Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Make-up Examinations – December 2025

Date: 26 – 12- 2025 **Time:** 1.00pm to 04.00pm

School: SOE	**Program:** B.Tech.-PET	
Course Code: PET2012	**Course Name:** Reservoir Fluid Mechanics	
Semester: MK	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	20	20	30	30	N.A.

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

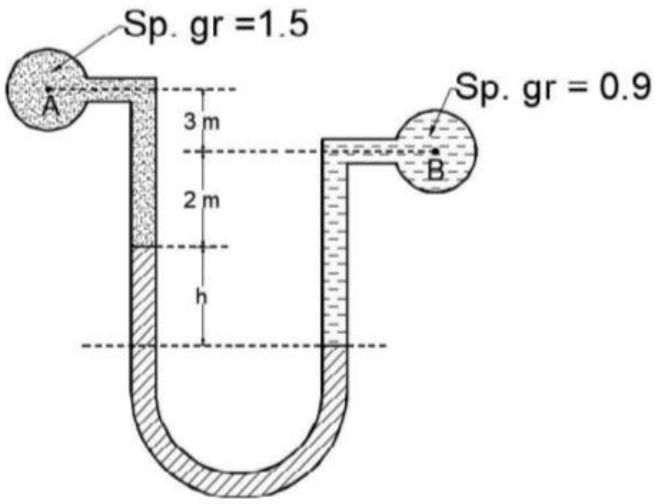
Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

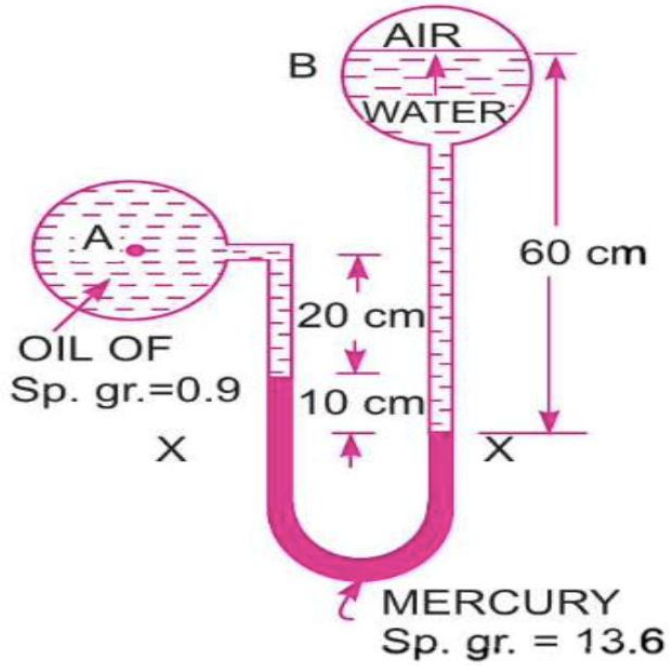
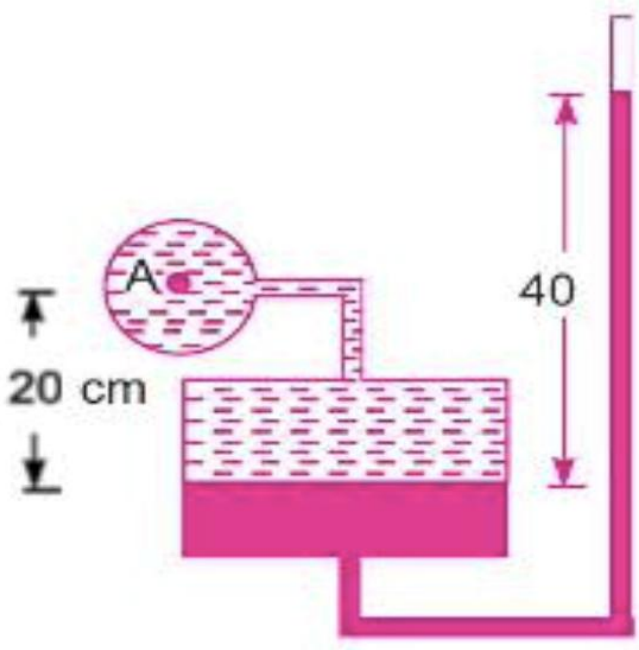
1.	Memorize Euler's equation of motion.	**2 Marks**	**L1**	**CO3**
2.	Identify the correct answer from the below options: The term "velocity potential function" is applicable to: A) Irrotational flow only B) Rotational flow only C) Both rotational and irrotational flows D) Steady compressible flow only	**2 Marks**	**L1**	**CO3**
3.	State the Newton's second law of motion.	**2 Marks**	**L1**	**CO3**
4.	Describe ideal fluid.	**2 Marks**	**L1**	**CO3**
5.	State four assumptions of Bernoulli's theorem.	**2 Marks**	**L1**	**CO3**
6.	Describe compressible and incompressible flow.	**2 Marks**	**L1**	**CO4**
7.	State the Darcy-Weisbach formula to calculate the energy loss due to friction in a pipe.	**2 Marks**	**L1**	**CO4**

