Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Applied Fluid Mechanics **Semester: III**
Program: B. Tech (Automotive Design Engineering) **Time 03 hrs.**
Course Code: MECH 2015 **Max. Marks: 100**

Instructions: **Note: Attempt all questions, internal choices are given. Section B and Section C, both having ONE INTERNAL choice.**

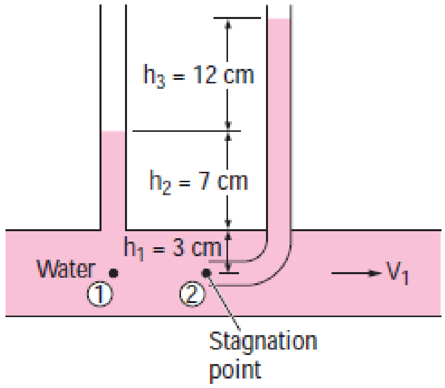
SECTION A

S. No.		Marks	CO
Q1	Explain effect of temperature on the viscosity of liquids and gases.	**05**	**CO1**
Q2	Explain Lagrangian and and Eulerian Method of fluid motion.	**05**	**CO2**
Q3	Explain velocity measurement in case of fluid flow through a circular pipe; also derive expression, which is used to calculate flow velocity.	**05**	**CO3**
Q4	Explain concept of equivalent length used to replace pipe systems (series and parallel) used to connect reservoirs.	**05**	**CO4**

SECTION B

Q5	For the velocity components in a fluid flow given by $= \ 2xy \ ; v = \ a^2 + x^2 - \ y^2$. Show that the flow is possible. Obtain the relevant stream function.	**10**	**CO2**
Q6	Show that the loss of head due to sudden expansion in the pipeline is the function of velocity $(h_l \ = \frac{1}{2g}\left(V_1{}^2 - V_2{}^2\right)$	**10**	**CO4**
Q7	Derive an expression for the velocity distribution for viscous flow through a circular pipe. Also, sketch the distribution of velocity and shear stress across a section of the pipe.	**10**	**CO4**
Q8	A wooden block in the form of a rectangular prism floats with its shortest axis vertical. The block is 40 cm long, 20 cm wide and 15 cm deep with a depth of immersion of 12 cm. calculate the position of metacenter and comment on the stability of the block.	**10**	**CO1**

	OR		
	Derive hydrostatic law ($\frac{\partial p}{\partial z} = -\gamma$)	**10**	**CO1**
	SECTION-C		
Q9	(A) Derive Bernoulli's equation along a streamline and state all the assumptions clearly.	**10**	**CO3**
	(B) A venturimeter of inlet diameter 300 mm and throat diameter 150 mm is fixed in a vertical pipe line. A liquid of sp. gr. 0.8 is flowing upward through the pipe line. A differential manometer containing mercury gives a reading of 100 mm when connected at inlet and throat. The vertical difference between inlet and throat is 500 mm. If Cd = 0.98, then find; (i) rate of flow of liquid in liter per second and (ii) difference of pressure between inlet and throat in N/m^2.	**10**	**CO4**
Q10	(A) A 250 mm diameter, 3 km long straight pipe runs between two reservoirs of surface elevations 135 m and 60 m. A 1.5 km long, 300 mm diameter pipe is laid parallel to the 250 mm diameter pipe from its mid-point to the lower reservoir. Neglecting all minor losses and assuming a friction factor of 0.02 for both pipes, find the increase in discharge caused by addition of 300 mm diameter pipe.	**15**	**CO4**
	(B) Explain boundary layer concept.	**05**	**CO5**
	OR		
	(A) A piezometer and a Pitot tube are tapped into a horizontal water pipe, as shown in figure given below, to measure static and stagnation (static+ dynamic) pressures. For the indicated water column heights, determine the velocity at the center of the pipe.	**15**	**CO4**

			
	(B) Boundary layer separation and its control.	**05**	**CO5**