Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: X31901

Subject Name: Fluid Mechanics

Date:11 /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 the effect of temperature on the viscosity of liquids and gases.	**07**
	(b)	With neat sketch write about the Newtonian and non Newtonian fluids.	**07**
Q.2	**(a)**	State Pascal's law and prove it.	**07**
	(b)	Explain the continuum concept used in fluid mechanics.	**07**
		OR	
	(b)	State advantages and limitations of manometers.	**07**
Q.3	**(a)**	Discuss the condition of stability for floating bodies.	**07**
	(b)	A rectangular plane surface 2 m wide and 3 m high immerged in water, it's plane is making an angle 45° with the free surface of water. The upper edge of rectangular plate is 1.5 m below free surface. Calculate: (i) Total pressure on plate and (ii) Position of centre of pressure.	**07**
		OR	
Q.3	**(a)**	Distinguish between (i) Steady and unsteady flow (ii) Uniform and non uniform flow (iii) Laminar and Turbulent flow	**07**
	(b)	Derive an expression for continuity for 3-D flow and reduce it for steady incompressible 2-D flow in Cartesian coordinate system.	**07**
Q.4	**(a)**	State and prove Bernoulli's equation.	**07**
	(b)	What is flow net? What are the uses of a flow net?	**07**
		OR	
Q.4	**(a)**	State methods of dimensional analysis and describe any one method for dimensional analysis.	**07**
	(b)	Determine power required per kilometer of a pipeline to overcome the viscous resistance to the flow of glycerin through horizontal pipe of diameter 200 mm at the rate of 20 litres/sec. Take μ=9 poise and kinematic viscosity ν=7 strokes.	**07**
Q.5	**(a)**	Derive the Hagen-Poiseullie equation. State the assumption made.	**07**
	(b)	Prove that velocity of sound wave in a compressible fluid is given by $C=\sqrt{\gamma RT}$	**07**
		OR	
Q.5	**(a)**	An aeroplane is flying at height of 1300 m where the temperature is -40 ^oC. The speed of plane is corresponding to Mach 2. Find the speed of the plane. Take R=287 J/KgK.	**07**
	(b)	Explain characteristics of turbulent flow.	**07**

****