Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 711201N **Date: 01-12-2014**

Subject Name: Advanced Fluid Mechanics

Time: 10:30 am - 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.**

Q.1	**(a)**	Classify and explain the open channel flow.	**07**
	(b)	What is water surface profile? Explain channel bed slopes and flow profiles.	**07**
Q.2	**(a)**	Derive non-uniform flow equation for rectangular open channel.	**07**
	(b)	Explain channel transitions and obtained condition to determine u/s depth of the channel transition.	**07**
		OR	
	(b)	Describe positive and negative surges of the channel.	**07**
Q.3	**(a)**	The differential equation of the water surface profile behind a dam is	**07**

$$\frac{dy}{dx} = 0.001 \frac{3^{10/3} - v^{10/3}}{y^{3-1}}$$

The boundary condition is : at x = 0, y = 10m. Solve this differential equation by finite difference method.

	(b)	What is FEM? Explain how the FEM is applied for transient flow in open channel.	**07**
		OR	
Q.3	**(a)**	Write short note on spatially varied flow.	**07**
	(b)	Write the three basic equations of fluid mechanics and derive the third equation.	**07**
Q.4	**(a)**	Explain water hammer analysis.	**07**
	(b)	What is skin drag? Derive general equation for the force exerted on a body placed in a moving fluid.	**07**
		OR	
Q.4	**(a)**	Write short note on Magnus effect.	**07**
	(b)	Derive equations for σ, τ_o and Cd when the velocity distribution is $u/U = 2(y/\sigma) - 2(y/\sigma)^3 + (y/\sigma)^4$	**07**
Q.5	**(a)**	Derive momentum equation to analyse the flow in the boundary layer.	**07**
	(b)	Draw and explain Stanton's curves for turbulent flow.	**07**
		OR	
Q.5	**(a)**	Derive universal velocity distribution equation for turbulent flow.	**07**
	(b)	Explain laminar flow and derive an equation to indicate relationship of shear stress and pressure gradient.	**07**

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