Name:

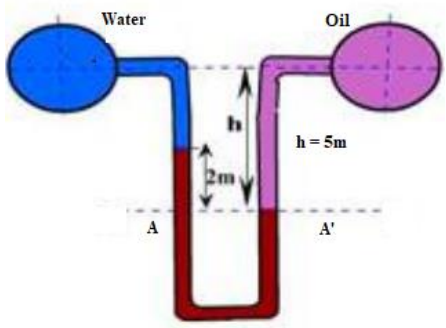
Enrolment No:

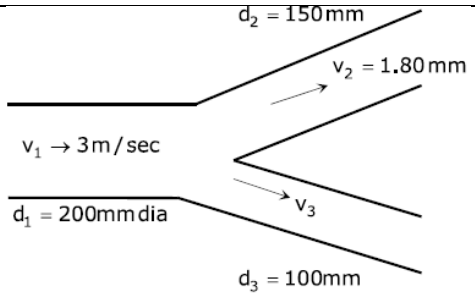
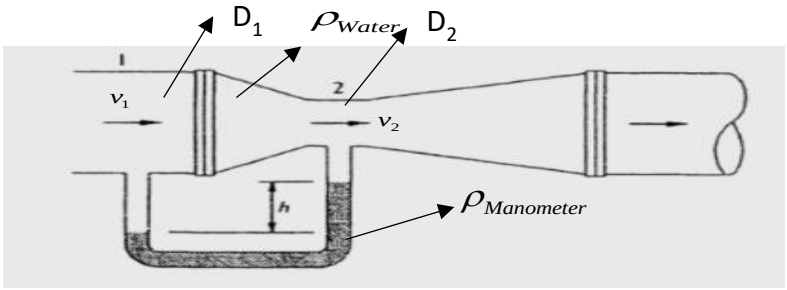
UPES

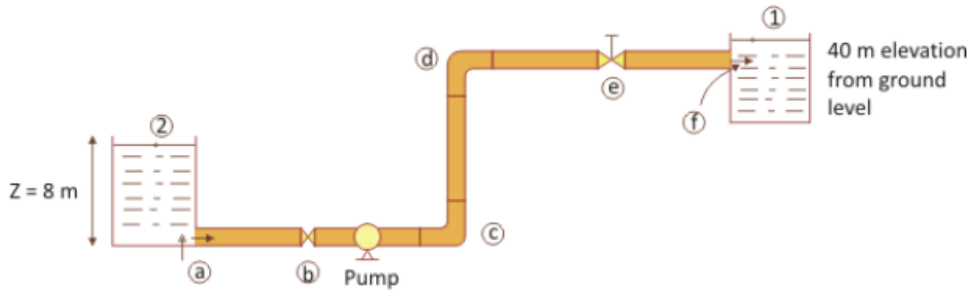
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2018

Course: BTech ET-LLB **Semester: IV**
Subject: Fluid Mechanics
Course Code: GNEG 223
Time: 03 hrs. **Max. Marks: 100**
Instructions: Assume the appropriate value of missing data if any.

SECTION A (4×5=20 M)
All the questions are compulsory

S. No.		Marks	CO
Q 1	What do you understand by viscosity of fluid? If temperature increases then what is the effect in the viscosities of gas and liquid?	**4**	**CO1**
Q 2	Reynold number is the ratio of which two forces? What is the expression of Reynold number? What is the criteria for laminar and turbulent flow?	**4**	**CO1**
Q 3	What is the unit of kinematic viscosity and pressure? Is pressure vector or scaler quantity?	**4**	**CO1**
Q 4	What are the conditions between the center of gravity and center of buoyancy or metacenter for a solid body to be in stable equilibrium when it is fully submerged and when it is floating above the fluid?	**4**	**CO2**
Q 5	What is the expression for general energy balance and what simplification leads to Bernoulli's equation?	**4**	**CO3**
	SECTION B (10×4= 40 M) **Answer all the questions. Q 9 has an internal choice**		
Q 6	If 5 liter of liquid weighs 20N, find the specific weight, density, and specific gravity.	**10**	**CO1**
Q7	Two pipes on the same elevation convey water and oil of specific gravity 0.88 respectively. They are connected by a U-tube manometer with the manometric liquid having a specific gravity of 1.25. If the manometric liquid in the limb connecting the water pipe is 2 m higher than the other find the pressure difference in two pipes. 	**10**	**CO2**
Q 8	How do relate material derivative with local derivative and convection? If the fluid velocity is $v = 3xi + x^2 yt\ j$ then what will be the value of acceleration in x and y direction at x = 1, y = 1 and t = 1?	**10**	**CO2**

Q 9	 Determine the value of velocity v_3 in the given figure. Write down the relation between P1, P2 and P3? OR Write the expression for Hagen Poiseuille Formula. In a laminar flow through pipe if the diameter of the pipe is doubled with the same pressure drop then what will be the effect on volumetric flow rate?	**10**	**CO3**
SECTION-C (20×2= 40 M) **Answer all the questions. Q 11 has an internal choice**			
Q 10	Derive the formula for measuring the velocity in the Venturi-meter shown below?  **(b)** Calculate the volumetric flow rate if D_1 = 20 mm, D_2 = 10 mm, h = 3 cm, $\rho_{water} = 10^3\, kg/m^3$ $\rho_{manometer} = 13.6\times10^3\, kg/m^3$, g = 10 m/s^2. Assume for first iteration C_v = 0.96. Only two iterations are required. Hint: (Reynold number is calculated using the velocity at the pipe diameter and not the throat diameter)	**20**	**CO3** **CO4**
Q 11	Design the power of the pump required for the water–transfer in the following figure. The pump delivers water $\rho = 1000\, kg/m^3, \eta = 10^{-3}\, Pa-s$ from one reservoir to another reservoir at 3×10^{-2} m^3/s through 70 m of 0.05-m-diameter pipe. See the figure below for several pipe–fittings installed on the pipe-line. The equivalent length of (a), (b), (c), (d), (e) and (f) are 2D, 3D, D, D, 5D, and D. Design the power of the pump. The surface of the pipe is rough (ϵ/D = 0.001).	**20**	**CO4**



OR

If the water vapor pressure at ambient temperature is 0.032 bar absolute. Atmospheric pressure = 1 bar absolute (10^5 Pa). The length before the pump is 20m. Then what is the value of NPSH? Use the remaining information from above.

Moody's Chart