GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER- V EXAMINATION-SUMMER 2023

Subject Code: 3153515   **Date: 23/06/2023**
Subject Name: Elements of Fluid Mechanics
Time: 02:30 PM TO 05:00 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 kinematic viscosity and dynamic viscosity.	**03**
	(b)	Discuss about rheological classifications of fluids.	**04**
	(c)	Derive Bernoulli's equation for a fluid flow through a circular tube along with all the assumptions involved.	**07**
Q.2	**(a)**	Define: (a) Mass density (b) Surface tension (c) Viscosity	**03**
	(b)	Discuss velocity distribution in laminar flow regime.	**04**
	(c)	Explain the generation of boundary layer for flow through tube of uniform cross-section.	**07**
		OR	
	(c)	Crude oil of viscosity 0.97 poise and relative density 0.9 is flowing through a horizontal pipe of diameter 100 mm and length 10 m. Determine the pressure difference at the ends of the pipe if 100 kg of oil is collected in 30 second.	**07**
Q.3	**(a)**	Define: (a) Drag coefficient (b) Power number	**03**
	(b)	Discuss vortex formation in an agitated vessel. How can it be prevented?	**04**
	(c)	Derive Hagen Poiseull's equation for the flow of incompressible fluid in laminar regime through a pipe of uniform cross-section.	**07**
		OR	
Q.3	**(a)**	Explain the difference between form friction and skin friction.	**03**
	(b)	Discuss various flow patterns in an agitated vessel.	**04**
	(c)	Show that the average velocity is one-half of the maximum velocity for a flow of fluid through a pipe of uniform cross-section in laminar flow regime.	**07**
Q.4	**(a)**	Discuss the difference between reciprocating pumps and centrifugal pumps.	**03**
	(b)	The diameters of a pipe at sections 1 and 2 are 10 cm and 15 cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5 m/s. Determine the velocity at section 2.	**04**
	(c)	Derive an expression to determine the discharge flow through a venturimeter.	**07**
		OR	
Q.4	**(a)**	Discuss various hydraulic coefficients.	**03**
	(b)	A tank of kerosene contains water up to a depth of 4 m and above it kerosene of specific gravity 0.8 for a depth of 1.5 m. Find the intensity of pressure at the bottom of the tank.	**04**
	(c)	With the help of a schematic diagram, discuss the constructional features and working of a rotameter.	**07**

Q.5 (a) Define Stoke's law and explain the various forces acting on a spherical particle while settling through a fluid. **03**

(b) Discuss the various types of impellers used in an agitated vessel with their applications. **04**

(c) Derive Ergun's equation to determine the pressure drop per unit length of the bed for a packed bed containing spherical particles. **07**

OR

Q.5 (a) Explain fluidization and its types. **03**

(b) Derive an expression for power correlation in an agitated vessel. **04**

(c) A water softener consists of a vertical tube of 50 mm diameter and packed to a height of 0.5 m with ion exchange resin particles. The particles may be considered spherical with a diameter of 1.25 mm. Water flows over the bed because of gravity and pressure difference at the rate of 30 cc/sec. The bed has a porosity of 0.3. Calculate the pressure drop. **07**