Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2020

Programme Name: B.Tech –ADE | **Semester : III**
Course Name : Applied Fluid Mechanics | **Time : 03 hrs**
Course Code : MECH2015 | **Max. Marks : 100**
Nos. of page(s) : 2
Instructions: Assume suitable data if required.

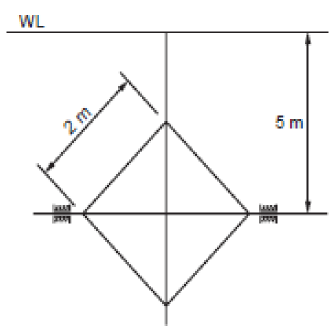
SECTION A

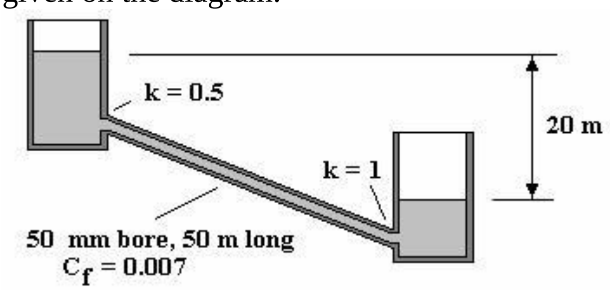
1. Each Question will carry 5 Marks
2. Instruction: Complete the statement

S. No.	Question	Marks	
Q 1	Define the following terms: a) Specific volume b) Specific gravity c) Vacuum pressure d) Incompressible fluid	5	CO1
Q 2	Discuss the following terms: a) Newtonian fluid b) Dynamics viscosity c) Compressibility	5	CO1
Q 3	Define a steady flow field in the Eulerian reference frame. In such a steady flow, is it possible for a fluid particle to experience a nonzero acceleration?	5	CO2
Q 4	Differentiate between free and forced vortex flow along with suitable examples.	5	CO3
Q 5	Define Stream line, streak line and path line.	5	CO2
Q 6	Discuss the kinetic energy and momentum correction factors.	5	CO2

SECTION B

1. Each question will carry 10 marks
2. Instruction: Write short / brief notes

S. No.	Question	Marks	
Q 7	An oil tank has an opening of 2 m square with diagonal horizontal in one of its vertical wall as shown in figure below. Determine the total force and torque required to close the opening by a hinged gate exactly if the oil (sp. gravity 0.90) level is 5 m above the centerline of the gate.  	10	CO1

Q 8	A kite of dimensions 0.8 m x 0.8 m and weighing 6 N is maintained in air at an angle of 100 to the horizontal. The string attached to the kite makes an angle of 450 to the horizontal and at this position the drag and lift coefficients are estimated to be 0.6 and 0.8 respectively. Determine : i. Wind speed ii. Tension in the string Tale density of air as 1.2 kg/m3.	**10**	**CO5**
Q 9	A horizontal ventuimeter with inlet diameter 200 mm and throat diameter 100 mm is employed to measure the flow of water. The reading of the differential manometer connected to the inlet is 180 mm of mercury. If the coefficient of discharge is 0.98, determine the rate of flow.	**10**	**CO4**
Q 10	The diagram shows a tank draining into another lower tank through a pipe. Note the velocity and pressure is both zero on the surface on a large tank. Calculate the flow rate using the data given on the diagram.  	**10**	**CO4**
Q11	Determine the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $u/U = 2(y/\delta) - (y/\delta)^2$	**10**	**CO5**
SECTION-C **1. Each Question carries 20 Marks.** **2. Instruction: Write long answer.**			
Q 12	Derive Euler's equation of motion along a streamline and integrate it to obtain Bernoulli's equation. State all assumptions made. **(OR)** A jet of water of diameter 7.5 cm strikes a curved plate at its center with a velocity of 20 m/s. The curved plate is moving with a velocity of 8m/s in the direction of the jet. The jet is deflected through an angle of 165^o. Assuming the plate smooth determine: (a) Force exerted on the plate in the direction of jet, (b) Work done by the jet on the plate per second.	**20**	**CO3**