Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

P.D.D.C. Sem- III Examination December 2010

Subject code: X30604

Subject Name: Advance Fluid Mechanics

Date: 16 /12 /2010 **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)**	Explain Buckingham π theorem method	**07**
	(b)	Derive the expression for the velocity distribution for viscous flow through circular pipe. Also sketch the velocity distribution and shear stress distribution across a section of the pipe.	**07**
Q.2	**(a)**	Obtain an equation of continuity for three dimensional flow.	**07**
	(b)	Derive an Equation of Gradually varied flow, and write assumption made in it.	**07**
		OR	
	(b)	Explain separation of boundary layer.	**07**
Q.3	**(a)**	Expiain formation of boundary layer with sketch.	**07**
	(b)	In a two dimensional fluid flow the component of the velocity along the x-axis is given $U = 3x-2x^2y+y^3$. Determine the component of the velocity along the y-axis for the Condition of continuity of flow.	**07**
		OR	
Q.3	**(a)**	Explain Hydrodynamically smooth and rough pipe.	**07**
	(b)	Determine the length of back water curve caused by an afflux of 1.5 m in a rectangular channel at width 45 m and depth 2.0 m. The slope of the bed is given as 1 in 2000. Take meaning's N = 0.03.	**07**
Q.4	**(a)**	Discuss the classification of channel slopes	**07**
	(b)	Laminar flow of an oil with maximum velocity at 5.6 m/sec in a 30 cm diameter pipe. If dynamic viscosity of an oil is 0.18 kg sec/m. Calculate shear stress at pipe wall and within fluid 6.0 cm from the pipe wall.	**07**
		OR	
Q.4	**(a)**	Explain Hardy cross method	**07**
	(b)	A model of spillway is made to test the flow. The discharge and velocity of flow over the model were measured as 2.5 m /sec and 1.5 m/s. Find the discharge and velocity over prototype which is 50 times larger them it's model.	**07**
Q.5	**(a)**	Discus the specific energy curve with a neat sketch	**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.5	**(a)**	Explain Prandtle's mixing length theory	**07**
	(b)	Find the expression for the drag force on smooth sphere of diameter D, moving with a uniform velocity V in a fluid of density ρ and dynamic viscosity μ	**07**

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