Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI (NEW) EXAMINATION – WINTER 2024

Subject Code:2160602 Date:25-11-2024

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)**	Classify various types of channel.	**03**
	(b)	Define the following terms: 1. Boundary Layer, 2. Critical Depth, 3. Mechanical Efficiency, 4. Hydraulic Jump.	**04**
	(c)	Discuss the phenomenon of boundary layer separation. Also discuss the effect of pressure gradient on boundary layer separation.	**07**
Q.2	**(a)**	Write short note on Reynold's experiment.	**03**
	(b)	State and derive Bernoulli's equation for incompressible fluid.	**04**
	(c)	Write the expression (equation) of following phenomenon with explanation of all terms used in the equation. 1. Darcy-Weisbach equation, 2. Head loss due to sudden enlarge-ment, 3. Dupuit's equation.	**07**
		OR	
	(c)	Prove that the maximum velocity is twice the average velocity of the flow for viscous flow in a circular pipe.	**07**
Q.3	**(a)**	A rectangular channel carries water at the rate of 1000 liters/sec. with bed slope 1 in 2000. Find the dimension of most economical section. Take n=0.015.	**03**
	(b)	Differentiate 1. Steady and Unsteady flow, 2. Uniform and Non-Uniform flow in case of open channel.	**04**
	(c)	Derive the dynamic equation of GVF.	**07**
		OR	
Q.3	**(a)**	Give classification of hydraulic jump.	**03**
	(b)	Differentiate between impulse turbine and reaction turbine.	**04**
	(c)	Draw a layout of typical hydroelectric plant and write functions all components of hydroelectric plant.	**07**
Q.4	**(a)**	What is priming of pump? Why it is necessary?	**03**
	(b)	Define ventilation. State the requirements of good ventilation system.	**04**
	(c)	Explain Prandtl mixing length theory and define mixing length clearly.	**07**
		OR	
Q.4	**(a)**	Define model and prototype. What is the significance of model analysis in fluid flow problems?	**03**
	(b)	Enlist dimensionless numbers. And derive equation of Froude's number through dimension analysis.	**04**

	(c)	What are similarities of model? Explain briefly about types of similarities between model and prototype.	**07**
Q.5	**(a)**	Explain the terms: Hydraulic gradient line and Total energy line.	**03**
	(b)	Define boundary layer thickness. Derive the expression for displacement thickness.	**04**
	(c)	Using Buckingham's $\prod$ -theorem, show that the velocity through a circular orifice is given by, $V = \sqrt{2gH} \varnothing [D/H, \mu/\rho VH]$. Where H is head causing flow, D is the diameter of the orifice, μ is viscosity, ρ is density and g is the acceleration due to gravity.	**07**

OR

Q.5	**(a)**	Write short note on water hammer.	**03**
	(b)	A pipe 20 cm in diameter and 45 m long conveys water at a velocity of 2.5 m/sec. Find the head loss in friction using Darcy-Weisbatch formula. Take f=0.006.	**04**
	(c)	What do you mean by most economical channel section? Derive the condition for trapezoidal channel of best section.	**07**

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