Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER– III• EXAMINATION – SUMMER 2015

Subject code: X31901 **Date:29/06/2015**
Subject Name: Fluid Mechanics
Time:02.30pm-05.00pm **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)**	What are the causes of viscosity (i) in gases, and (ii) in liquids?	**07**
	(b)	A glass tube of 5 mm diameter is immersed in (i) water and (ii) mercury. The temperature of the liquid is 25°C and the value of surface tension of water and mercury at 25°C in contact with air are 0.075 N/m and 0.5 N/m respectively. Determine the capillary effects. The contact angle of water $\theta = 0^o$ and for mercury $\theta = 128^o$	**07**
Q.2	**(a)**	State and prove the Pascal's law and give its application in real situation.	**07**
	(b)	Explain the working of inverted U- tube manometer with neat sketch	**07**
		OR	
	(b)	A rectangular plane surface 3 m wide and 4 m high immerged in water, it plane is making an angle 45° with the free surface of water. The upper edge of rectangular plate is 2 m below the free surface. Calculate (i) total pressure force on the plate and (ii) position of centre of pressure.	**07**
Q.3	**(a)**	Explain with neat sketch stability of immersed and floating body.	**07**
	(b)	The floating pontoon 25 cm × 40 cm and height of 10 cm, weighing 100 N, is immersed in the water container having dimensions 30 cm × 45 cm. The liquid is 10 cm deep before immersion. At what level pontoon will float?	**07**
		OR	
Q.3	**(a)**	Classify fluid flow in detail.	**07**
	(b)	Derive Euler's equation of motion along a streamline and derive Bernoulli's equation from it. State the assumptions made.	**07**
Q.4	**(a)**	Explain Venturimeter with neat sketch and derive expression for discharge through it.	**07**
	(b)	Water flow over a rectangular weir of 2 m at a depth of 8 cm and afterwards passes through a triangular right angled weir. Determine the depth of water through the triangular weir. Take discharge co-efficients for the rectangular and triangular weirs 0.65 and 0.6 respectively.	**07**
		OR	
Q.4	**(a)**	The stream function for a two-dimensional flow is given by $\psi = 2xy + 25$, calculate the velocity at the point A (1, 2). Find the velocity potential function ϕ.	**07**

Q.4	**(b)**	The efficiency of fan (η) depends upon diameter of rotor (D), discharge of fluid (Q), density of fluid (ρ), dynamic viscosity of fluid (μ) and angular velocity of rotor (ω). Find expression for η in terms of dimensionless parameters.	**07**
Q.5	**(a)**	Derive the Hagen-Poiseullie equation stating the assumptions made. Sketch velocity and shear stress distribution in pipe flow.	**07**
	(b)	Explain Saybolt viscometer with neat skrtch.	**07**
		OR	
Q.5	**(a)**	Explain zone of action, zone of silence, Mach line, Mach angle and Mach cone with neat sketch.	**07**
	(b)	Derive Darcy Weisbach equation for the co-efficient of friction in pipes	**07**

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