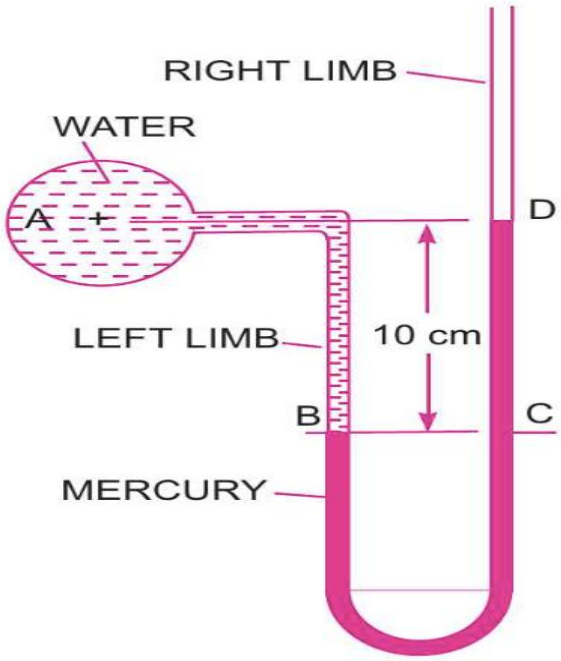
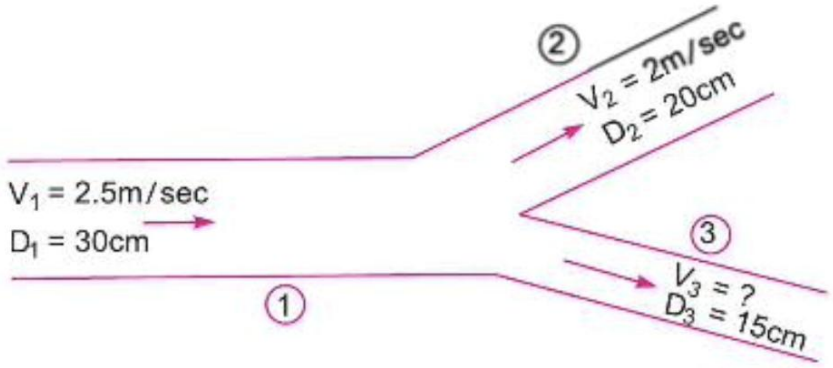
8.	Identify the correct answer from the options as given below: At subsonic velocity the pressure _____ in converging duct. A) Decrease B) Increase C) Moderate D) None	**2 Marks**	**L1**	**CO4**
9.	Define the governing equation of **Mach number**.	**2 Marks**	**L1**	**CO4**
10.	State stagnation pressure.	**2 Marks**	**L1**	**CO4**

