

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/ Backlog), November 2017

B. Tech Chemical Engineering, Semester III

Roll No.....

CHE307 : Fluid Flow Operations and Mechanical Operations

Time: 3 hours

Max. Marks: 100

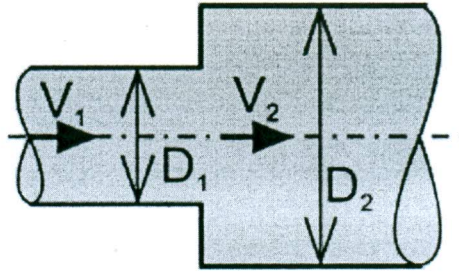
Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	1/ρ is known as: a) Specific weight b) Specific volume c) Specific gravity d) None of the above	
ii.	Kinetic viscosity per unit volume of density of fluid is called as: a) Average viscosity b) Dynamic Viscosity c) Specific gravity d) Shear stress	
iii.	Shear stress is more than yield value and shear and shear stress is propotional to shear strain in : a) Real fluid b) Ideal fluid c) Non Newtonian fluid d) Ideal plastic fluid	
iv.	P/ρ^k is constant in: a) Isothermal process b) Adiabatic process c) Isobaric process d) Isochoric process	
v.	Ratio between work done by the pump to the work put into the pump done by the motor is known as: a) Pump efficiency b) Equivalent pump head c) Rotor efficiencys d) none of the above	
vi.	Center of gravity for rectangle from the base is given by: a) $d/2$ b) $d/3$ c) d^2 d) None of the above	
vii.	Devices used for measuring the pressure by balancing the fluid column by spring or dead weight are known as: a) Manometers b) Mechanical guages c) Speedometers d) All the above	
viii.	If $du/dy = 0$ for a static fluid then the pressure acting on fluid particles is due to: a) Pressure of fluid normal to surface b) Due to gravity c) Both a and b d) None of the above	
ix.	Bulk modulus is the ratio of: a) Shear stress to volumetric strain b) Volumetric strain to shear stress c) Compressive stress to volumetric strain d) Volumetric strain to compressive	

	stress	
x.	What type of body is airfoil: a) Streamline body c) Bluff body	b) Wave body d) Induced body
Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
1.	State and prove the pascal's law?	
2.	Explain difference between Laminar flow and Turbulent flow?	
3.	Differentiate between pump and compressor.	
4.	Explain the terms dynamic viscosity and dynamic viscosity. Give their dimensions.	
Q.3A	Explain the cyclone separators and their advantages.	05
Q.3B	Explain the filtration through packed bed columns.	05
Q.4A	Discuss the concept of compressibility and bulk modulus.	05
Q.4B	What is the bulk modulus of elasticity of a liquid which is compressed in a cylinder of volume 0.0125 m^3 at 80 N/cm^2 pressure to a volume of 0.124 m^3 at 150 N/cm^2 pressure.	05
Q.5A	Distinguish between manometers and mechanical gauges. What are the different types of mechanical gauges?	05
Q.5B	A hydraulic press has a ram of 30 cm diameter and a plunger of 5 cm diameter. Find the weight lifted by hydraulic press when the force applied at the plunger is 400 N.	05
Q.6A	Derive an expression for the force exerted on a submerged vertical plane surface by the static liquid and locate the position of center of pressure.	05
Q.6B	Determine the total pressure and depth of center of pressure on a plane rectangular surface of 1 m wide and 3 m deep when its upper edge is horizontal and a) coincide with water surface b) 2m below the free water surface.	05
	OR	
Q.6B	When will be the center of pressure and center of gravity of an immersed surface coincide? Prove it.	05
Q.7A	Discuss the continuity equation of motion for microscopic system.	05
Q.7B	Explain the velocity profile for incompressible fluid in a pipe.	05
	OR	
Q.7B	State and derive the Buckingham Pie Theorem.	05
Q.8A	Explain the concept of Couette flow and how it is differ from Poiseuille flow?	10
Q.9A	State and derive Bernoulli's equation.	10
Q.9B	On a circular conduit there are different diameters: diameter $D_1 = 2 \text{ m}$ changes into $D_2 = 3 \text{ m}$. The velocity in the entrance profile was measured: $v_1 = 3 \text{ m/s}$. Calculate the discharge and mean velocity at the outlet profile (see figure). Determine also type of flow in both conduit profiles (whether the flow is	10

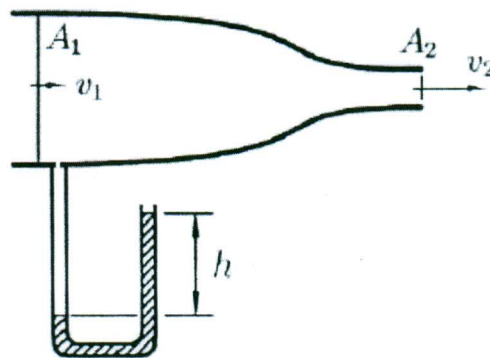
laminar or turbulent) - temperature of water $T = 12^\circ \text{C}$



OR

- Q.9B A U tube manometer containing water is connected to a nozzle of an air tunnel that discharges to the atmosphere as shown in Figure. The area ratio is $A_2/A_1 = 0.25$. For given operational conditions the level difference in the manometer is $h = 94 \text{ mm}$. Take the water density $= 1000 \text{ kg/m}^3$ and the air density $= 1.23 \text{ Kg/m}^3$.

10



***** Best of Luck *****