

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2023

Subject Code:3153515

Date:05-12-2023

Subject Name:Elements of Fluid Mechanics

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
Q.1	(a) Differentiate between uniform and non-uniform flow?	03
	(b) Discuss the fluid property of vapor pressure. Mention its variation with temperature.	04
	(c) What is transition length? Discuss the formation of boundary layer for flow of fluid inside a pipe.	07
Q.2	(a) What is Bingham Plastic? How its flow behavior is different from that of Newtonian fluid	03
	(b) Find the kinematic viscosity of an oil having density 981 kg/m^3 . The shear stress at a point in oil is 0.2542 N/m^2 and velocity gradient is 0.2 per second.	04
	(c) Write about a) Density b) Specific volume c) Specific gravity d) specific weight e) Dynamic viscosity f) Kinematic viscosity g) shear stress	07
OR		
	(c) Two plates are placed at a distance of 0.15 mm apart. The lower plate is fixed while upper plate having surface area 1 m^2 is pulled at 0.3 m/s. Find the force and power required to maintain this speed, if fluid is having a viscosity of 1.5 poise.	07
Q.3	(a) An oil of viscosity 0.95 poise and specific gravity 0.92 is flowing through a horizontal pipe of diameter 120mm and length 20m. Calculate the velocity and Reynold's number if 120 kg of oil is collected in tank in 40 seconds.	03
	(b) Discuss the main parts of a centrifugal pump.	04
	(c) Write a short note on various skin and form friction losses for flow of fluid through a pipe	07
OR		
Q.3	(a) Signify the relationship between skin friction and wall shear.	03
	(b) With the help of neat diagram explain various heads in a pump.	04
	(c) Derive Hagen Poseulli's equation for laminar flow of fluid through a pipe.	07
Q.4	(a) Explain the principle of operation of rotameter?	03
	(b) What is pressure difference between upstream section and throat of 60 mm and 30 mm horizontal venturimeter carrying 60 liters/sec of water at room temperature.	04
	(c) Derive Hagen Poiseullis equation for estimating flow of a fluid through a pipe.	07

OR

- Q.4** (a) Mention Stoke's law. How the motion of a spherical particle is explained in fluid medium by Stoke's law? **03**
- (b) Mention the case of total drag acting on a particle when it is aligned parallel, perpendicular and at angle with respect to direction of flow. **04**
- (c) Derive Kozeny Carman equation for flow of particle through a bed of solids. **07**
- Q.5** (a) What is meant by Vena contracta? **03**
- (b) Mention the various dimensionless numbers used in agitation operations describing their significance. **04**
- (c) What is fluidization? Describe the different types of fluidization mentioning their applications. **07**

OR

- Q.5** (a) Why agitation operations are important to be carried out in Industry? **03**
- (b) Write a short note on velocity patterns persistent in an agitated vessel. **04**
- (c) How power consumption for an agitation operation can be determined? **07**