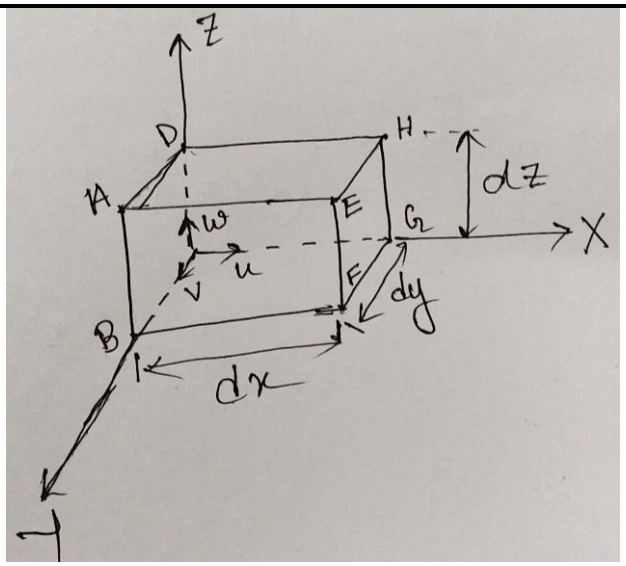
Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	A differential manometer is connected at the two points A and B of two pipes as shown in below figure. The pipe A contains a liquid of specific gravity = 1.5 while pipe B contains a liquid of specific gravity = 0.9. The pressure at A and B are 1 kgf/cm^2 and 1.80 kgf/cm^2, respectively. Solve the difference in mercury level in the differential manometer. 	**10 + 10 Marks**	**L3**	**CO1**
	b.	A differential manometer is connected at the two points A and B as shown in below figure. At B air pressure is 9.81 N/cm^2 (absolute), solve the absolute pressure at A.		**L3**	**CO1**

					
		Or			
12.	**a.**	A single column manometer is connected to a pipe containing a liquid of specific gravity 0.9 as shown in figure below. Solve the pressure in the pipe if the area of the reservoir is 100 times the area of the tube for the manometer reading shown in figure below. Consider the specific gravity of mercury is 13.6. 	**10 + 10 Marks**	**L3**	**CO1**
	b.	A U-tube manometer, as shown in below figure is used to measure the pressure of water in a pipeline, which is in excess of atmospheric pressure. The right limb of the manometer contains mercury and is open to atmosphere. The contact between water and mercury is in the left limb. Calculate the pressure of water in the main line, if the difference in level of mercury in the limbs		**L3**	**CO1**

		of U-tube is 10 cm and the free surface of mercury is in level with the centre of the pipe.  			
13.	**a.**	A 30 cm diameter pipe, conveying water, branches into two pipes of diameters 20 cm and 15 cm, respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/s, solve the discharge in this pipe. Also calculate the velocity in 15 cm pipe if the average velocity in 20 cm diameter pipe is 2 m/s. (See the below figure for your reference)  	**10 + 10 Marks**	**L3**	**CO2**
	b.	A 30 cm diameter pipe caries oil of specific gravity 0.8. At a velocity of 2 m/s. At another section the diameter is 20 cm. Solve the velocity at this section and also mass rate of flow of oil.		**L3**	**CO2**
		Or			
14.	**a.**	A fluid element is flowing in x, y, and z directions, respectively (see the below figure). Show the empirical relationship for incompressible fluid flow and at steady flow.	**10 + 10 Marks**	**L3**	**CO2**

					
	b.	For a fluid flow in a Cartesian system with a velocity of V demonstrate that the acceleration A = $\sqrt{a_x^2 + a_y^2 + a_z^2}$		**L3**	**CO2**

15.	**a.**	From the Euler's equation of motion produce Bernoulli's equation.	**10 + 10 Marks**	**L3**	**CO3**
	b.	An orifice meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50 cm of mercury. Solve the rate of flow of oil of specific gravity 0.9 when the co-efficient of discharge of the orifice meter = 0.64		**L3**	**CO3**
		Or			
16.	**a.**	For a venturi meter show that- $$Q_{act} = C_d \times \frac{a_1 a_2}{\sqrt{a_1^2 - a_2^2}} \times \sqrt{2gh}$$	**10 + 10 Marks**	**L3**	**CO3**
	b.	A pipe, through which water is flowing, is having diameter, 20 cm and 10 cm at the cross-sections 1 and 2, respectively. The velocity of water at section 1 is given 4 m/s. Solve the velocity head at sections 1 and 2 and also rate of discharge.		**L3**	**CO3**

17.	**a.**	Major loss in a pipe can be calculated if velocity (V) and Chezy's constant (C) value are known to you. Show that $\boldsymbol{V = C\sqrt{mi}}$	**10 + 10 Marks**	**L3**	**CO4**
	b.	Solve the head lost due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using (i) Darcy formula, (ii) Chezy's formula for which C = 60.		**L3**	**CO4**

Or					
18.	**a.**	For head loss due to sudden enlargement show that- $h_e = \frac{(V_1 - V_2)^2}{2g}$	**10 + 10 Marks**	**L3**	**CO4**
	b.	Solve the loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. The rate of flow of water through the pipe is 250 liter/s.		**L3**	**CO4**