Name:

Enrolment No:



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

Course: Fluid Mechanics

Program: B. Tech. (ADE, AMNT)

Course Code: MECH 2023

Semester: III
Time : 03 hrs.
Max. Marks: 100

Attempt all questions Assume suitable value if any missing

Instruc	Instructions: Attempt all questions. Assume suitable value if any, missing.				
SECTION A (5Qx4M=20Marks)					
S. No.		Marks	СО		
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		L		
	(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 = $8.10 \times 10^{-1} \text{ Ns/m}^2$.	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/cm² 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	