

# GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-III EXAMINATION – WINTER 2025

Subject Code:3130502

Date:31-12-2025

Subject Name: Fluid Flow Operations

Time:10:30 AM TO 01:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

	MARKS
<b>Q.1</b> (a) Define dynamic and kinematic viscosity.	<b>03</b>
(b) Write note on Laminar and turbulent flow.	<b>04</b>
(c) Discuss with neat sketch and suitable examples: the classification of time independent fluids.	<b>07</b>
<b>Q.2</b> (a) Explain the working of Target meter.	<b>03</b>
(b) Describe rotameter with neat sketch.	<b>04</b>
(c) Sulphuric acid of density $1300 \text{ kg/m}^3$ is flowing through a pipe of 50 mm ID. An orifice meter of 10 mm diameter is fitted in the pipe. A mercury (Specific Gravity 13.6) manometer fitted to the system measures the differential pressure as 10 cm. Calculate the mass flow rate of the acid in kg/hr. Assume orifice coefficient as 0.61.	<b>07</b>
<b>OR</b>	
(c) A venturimeter is to be fitted in a pipe of 250 mm diameter where pressure head is 7.6 m of flowing fluid and the maximum flow is $8.1 \text{ m}^3$ per minute. Determine the least diameter of the throat to ensure that the pressure head does not become negative. Take coefficient of venturimeter as 0.96.	<b>07</b>
<b>Q.3</b> (a) Define Cavitation, Priming and NPSH	<b>03</b>
(b) Give the difference between pipes and tubes.	<b>04</b>
(c) Develop the equation for the flow rate measurement starting from Bernoulli's Theorem and continuity equation for the venturimeter.	<b>07</b>
<b>OR</b>	
<b>Q.3</b> (a) Give significance of the Reynold's number and prove that it is dimensionless.	<b>03</b>
(b) Give the classification of the different types of valves used in the pipe fitting.	<b>04</b>
(c) The power required by agitator in a tank is a function the diameter of the agitator, number of rotations of the impeller per unit time, viscosity and density of the liquid. Obtain the relationship using dimensional analysis using Buckingham Pi method between power and four variables.	<b>07</b>

- Q.4** (a) Define drag and drag coefficient. **03**  
 (b) Explain difference between fans, Blowers and compressor **04**  
 (c) Show that average velocity is one – half of the maximum velocity for laminar flow of incompressible Newtonian fluid through a circular pipe. **07**
- OR**
- Q.4** (a) Derive the expression for the effect of cross sectional area on velocity for the isentropic flow of compressible fluid through nozzle. **03**  
 (b) Derive the equation to calculate critical pressure ratio ( $r_c$ ) for isentropic flow of compressible fluid. **04**  
 (c) Define mach number and explain in detail about isentropic flow of compressible fluid. **07**
- Q.5** (a) What is boundary layer separation and wake formation? **03**  
 (b) Discuss velocity Distribution for laminar flow of Newtonian fluids in a circular channel. **04**  
 (c) Discuss friction loss in sudden expansion and sudden contraction in cross sectional area of pipe for incompressible flow. **07**
- OR**
- Q.5** (a) Describe form friction losses in Bernoulli equation with suitable example. **03**  
 (b) Write a short note on prevention of leakage around moving parts. **04**  
 (c) With neat sketch, explain principle construction and working of a centrifugal pump. **07**

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