

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2023

Course: Fluid Mechanics in Petroleum Engineering
Program: B. Tech. (APE-Upstream)
Course Code: PEAU 2005

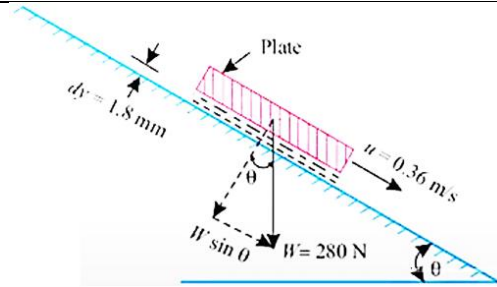
Semester : IV
Time : 3 hr
Max. Marks : 100

Instructions: Assume any missing data. The notations used here have the usual meanings. Draw the diagrams, wherever necessary.

SECTION - A (5 × 4 = 20 marks)
(Answer all the questions)

S. No.		Marks	CO
1.	Discuss the Eulerian description of fluid motion? How does it differ from the Lagrangian description?	4	CO1
2.	Differentiate between streamline and streak line.	4	CO1
3.	Define the terms: notch, weir, nappe, and crest.	4	CO2
4.	Explain the principle and working of orifice meter with a neat sketch.	4	CO2
5.	Describe the characteristics of boundary layer along a thin flat plate.	4	CO2

SECTION - B (4 × 10 = 40 marks)
(Answer all the questions)

S. No.		Marks	CO	
6.	<p>A plate having an area of 0.6 m^2 is sliding down the inclined plane at 30° to the horizontal with a velocity of 0.36 m/s. There is a cushion of fluid 1.8 mm thick between the plane and the plate. Find the viscosity of the fluid if the weight of the plate is 280 N.</p>		10	CO1
7.	<p>A cylindrical tank 0.9 m diameter and 2 m high, open at top is filled with water to a depth of 1.5 m. It is rotated about its vertical axis at $N \text{ rpm}$. Determine the value of N, which will raise the water level even with brim.</p>	10	CO3	

8.	Find the discharge through a trapezoidal notch which is 1.2 m wide at the top and 0.50 m at the bottom and is 40 cm in height. The head of water on the notch is 30 cm. Assume C_d for rectangular portion as 0.62, while that for triangular notch is 0.60.	10	CO4
9.	A pumping plant forces water through a 600 mm diameter main, the friction head being 27m. In order to reduce the power consumption, it is proposed to lay another main of appropriate diameter along the side of the existing one so that the two pipes may work in parallel for the entire length and reduce the friction head to 9.6m only. Find the diameter of the new pipe if with exemption of diameter, it is similar to the existing one in every respect.	10	CO3
SECTION – C (2 × 20 = 40 marks) (Answer all the questions)			
10.(a)	A venturi-meter is used for measurement of discharge of water in horizontal pipeline. If the ratio of upstream pipe diameter to that of throat is 2:1, upstream diameter is 300 mm, the difference in pressure between the throat and upstream is equal to 3 m head of water and loss of head through meter is one-eighth of the throat velocity head, calculate the discharge in the pipe.	12	CO5
(b)	A circular tank of diameter 1.5 m contains water upto a height of 4m. An orifice of 40 mm diameter is provided at its bottom. If $C_d = 0.62$, find the height, if water above the orifice, after 10 minutes.	8	
11.(a)	Discuss major and minor losses in flow through pipes.	5	CO3
(b)	The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300m, 170m and 210 m of diameters 300mm, 200mm, and 400mm respectively is 12m. Determine the rate of flow of water if coefficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering i) both major and minor losses. ii) Considering only minor losses.	15	