

R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT
(An Autonomous Institute U/s UGC Act 1956)

B.Tech. SEMESTER-III, SEMESTER END EXAMINATION – WINTER 2025

SUBJECT CODE: 1CH302

DATE: 18-12-2025

SUBJECT NAME: FLUID FLOW OPERATIONS

TIME: 11:00 AM to 01:30 PM

TOTAL MARKS: 70

Instructions

1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Write answers of **Section A** and **Section B** in **separate answer books**.
3. Attempt all questions from both **Section A** and **Section B**.
4. Each section carries **35 marks**, with a total of **70 marks** for the examination.
5. The figures to the right of each question indicate full marks, make suitable assumptions with justification.
6. BL - Cognitive Level (As per Revised Bloom's Taxonomy) (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

SECTION A

		Marks	BL	CO
Q.1	(a) Explain a Newtonian fluid and a Non-Newtonian fluid.	03	U	1
	(b) What is Reynolds number for flow in a straight tube?	04	R	1
Q.2	(a) What is the momentum correction factor?	03	R	2
	(b) Discuss the concept of stream line and stream tubes.	04	U	2
	(c) Explain pump work in Bernoulli's equations.	07	U	2
OR				
Q.2	(a) What are the three heads in Bernoulli's equation?	03	R	2
	(b) Explain the difference between mass velocity and average velocity in a fluid flow system.	04	U	2
	(c) Explain the bernoulli's equation including head loss and pump/turbine head, and explain each term with a neat diagram.	07	U	2
Q.3	(a) Define mach number and state its significance in fluid flow	03	R	3
	(b) Explain continuity equation for compressible fluids.	04	U	3
	(c) Explain in detail drag and drag coefficient.	07	U	3

OR

Q.3	(a) What is stream lining? Give one example of its application.	03	R	3
	(b) What are subsonic, sonic, and supersonic velocity.	04	R	3
	(c) Explain isentropic expansion and adiabatic frictional flow in detail.	07	U	3

SECTION B

		Marks	BL	CO
Q.4	(a) What is hydraulic radius? Give its formula for circular and rectangular sections.	03	R	4
	(b) Derive the Hagen–Poiseuille equation for laminar flow of an incompressible fluid through a circular pip	04	N	4
Q.5	(a) Discuss in brief about assembly used for prevention of leakages around moving parts of machine.	03	U	5
	(b) Describe the working of Needle valve and ball valve	04	U	5
	(c) Sulfuric acid of density 1300 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 (sp. gr 13.6) manometer fitted to the system measures the differential pressure as 10 cm. Analyze the mass flow rate of the acid in kg/hr. Assume orifice coefficient as 0.61.	07	N	5

OR

Q.5	(a) Distinguish between area meters and insertion meters.	03	U	5
	(b) Discuss in brief pipe and fittings.	04	U	5
	(c) Illustrate construction and working of Venturi meter with neat diagram.	07	N	5
Q.6	(a) What is cavitation in pumps? How is it resolved?	03	R	6
	(b) Explain jet ejector with the help of a neat diagram.	04	U	6
	(c) Explain construction and Working of Centrifugal Pump.	07	U	6

OR

Q.6	(a) State any two applications of Jet ejectors.	03	R	6
	(b) Discuss the power requirement and efficiency of a centrifugal pump.	04	U	6
	(c) Describe the working and efficiency of fans, blowers, and compressors. Illustrate how they differ in pressure development and energy consumption.	07	U	6
