Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2020

Program Name: B.Tech (APE Gas) **Semester : III**

Course Name : Fluid Mechanics **Time : 03 hrs**

Course Code : MECH2007 **Max. Marks : 100**

Nos. of page(s) : 2

Instructions: *The question paper consists of two sections. Answer the questions section wise.*

Note: ***Assume suitable data wherever necessary***

SECTION A
(Answer all questions)

S. No.		Marks	CO
1.	A cylindrical vessel 12 cm in diameter and 30 cm deep is filled with water upto the top. The vessel is open at the top. Find the quantity of liquid spill out from the vessel, when it is rotated about its vertical axis with a speed of (a) 250 r.p.m., and (b) 500 r.p.m.	**10**	**CO2**
2	An open tank contains water upto a depth of 2 m and above it an oil of specific gravity 0.9 for a depth of 1 m. Find the pressure intensity (i) at the interface of the two liquids, and (ii) at the bottom of the tank.	**10**	**CO1**
3.	Explain construction, principal and working of centrifugal and reciprocating pumps.	**10**	**CO4**
4	Derive Bernoulli's equation for flow through a straight pipe and explain the significance of each term in the equation.	**10**	**CO3**
5	In a two dimensional incompressible flow, the fluid velocity components are given by u = x – 4y, and v = -y - 4x. Show that velocity potential exist and determine its form. Find also the stream functions.	**10**	**CO2**
6	The space between two square flat parallel plates is filled with oil. Each side of the plate is 60 cm. The thickness of the oil film is 12.5 mm. The upper plate, which moves at 2.5 m/s requires a force of 98.1 N to maintain the speed. Determine dynamic viscosity and kinematic viscosity of oil if the specific gravity of the oil is 0.95.	**10**	**CO1**

SECTION B
(Answer all questions and question 8 has internal choice)

7.	a. Derive Darcy's Weisbach Equation for head loss through pipes. b. Nikuradse developed a semi theoretical correlation for f vs Re for steady turbulent flow in smooth pipes: $$\frac{1}{\sqrt{f}} = 1.75\ln(Re\sqrt{f}) - 0.4$$ Toluene (ρ = 866 kg/m^3, μ = 0.0008 Ns/m^2) is conveyed through a 100 m pipeline of diameter 0.2 m. What is the maximum flow rate of toluene in kg/sec that can be maintained, if the frictional pressure loss is not exceed 10 kN/m^2?	**(10+10)**	**CO5**

8	A. Get the equation for time of emptying a circular horizontal tank. B. A circular tank of diameter 1.25 m contains water upto a height of 5 m. An orifice of 50 mm diameter is provided at its bottom. If C_d = 0.62, find the height of water above the orifice after 1.5 minutes. **(OR)** A. What is the difference between Notch and weir. Derive an expression for discharge over a triangular notch. B. A sharp crested rectangular weir of 1 m height extends across a rectangular channel of 3 m width. If the head of water over the weir is 0.45 m, calculate the discharge. Consider velocity of approach and assume C_d = 0.623.	**(12+8)**	**CO4**