Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2021

Programme Name: B. Tech (APE Gas) **Semester : III**
Course Name : Momentum Transfer **Time : 03 hrs**
Course Code : CHCE2003 **Max. Marks: 100**
Nos. of page(s) : 2
Instructions: *The question paper consists of TWO sections. Answer all questions.*
Note: ***Assume suitable data wherever necessary***

Section - A
(Answer all questions)

S. No.		Marks	CO
1.	Derive Euler's equation and obtain Bernoulli's equation from it	**10**	**CO3**
2	If for a two dimensional potential flow, the velocity potential given by $\phi = 4x\,(3y-4)$, determine the velocity at a point (2, 3). Determine also the value of stream function Ψ at a point (2, 3).	**10**	**CO2**
3.	A 30 cm x 15 cm venturimeter provided in a vertical pipeline carrying oil of specific gravity 0.9 and the flow being upwards. The difference in elevation of the throat section and entrance section of the venturimeter is 30 cm. The differential U-tube mercury manometer shows a gauge deflection of 25 cm. Calculate (i) the discharge of oil and (ii) the pressure difference between entrance section and throat section. Take the coefficient of discharge as 0.98.	**10**	**CO4**
4	Water flows through a pipe AB 1.2 m diameter at 3 m/s and then pass through a pipe BC 1.5 m diameter. At C, pipe branches. Branch CD is 0.8 m in diameter and carries one-third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB, and velocity in CD and the diameter of CE.	**10**	**CO5**
5	Describe the working principle of a centrifugal pump with a neat diagram. Define pump priming and explain why it is required.	**10**	**CO4**
6	Derive an expression for head loss due to sudden expansion.	**10**	**CO3**

Section – B
(Answer all questions. Question 7 has internal choice)

S. No.		Marks	CO
7	A tank contains water up to a height of 0.5 m above the base. An immiscible liquid of specific gravity 0.8 filled on top of water up to 1 m height. Calculate I. Total pressure on one side of the tank II. The position of the centre of pressure for one side of the tank, which is 2 m wide **(OR)** A trapezoidal channel 2 m wide at the bottom and 1 m deep has side slope 1:1. Determine (i) Total pressure and (ii) the center of pressure on the vertical gate closing the channel when it is full of water.	**20**	**CO1**

8	A). Derive Hagen-Poiseuille equation for incompressible, steady and uniform laminar flow in circular cross section pipes. B). A crude oil of viscosity 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 100 mm and of length 10 m. Calculate the difference of pressure at the two ends of the pipe, if 100 kg of oil collected in a tank in 30 seconds.	**(10+10)**	**CO5**