Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2024

Subject Code:3130502 Date:16-07-2024

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
Q.1	**(a)**	Define: (i) Ideal fluid (ii) Potential flow (iii) Fully developed flow.	**03**
	(b)	Explain in detail about continuous gravity decanter.	**04**
	(c)	Discuss Rayleigh Method for the application of dimensional analysis to fluid flow: The efficiency η of a fan depends on the density ρ, the dynamic viscosity μ of the fluid, the angular velocity ω, diameter D of the rotor and the discharge Q. Express η in terms of dimensionless parameter. $\eta = f(\rho,\mu,\omega,D,Q)$	**07**
Q.2	**(a)**	What is cavitation?	**03**
	(b)	Discuss the working of Needle valve and ball valve.	**04**
	(c)	Derive Bernoulli's equation for the flow with friction through inclined stream tube.	**07**
		OR	
	(c)	Derive the Hagen-Poiseuille equation.	**07**
Q.3	**(a)**	Define hydraulic radius.	**03**
	(b)	Discuss the concept of stuffing boxes.	**04**
	(c)	Derive the relation between mass velocity and average velocity.	**07**
		OR	
Q.3	**(a)**	Define viscosity and write the units of viscosity.	**03**
	(b)	Distinguish between notch and weir.	**04**
	(c)	Explain the Newtonian and Non Newtonian fluids in detail with examples.	**07**
Q.4	**(a)**	Define: i) Mach number ii) Drag coefficient iii) Reynolds number	**03**
	(b)	Distinguish between pipe and tube.	**04**
	(c)	Discuss different types of flow measuring devices along with their utility and application.	**07**
		OR	
Q.4	**(a)**	What are the advantages of Centrifugal pump over Reciprocating pump?	**03**
	(b)	Explain the types of friction.	**04**
	(c)	Discuss the concept of hydrostatic equilibrium and derive mathematical condition of hydrostatic equilibrium.	**07**
Q.5	**(a)**	Define NPSH.	**03**
	(b)	Discuss the working of Gate valve and Globe valve.	**04**
	(c)	A pitot tube with a discharge of co-efficient of 0.9, is connected to a manometer containing water. Light oil with specific gravity of 0.8 is flowing through a pipe line of 8.0 cm i.d. When the pitot tube is kept at the centre of the pipe the manometer read 9.0 cm. Calculate the flow rate of the oil if the average velocity is 80% of the maximum.	**07**
		OR	

Q.5 **(a)** Explain the variable head meter and variable area meter with example. **03**

(b) Explain the boundary layer formation in straight tubes. **04**

(c) Carbon tetrachloride is to flow through a smooth horizontal circular tube of ID 3 cm at a volumetric flow rate of 2 liter per sec. at 25 ^{0}C. Estimate the pressure loss per cm. length of the tube. Density and viscosity of carbon tetrachloride are 1.54 gm/cc and 0.87 c.p. respectively. **07**

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