish between dynamic viscosity and kinematic viscosity	**5**	**CO1**
Q 3	Explain the bourdon tube pressure gauge.	**5**	**CO1**
Q 4	Explain the types of flow of liquid.	**5**	**CO1**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Two large plane surfaces are 2.4 cm apart. The space between the surfaces is filled with glycerin. What force is required to drag a very thin plate of surface area 0.5 m^2 between the two large plane surfaces at a speed of 0.6 m/s, if the thin plate is at a distance of 0.8 cm from one of the plane surfaces? Take the dynamic viscosity of glycerin = 8.10x 10^{-1} Ns/m^2.	**10**	**CO2**
Q 7	Find the magnitude and direction of the resultant force due water acting on a roller gate of cylindrical form of 4.0 m diameter, when the gate is placed on the dam in such a way that water is just going to spill. Take the length of gate as 8 m.	**10**	**CO2**
Q 8	In a two dimensional incompressible flow, the fluid velocity components are given by. $$u = x - 4y \text{ and } v = -y - 4x$$ Show that velocity potential exists and determine its form. Find also stream function.	**10**	**CO2**
Q 9	The water is flowing through a taper pipe of length 100 m having diameter 600 mm at the upper end and 300 mm at the lower end, at the rate of 50 litres/s. the pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is 19.62N/cm^2.	**10**	**CO3**

	OR A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of water. The pressure at inlet is 17.658 N/cm^2 and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through venturimeter. Take Cd= 0.98.		
SECTION-C **(2Qx20M=40 Marks)**			
Q10	A crude oil of viscosity 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe diameter 100 mm and length 10 m. Calculate the difference of pressure at the two ends of the pipe, if 100 kg of oil is collected in a tank in 30 seconds. OR An oil of specific gravity is flowing through a pipe of diameter 300 mm at the rate of 500 litres/s. find the head lost due to friction and power required to maintain the flow for a length of 1000m. Take kinematic viscosity = 0.29 stokes.	**20**	**CO3**
Q11	For the velocity profile for laminar boundary layer $$\frac{u}{U} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^2$$ Determine the boundary layer thickness, shear stress, drag force and coefficient of drag in terms of Reynolds number.	**20**	**CO4**