Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

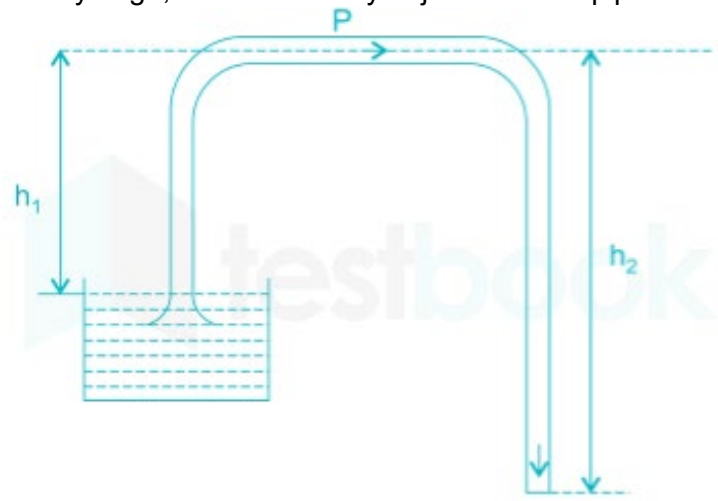
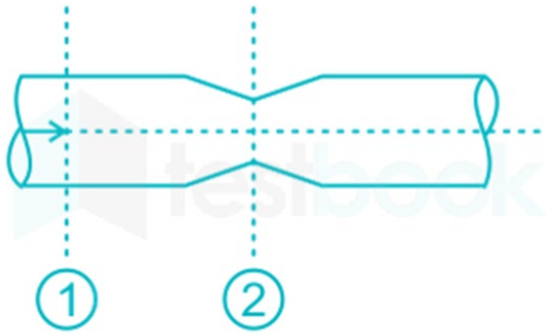
END TERM EXAMINATION – AUG- 2024

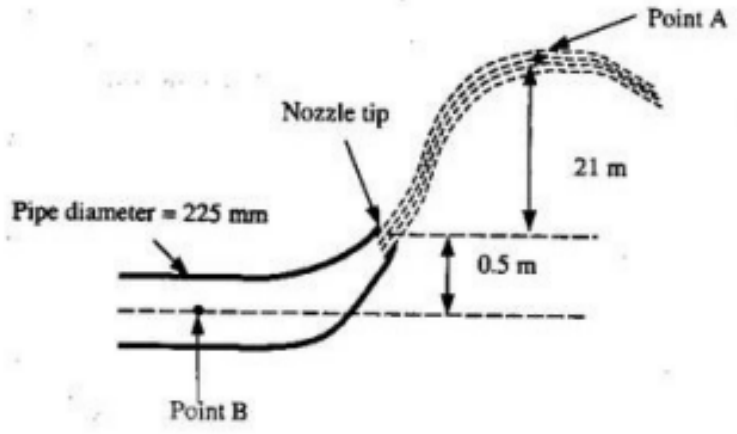
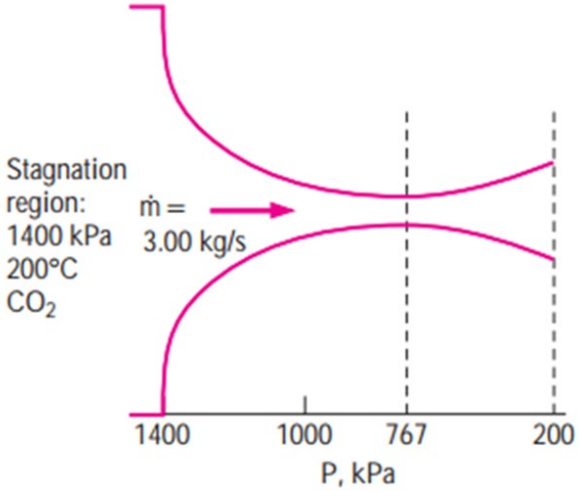
Semester : IV (4PET01- DCET)	**Date : 09.08.2024**
Course Code : PET2012	**Time : 9:30 AM – 12:30 PM**
Course Name : Reservoir Fluid Mechanics	**Max Marks : 100**
Program: B.Tech. in Petroleum Engineering	**Weightage : 50%**

