Name: **Enrolment No:**	

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

Course: Introduction to Fluid Mechanics — **Semester: IV**
Program: B Tech Civil Engineering — **Time: 03 hrs.**
Course Code: CIVL 2006 — **Max. Marks: 100**

Instructions: Attempt all the question

Set-2

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Compare the variation of viscosity vs rate of shear strain for pseudoplastic and dilatant.	**4**	**CO1**
Q 2	A steady, incompressible flow is given by $u = 4x^2 + y^2$ and $v = -4xy$. What is the convective acceleration along x-direction at point (3, 3)	**4**	**CO2**
Q 3	Why the length of converging section in venturimeter is kept shorter than the diverging section?	**4**	**CO3**
Q 4	A sphere is moving in water with a velocity of 1.6 m/s. Another sphere of twice the diameter is placed in a wind tunnel and tested with air, which is 750 times less dense and 60 times less viscous than water. Find the velocity of air that will give dynamically similar conditions.	**4**	**CO4**
Q 5	A ship whose full length is 100 m is to travel at 10 m/s. For dynamic similarity, with what velocity should a 1: 25 model of the ship be towed?	**4**	**CO4**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	A body of specific weight 8000 N/m^3 extends above the surface of sea water of specific weight 1000 N/m^3 .then find the % of total volume of body visible to the observer.	**10**	**CO1**
Q 7	A trapezoid 2m wide at bottom and 1m deep has side slopes 1:1. Determine a) Total pressure b) Centre of pressure on the vertical gate closing the channel when it is full of water.	**10**	**CO1**
Q 8	An orifice meter with diameter 10 cm is inserted in a pipe of 20cm diameter. The pressure gauges fitted u/s and d/s of the orifice meter gives readings of 19.62 N/cm2 and 9.81 N/cm2 respectively. Cd = 0.6. Find the discharge of water through pipe.	**10**	**CO3**
	OR		

Q 8	a) Explain the constructional details of Orificemeter. b) What is the percentage error in the estimation of the discharge due to an error of 2% in the measurement of the reading of a differential manometer connected to an orifice meter?	**10**	**CO3**
Q 9	In a vertical pipe conveying oil of specific gravity 0.8, two pressure gauges have been installed at A and B where the diameters are 16cm and 8cm respectively. A is 2m above B. The pressure gauge readings have been shown that the pressure at B is greater than at A by 0.981 N/cm^2. Neglecting all losses calculate the flow rate. If the gauges at A and B are replaced by tubes filled with the same liquid and connected to a U-tube containing Hg, calculate the difference of level of Hg in the two limbs of the U-tube.	**10**	**CO3**
SECTION-C (2Qx20M=40 Marks)			
Q 10	The variable controlling the motion of a floating vessel through water are the drag force F, the speed v, the length l, the density ρ. Dynamic viscosity μ of water and gravitational constant g. If the non-dimensional groups are Reynolds number (Re), Weber number (We), Prandtl number (Pr) and Froude number (Fr), find the expression for F.	**20**	**CO4**
OR			
Q 10	In order to estimate the energy loss in a pipeline of 4m diameter through which kerosene of specific gravity 0.6 and dynamic viscosity of 0.01 Poise is to be transported at the rate of 4000 lps, model tests were conducted on a 0.2m diameter pipe using water at 20°C. Calculate the discharge required for the model pipe. If the energy head loss in 40m length of the model pipe is measured 8m of water, determine the corresponding head loss in the prototype. Also determine the value of Darcy's friction factor for the prototype pipe. Tae the absolute viscosity of water at 20°C as 10-2 poise.	**20**	**CO4**
Q 11	A 2-D flow is described by the velocity components, **$u=10x^3$; and $v= -10x^2y$.** Evaluate the stream functions, velocity and accelerations at the point P(2,2). Also sketch the steam function.	**20**	**CO2**