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

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December- 2021

Course: Momentum Transfer	**Semester: III**
Program B. Tech: CE+RP	**Time: 03 hrs.**
Course Code: CHCE 2003	**Max. Marks: 100**

SECTION A

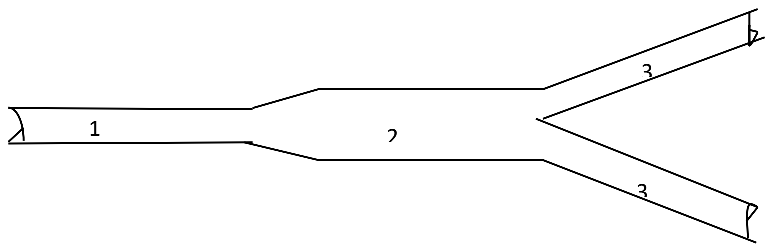
1. **All questions are compulsory**
2. **Each question carries 4 marks**
3. **Assume suitable and necessary data if required and Justify**

Q 1	Distinguish between a. Dynamic Viscosity & Kinematic Viscosity b. Absolute Pressure & Gauge Pressure	**4**	**CO1**
Q 2	What do you understand by Total pressure and Centre of Pressure?	**4**	**CO2**
Q 3	Differentiate between Eulerian & Lagrangian methods of representing fluid flow	**4**	**CO3**
Q 4	What are the various flow measuring devices?	**4**	**CO4**
Q 5	How to prevent cavitation?	**4**	**CO5**

SECTION B

1. **All questions are compulsory**
2. **Each question carries 10 marks**
3. **Assume suitable and necessary data if required and justify**

Q 6	Determine the total pressure and position of center of pressure on a triangular plate of base 3 m and height 6 m which is immersed in water in such a way that the plane of the plate makes an angle of 60^0 with the free surface of the water. The base of the plate is parallel to water surface and at a depth of 3 m from water surface.	**10**	**CO2**
Q 7	A liquid having a density of 1074 Kg/m^3 is flowing through the piping system as shown below. The flow rate entering in pipe 1 (ID 52.5 mm) is 1.892 m^3/h. The flow divides equally in each of pipes 3. Pipe 2 (ID 77.92 mm) and pipe 3 (ID 40.89 mm). Calculate the following 1. The velocity in pipes 2 & 3 **2.** The mass velocity in pipes 2 & 3 3. The total mass flow rate m in pipe 1 and pipes 3	**10**	**CO3**

			
Q 8	A sharp-edged orifice having a diameter of 0.0566 m is installed in a 0.1541 m pipe through which oil having a density of 878 kg/m^3 and a viscosity of 4.1 CP is flowing. The measured pressure difference across the orifice is 93.2 kN/m^2.Calculate the volumetric flow rate in m^3/s . Take C_o = 0.61.	**10**	**CO4**
Q 9	Explain with a sketch the concept of pump head flow characteristics and system resistance.	**10**	**CO5**
SECTION C 1. **Answer All Questions** 2. **Each Question carries 20 Marks.** 3. **Assume Suitable and necessary data if required and Justify**			
Q 10	Crude oil is to be transported from an oil field to a refinery, located 600 kilometers away from the source through a steel pipe line 400 mm diameter. The difference in level between the two is negligible. Determine theoretically power required to overcome friction in line. Since maximum allowable pressure in any section of the line is 300 N/cm^2 it will be necessary to insert additional pumping stations at suitable intervals along the line. Each station increases the pressure which drop to 170 N/cm^2 at the inlet to the next pumping station. How many pumping stations are required? Data: Viscosity of Crude Oil = 0.047 P , Specific Gravity of Crude oil = 0.87 Flow rate = 300 m^3/hr., Friction Factor = 0.0014 + 0.125/$Re^{0.32}$	**20**	**CO4**
Q 11	a. How the pumps are classified? Explain with neat sketch the principal and working of a single stage centrifugal pump b. Distinguish between centrifugal pumps and reciprocating pumps	**10+10**	**CO5**