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

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, Dec 2020

Course: Hydraulic Engineering — **Semester: V**
Program: B Tech Civil Engineering — **Time: 03 Hours**
Course Code: CIVL 3019 — **Max. Marks: 100**

Instructions: Attempt all the questions

SECTION A (6 x 5 = 30 marks)

1. **Each Question carries 5 marks**
2. **Instruction: Complete the statement/Select the correct answer(s)**
3. **Also explain your answer in 1-2 line(s)**

S. No.		Marks	CO
Q1	Consider an incompressible laminar boundary layer flow over a flat plate of length L, aligned with the direction of an oncoming uniform free stream. If F the ratio of the drag force on the front half of the plate to the drag force on the rear half, then a) F< 2 b) F=0.5 c) F= 1 d) F> 2	**5**	**CO2**
Q2	A fully developed laminar viscous flow through a circular tube has the ratio of maximum velocity to average velocity as: (a) 3.0 (b) 2.5 (c) 2.0 d) 1.5	**5**	**CO1**
Q3	In a steady flow of an oil in the fully developed laminar regime, the shear stress is: a) Constant across the pipe b) Maximum at the centre and decreases parabolically towards the pipe wall boundary c) Zero at the boundary and increases linearly towards the centre. d) Zero at the centre and increases towards the pipe wall.	**5**	**CO1**
Q4	Flow separation is caused by: (a) Reduction of pressure to local vapour pressure (b) A negative pressure gradient (c) A positive pressure gradient (d) Thinning of boundary layer thickness to zero.	**5**	**CO2**
Q5	The pressure drop in a 100 mm diameter horizontal pipe is 50 kPa over a length of 10m. The shear stress at the pipe wall is: (a) 0.25 kPa (b) 0.125 kPa (c) 0.50 kPa (d) 25.0 kPa	**5**	**CO2**
Q6	Velocity of air passing through a rectangular duct and a circular duct is same. Which one of the following is the correct expression for the equivalent diameter of the circular duct in respect of a rectangular duct for the same pressure loss per unit length? (a and b are the length and breadth of the rectangular duct cross-section)	**5**	**CO3**

SECTION B (10 x 5 = 50 marks) **1. Each Question carries 10 marks** **2. Instruction: Write Short/brief notes**			
Q7	A pipeline connecting two reservoirs has its diameter reduced by 20% due to deposition of chemicals. For a given head difference in the reservoirs with unaltered friction factor, this would cause a reduction in discharge of how much?	**10**	**CO1**
Q8	A rough plastic pipe of 0.5m diameter and 0.3 Km length carrying water with a velocity of 300 cm/s, has an absolute roughness of 0.25mm and a kinematic viscosity of 0.9 centistokes. a) Is the Flow laminar or turbulent? b) What is the head loss in friction?	**5+5**	**CO1**
Q9	Explain the phenomenon of separation of boundary layer. For the following profile sate whether the flow is separated or not. $\mathbf{u/U = -20(y/\delta)^{0.5} + (y/\delta)^2}$	**5+5**	**CO2**
Q10	A kite weighing 12.26 N has an effective area of 0.9m^2. The tension in the kite string is 32.37 N when the string makes an angle of 45^o with the horizontal. For a wind of 32 km/h, what are the coefficients of lift and drag if the kite assumes an angle of 8^o with the horizontal? Take specific weight of air as 11.80 kg/m^3.	**10**	**CO2**
Q11	Determine the normal depth, bed width and sides slopes of a most efficient trapezoidal channel section to carry a discharge of 25 m3/s. The longitudinal slope of the channel is to be 0.0009 and Manning's n can be taken as 0.015.	**10**	**CO3**
SECTION-C (20 x 1 = 20 marks) **1. Each Question carries 20 marks** **2. Instruction: Write long answer.**			
Q12	A discharge of 16.0 m^3/s flows with a depth of 2.0 m in a 4.0 m wide rectangular channel. At a downstream section the width is reduced to 3.5 m and the channel bed is raised by ΔZ. Analyse the water-surface elevation in the transitions when (a) $\Delta Z = 0.02$ m, and (b) $\Delta Z = 0.35$ m.	**10+10**	**CO3**
OR			
Q12	A river 100 m wide and 3.0 m deep has an average bed slope of 0.0005. Estimate the length of GVF profile produced by a low dam which raises the water surface just upstream if it by 1.50 m. Assume n = 0.035. Use direct step method and show atleast 5 steps	**20**	**CO3**