Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III EXAMINATION – SUMMER 2015

Subject Code: 131403 **Date:**29/**05/2015**

Subject Name: Food Engineering Transport Phenomena

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 is pipe? Explain loss of head in pipe along with calculation formulae.	**07**
	(b)	1. An open tank contains water up to depth of 2 m and above it an oil of specific gravity 0.9 for a depth of 1 m. Find the pressure intensity (i) At the interface of the two liquids. (ii) At the bottom of the tank.	**04**
		2. Calculate the capillary fall in a glass tube of 2.5 mm diameter when immersed vertically in mercury. σ for mercury = 0.52 N/m in contact with air. The specific gravity of mercury is given as 13.6 and angle of contact=130°.	**03**
Q.2	**(a)**	Discuss Fick's law of diffusion along with mass transfer mechanism.	**07**
	(b)	Write a short note on Measurement of flow in open channels.	**07**
		OR	
	(b)	Define the following terms: 1. Capillarity 2. Specific volume 3. Discharge rate 4. Rotational flow 5. Value of Reynolds number for transition flow 6. Compressible flow 7. Surface tension	**07**
Q.3	**(a)**	The drag force exerted by a flowing fluid on a solid body depends up on the length of the body (L); velocity (V); density of fluid (ρ) and viscosity (μ). Find an expression for drag force using Buckingham's theorem.	**07**
	(b)	Explain Reynolds experiment with neat diagram. Also write significance of Reynolds number and Froude number.	**07**
		OR	
Q.3	**(a)**	Derive Bernoulli's equation by developing Euler's equation of motion.	**07**
	(b)	Name of equipments used for measurement of flow rate. Explain vena contracta in detail with neat sketch.	**07**
Q.4	**(a)**	Define meta centric height and explain condition of equilibrium with diagram for floating body.	**07**
	(b)	Show that shear stress distribution in circular pipe for viscous flow is linear. Develop the equation for point velocity in circular pipe from it.	**07**
		OR	
Q.4	**(a)**	Water is flowing through a pipe of 100mm diameter with an average velocity of 10 m/sec. Determine the the discharge of the water in litres/second. Also determine the velocity of water at the other end of pipe if the diameter of the pipe is gradully changes to 200 mm.	**07**
	(b)	Derive an equation of continuity for two dimensions rectangular Cartesian co-ordinates.	**07**
Q.5	**(a)**	Show that ratio of maximum velocity (Umax) to average velocity of liquid for circular pipe for incompressible one dimensional laminar flow is 2**.**	**07**
	(b)	Derive an expression for time period (t) which depends on length (L) of pendulum & gravity acceleration (g) Using dimensional analysis	**04**

	(c)	What is fluid? What do you mean by kinematic study of fluid?	**03**
		OR	
Q.5	**(a)**	Explain Rotameter in detail.	**07**
	(b)	Classify weirs and notches. What is discharge co-efficient? Describe in brief about V-notch.	**07**

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