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**

****

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III(NEW) EXAMINATION – SUMMER 2023

Subject Code:3130502 Date:24-07-2023

Subject Name:Fluid Flow Operations

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)**	Define Viscosity.	**03**
	(b)	Write different units of pressure and give their interconversion.	**04**
	(c)	Derive the working equation of a U tube manometer.9	**07**
Q.2	**(a)**	Define: (i) Ideal fluid (ii) Potential flow (iii) Fully developed flow.	**03**
	(b)	The maximum depth of the Arabian sea is roughly 4600 m. What is the pressure at this point if the average density of the sea water is taken as 1040 kg/m^3.	**04**
	(c)	Derive the Hagen-Poiseuille's equation.	**07**
		OR	
	(c)	Derive the equation of continuity.	**07**
Q.3	**(a)**	What is the significance of hydraulic radius?	**03**
	(b)	Discuss about different time independent non-Newtonian fluids. Give atleast one example of each.	**04**
	(c)	Derive Bernoulli's equation and explain the correction factors involved in it.	**07**
		OR	
Q.3	**(a)**	What is the relation between point velocity, average velocity and maximum velocity for laminar flow of a Newtonian fluid in a pipe?	**03**
	(b)	Explain the significance of kinematic viscosity.	**04**
	(c)	Water is flowing through a pipe having diameters 30 cm and 20 cm at the bottom and upper level respectively. The intensity of pressure at the bottom end is 2.5 kgf/cm^2 and the pressure at the upper end is 1 kgf/cm^2. Determine the difference in datum head if the rate of flow through pipe is 40 lit/sec.	**07**
Q.4	**(a)**	Explain the significance of Mach number.	**03**
	(b)	Explain the Rayleigh method for dimensional analysis.	**04**
	(c)	Explain construction and working of a centrifugal pump.	**07**
		OR	
Q.4	**(a)**	Discuss Drag force and Drag coefficient.	**03**
	(b)	Discuss flow of compressible fluid through convergent-divergent nozzles.	**04**
	(c)	Explain construction and working of a reciprocating pump.	**07**

Q.5	**(a)**	What is cavitation in pumps? How is it resolved.	**03**
	(b)	Explain construction and working of a glob valve	**04**
	(c)	Derive the working equation for a venturi meter. Also explain its construction and working	**07**

OR

Q.5	**(a)**	Why the coefficient of discharge of venturi meter is larger than that of an orifice meter?	**03**
	(b)	Explain construction and working of a gate valve.	**04**
	(c)	Derive the flow equation for a sudden expansion in a pipe.	**07**

****

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III (NEW) EXAMINATION – SUMMER 2022

Subject Code:3130502 Date:11-07-2022

Subject Name:Fluid Flow Operations

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)**	Define mass velocity, ideal fluid, and real fluid.	**03**
	(b)	Explain the Boundary layer, its separation, and wake formation.	**04**
	(c)	Develop the Bernoulli equation for incompressible fluid.	**07**
Q.2	**(a)**	Classify fluid.	**03**
	(b)	Define laminar and turbulent flow.	**04**
	(c)	Develop equation of pressure difference for inclined tube manometer.	**07**
		OR	
	(c)	Develop mathematical expression for hydrostatic equilibrium.	**07**
Q.3	**(a)**	Define potential flow, streamline and stream tubes.	**03**
	(b)	Explain continuous gravity decanter.	**04**
	(c)	Discuss about pressure drop in fluidization.	**07**
		OR	
Q.3	**(a)**	Write the significance of Mach number and acoustic velocity.	**03**
	(b)	Explain centrifugal decanter.	**04**
	(c)	Discuss flow of compressible fluid through convergent-divergent nozzles.	**07**
Q.4	**(a)**	Give barometric equation with nomenclature.	**03**
	(b)	Describe pump work in Bernoulli's equation	**04**
	(c)	Explain construction and working of the Gate valve.	**07**
		OR	
Q.4	**(a)**	Define viscosity and write down its unit.	**03**
	(b)	Describe correction for friction in Bernoulli's equation	**04**
	(c)	Explain the construction and working of the Globe valve.	**07**
Q.5	**(a)**	Define Newtonian and Non-Newtonian fluid.	**03**
	(b)	Water is flowing through a 25 mm internal diameter pipe at the rate of 1 kg/s. Calculate the pressure drop over a length of 100 meters. Data : Friction factor 'f ' = 0.0001 Data: Friction factor 'f ' = 0.0001 Density of water = 1000 kg/m^3 Viscosity of water = 8.0×10^{-4} Pa.s	**04**
	(c)	Crude oil has a specific gravity of 0.91 and a viscosity of 0.124 Pa s is pumped at a rate of 7 l/s through a pipeline 75 mm diameter having a length of 62 m and whose outlet is 3 m higher than its inlet. Determine the power required for the pump if its efficiency is 60%.	**07**

OR

Q.5 **(a)** Define Compressible and Incompressible fluid. **03**

(b) Acetic acid is to be pumped at a rate of 0.02 m^3/s through a 75 mm ID pipeline. Calculate the pressure drop in the pipeline over a length of 70 m. **04**
Data:
Density of acetic acid = 1060 kg/m^3
Viscosity of acetic acid = 0.0025 $(N.s)/m^2$

(c) A venturi meter is to be fitted in a pipe of 250 mm diameter where the pressure head is 7.6 m of flowing fluid and the flow rate is 8.1 m3/min. Determine the diameter of the throat. Take the coefficient of venturi meter as 0.96. **07**

****