Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December- 2022

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

Instruction : Assume suitable and necessary data if required and Justify

SECTION A
(5Qx4M=20Marks)

Q 1	At a certain point in a flowing oil, the shear stress is 3 N/m^2 and velocity gradient is 0.35/sec. The mass density of the oil is 800 kg/m^3. Find the kinematic viscosity of the oil in stokes.	**4**	**CO1**
Q 2	Draw steady laminar velocity profile for fluid contained between the plates.	**4**	**CO2**
Q 3	What are the advantages of triangular notch over rectangular notch.	**4**	**CO3**
Q 4	Distinguish between $NPSH_A$ and $NPSH_R$?	**4**	**CO4**
Q 5	Name the various types of valves used in chemical industry.	**4**	**CO4**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Find the convective acceleration at the middle of a pipe which converges uniformly from 0.6 m diameter to 0.3 diameter over 3 m length. The rate of flow is 40 lit/s. If the rate of flow changes uniformly from 40 lit/s to 80 lit/s in 40 seconds, find the total acceleration at the middle of the pipe at 20^{th} second.	**10**	**CO2**
Q 7	Prove that maximum velocity in a circular pipe for viscous flow is equal to twice the average velocity of the flow	**10**	**CO3**
Q 8	A orifice meter is used to measure the flow rate of water in a pipeline of 78 mm diameter . The orifice diameter is 15 mm. Mercury manometer reads 18 cm. The volumetric flow rate is 719 cm^3/s. Determine (i) coefficient of discharge of the meter and (ii) If the pressure drop is decreased to 9 cm of Hg, what will be the flow rate	**10**	**CO3**
Q 9	Explain with neat sketch the principle and working of a centrifugal pump.	**10**	**CO4**

SECTION-C (2Qx20M=40 Marks)			
Q 10	600 cm^3/s of water at 47^o C is pumped through a 40 mm internal diameter pipe through a length of 150 m in a horizontal direction and up through a vertical height of 10 m. In the piping system there is one control valve which may be taken as equivalent to 200 pipe diameters and other pipe fittings equivalent to 60 pipe diameters. Also in the system there is a loss in head of 1.5 m of water. What power must be delivered to the pump, if the pump efficiency is 60%?	**20**	**CO3**
Q 11	A single acting reciprocating pump has a piston of diameter of 15 cm and stroke 30 cm. The pump is located at 3 m above the sump level. The diameter of suction pipe and its length are 6 cm and 10 m respectively. The cavitation occurs if the absolute pressure head in the cylinder falls below 3 m of water during suction stroke. Find the maximum speed of the pump to avoid cavitation (Atmospheric pressure head is 10.33 m of water)	**20**	**CO4**

END