Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–III • EXAMINATION – SUMMER 2013

Subject Code: X30604 **Date: 17-05-2013**

Subject Name: Advanced Fluid Mechanics

Time: 02.30 pm - 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.**

Q.1	**(a)**	Explain hydrodynamically smooth and rough pipe.	**07**
	(b)	Explain "flow net". Write its uses and limitations.	**07**
Q.2	**(a)**	Obtain equation of continuity for three dimensional flows by Cartesian co-ordinates.	**07**
	(b)	The velocity in x. y and z directions are given by u = 2x – yt, v = y – zt and w = x – 3z + t respectively. Determine the acceleration and velocity at point (1 , 1, 2) and t = 1.	**07**
		OR	
	(b)	Discuss the specific energy curve with a neat sketch.	**07**
Q.3	**(a)**	Defines the term stream function. How it differs by potential function.	**07**
	(b)	In a two dimensional incompressible flow, the fluid velocity components are given by U = x – 4y and V = -y – 4x. Show that velocity potential exists and determine its form. Find also the stream function.	**07**
		OR	
Q.3	**(a)**	Obtain equation of continuity for the fluid flow in polar co- ordinate.	**07**
	(b)	In a two dimensional flow of compressible fluid, the tangential component of velocity $V\alpha=\frac{C\sin\alpha}{r^2}$, where C is constant. Using equation of continuity, determine the expression for radial velocity V. Also find the magnitude and direction of resultant velocity.	**07**
Q.4	**(a)**	Explain Hardy cross method.	**07**
	(b)	Describe various types of hydraulic models.	**07**
		OR	
Q.4	**(a)**	Describe Rayleigh method for dimensional analysis.	**07**
	(b)	Explain and prove Buckingham's π – theorem.	**07**
Q.5	**(a)**	Explain the concept of boundary layer. Derive the expression for displacement thickness.	**07**
	(b)	Describe Reynold's experiment and discuss the laminar and turbulent flow in pipe.	**07**
		OR	
Q.5	**(a)**	Explain formation of boundary layer with neat sketch and also explain separation of boundary layer.	**07**
	(b)	Explain Prandtle's mixing length theory.	**07**

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