Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:2160602 Date:05-12-2023

Subject Name:Applied 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.**

Q.1	**(a)**	Enlist the important applications of Navier-stoke equations.	**03**
	(b)	Describe water hammer phenomenon in pipes.	**04**
	(c)	Derive the Hagen-Poiseuille equation for laminar flow in the circular pipe.	**07**
Q.2	**(a)**	Define and enlist types of draft tube with neat sketch.	**03**
	(b)	Differentiate hydro-dynamically smooth and rough pipes.	**04**
	(c)	Prove that Maximum Velocity is equal to one and half times the average velocity for flow between fixed parallel plate.	**07**
		OR	
	(c)	Enlist the various major and minor energy losses in pipes? Derive an expression for head loss due to sudden enlargement of pipe.	**07**
Q.3	**(a)**	What are the differences between pipe flow and open channel flow?	**03**
	(b)	What do you mean by pipes in series and pipes in parallel? How the loss of head is determined in both systems.	**04**
	(c)	Explain boundary layer growth over a flat plate. Derive the expression for momentum thickness of boundary layer flow.	**07**
		OR	
Q.3	**(a)**	Describe Reynolds's experiment.	**03**
	(b)	Write a note on prevention of boundary layer separation.	**04**
	(c)	Define the most economical channel section and Discuss the importance of it.	**07**
Q.4	**(a)**	Define: Critical flow, Critical depth.	**03**
	(b)	Derive Chezy's formula to calculate the velocity in case of a channel.	**04**
	(c)	Derive an expression for the velocity distribution of viscous flow through a circular pipe and prove that the ratio of maximum velocity to average velocity is 2.	**07**

OR

Q.4	**(a)**	What is priming? Why is it necessary in centrifugal pump?	**03**
	(b)	What is cavitation? What are its effects? Give necessary precaution against cavitations in pumps.	**04**
	(c)	Draw a general layout of a Hydroelectric power plant using an impulse turbine and define the following: (1) Gross Head (2) Net Head (3) Hydraulic Efficiency (4) Overall Efficiency of Impulse turbine	**07**
Q.5	**(a)**	Differentiate between a pump and the turbine.	**03**
	(b)	Explain construction and working of a pelton wheel.	**04**
	(c)	What is dimensional less number? State and explain them.	**07**

OR

Q.5	**(a)**	Define: Volumetric efficiency, hydraulic efficiency.	**03**
	(b)	Differentiate between Impulse and Reaction turbine.	**04**
	(c)	State and explain Buckingham's π theorem. Why it is considered over Rayleigh method over dimensional analysis.	**07**

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