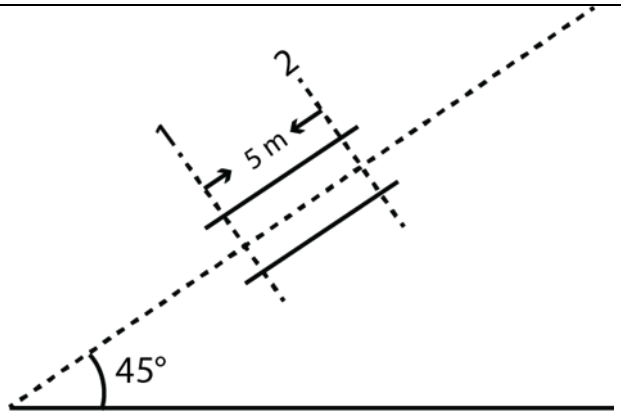
Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A			
	ANSWER ANY 5 QUESTIONS	**5Q X 2M=10M**	
1	State Newton's Law of viscosity. Also, state its mathematical expression.	(CO 1)	[Knowledge]
2	Define specific weight. Write down its unit and dimensional formula.	(CO 1)	[Knowledge]
3	State Pascal's Law. Also, write down its mathematical expression.	(CO 1)	[Knowledge]
4	Define Mach Number. Also, state its significance.	(CO 4)	[Knowledge]
5	Define convective acceleration. Also, state the value of convective acceleration for uniform flow.	(CO 2)	[Knowledge]
6	Define Reynold's Number. State its significance in fluid mechanics.	(CO 3)	[Knowledge]
7	Describe Darcy Weisbach Equation along with its mathematical expression.	(CO 4)	[Knowledge]

PART B			
	ANSWER ANY 5 QUESTIONS	**5Q X 10M=50M**	
8	The orifice meter is a valuable tool for precise flow measurement, offering significant advantages in efficiency, durability, and versatility across various industries. Discuss the orifice meter in detail and include a clear diagram.	(CO 2)	[Comprehension]
9	A venturimeter is installed in a pipeline of 400 mm diameter. The throat-pipe diameter ratio is 1/3. Water flows through the installation. The pressure in the	(CO 2)	[Comprehension]

	pipeline is 1.405 kg/cm2 and the vacuum in the throat is 37.5 cm of mercury. If 4% of the differential head is lost between the gauges, calculate the flow in the pipeline (m^3/s). (Answer correct up to two decimal places)		
10	Bernoulli's theorem states that the total mechanical energy of the moving fluid comprising the gravitational potential energy of elevation, the energy associated with the fluid pressure and the kinetic energy of the fluid motion, remains constant. Derive an expression for this theorem from by Euler's equation approach.	(CO 3)	[Comprehension]
11	If a pipe (siphon) draws water from a reservoir and discharges it out atmospheric pressure as shown in the figure. Assuming the ideal fluid and reservoir is very large, find the velocity at joint P in the pipe. 	(CO 3)	[Comprehension]
12	At a location of a horizontal pipe, the pressure head is 32 cm and the velocity head is 4 cm. The reduction in area at a location 2 is such that the pressure head drops down zero. Predict the ratio of velocity at location-2 to that at location-1 	(CO 3)	[Comprehension]
13	Pitot static tube is mounted on an aircraft travelling at a speed 300 kmph against a wind velocity of 20 kmph. If the specific weight of air is 12 N/m^3 determine the pressure difference the instrument will register.	(CO 3)	[Comprehension]
14	A U-tube manometer is used to measure the pressure of crude oil of specific gravity 0.85 flowing in a pipe line. Its left end is connected to the pipe and right end is open to the atmosphere. The centre of the pipe is 100 mm below the level of mercury in the right limb. If the difference of mercury level in the two limbs is 160 mm. Estimate the pressure in the pipe.	(CO 2)	[Comprehension]

	PART C		
	ANSWER ANY 2 QUESTIONS		**2Q X 20M=40M**
15	A jet of water emerges from a nozzle (75 mm in diameter) connected to a pipe (225 mm in diameter) as shown in the figure. The velocity of the water at the point is 18 m/s. The friction in the pipe and nozzle is negligible. Calculate the velocity of the water at the nozzle point. Also, calculate the gauge pressure at point B in KPa.  	(CO 3)	[Application]
16	Carbon dioxide flows steadily through a varying cross-sectional area duct, such as a nozzle, at a mass flow rate of 3 kg/s. The CO_2 enters the duct at a pressure of 1400 kPa and a temperature of 200°C with a low velocity, and it expands in the nozzle to a pressure of 200 kPa. The duct is designed so that the flow can be approximated as isentropic. Determine the following at each location along the duct corresponding to a pressure drop of 200 kPa: (a) Density (b) Velocity (c) Flow area (d) Mach number Assume Cp = 0.846 KJ/Kg.K and γ = 1.289  	(CO 4)	[Application]
17	An upward flow of crude oil (mass density 800 kg/m^3, dynamic viscosity 0.8 kg/m-s) takes place under laminar conditions in an inclined pipe of 0.1 m diameter as shown in the figure. The pressures at sections 1 and 2 are measured as p1=435 kN/m^2 and p2=200kN/m^2. If the flow is reversed, keeping the same discharge, and the pressure at section 1 is maintained as 435 kN/m^2, Compute the pressure at section 2.	(CO 4)	[Application]


2
1
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