Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(New) • EXAMINATION – WINTER 2016

Subject Code:2141307 **Date:21/11/2016**

Subject Name:Basics of Environmental Hydraulics

Time:02:30 PM to 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.**

MARKS

Q.1 **Short Questions** **14**

1 Fluids for which the flow behavior index n is less than unity are called:
(a) Ideal Plastic (c) Dilatant substance
(b) Ideal fluid (d) Pseudo-plastic

2 For incompressible flow, continuity equation can take the form:
(a) $A_1V_1 = A_2V_2$ (c) $\rho_1A_1V_1= \rho_2A_2V_2$
(b) $\rho_1A_1= \rho_2A_2$ (d) $p_1A_1V_1= p_2A_2V_2$

3 Working principle of Venturimeter is based on
(a) Bernoulli's Equation (c) Continuity Equation
(b) Momentum Equation (d) None of these

4 Mercury is used in manometers because it is:
(a) Is shinning and can be easily read
(b) having low surface tension
(c) does not stick to surface
(d) has high density and so reduces heights of manometer

5 Cipollette weir is special type of _____ weir.
(a) Triangular (c) Stepped
(b) Trapezoidal (d) All of the above

6 Laminar flow is also known as:
(a) Steady flow (c) Unsteady flow
(b) Uniform flow (d) Streamline flow

7 If the head of liquid from the centre of orifice is more than five times the diameter of orifice is called_____.

8 All the terms of energy in Bernoulli's equation have dimension of:
(a) Energy (c) Mass
(b) Work (d) Length

9 Poise is the unit of _____.

10 A curved surface is submerged in a liquid. The Vertical component of the total pressure force on surface is
(a) Weight of liquid covered by surface
(b) Pressure force on a horizontal projection of surface
(c) Pressure force on a vertical projection of surface
(d) None of the above

11 For low discharge _____ notch will gives more accurate result.
(a) Triangular (c) Stepped
(b) Trapezoidal (d) Rectangular

	12	Pressure intensity in water at a level of 1m below the free surface of water is _____ .	
	13	Line which gives the sum of pressure head and datum head of a flowing flow in a pipe with respect to some reference line is known as _____ .	
	14	Which one is the completely theoretical line: (a) Streamline (c) Pathline (b) Streakline (d) All of above	
Q.2	**(a)**	Discuss about Energy gradient line and Hydraulic gradient line.	**03**
	(b)	Oil is used for lubrication between a square plate of size 0.9 m x 0.9 m and an inclined plane with angle of inclination 30° from the base. The weight of the plate is 400 N and it slides down the inclined plane with uniform velocity of 0.4 m/s. The thickness of oil film is 1.5 mm. Determine dynamic viscosity of oil.	**04**
	(c)	Derive an expression for most efficient and economical cross section for triangular cross section	**07**
		OR	
	(c)	Derive an expression for Bernoulli's Equation.	**07**
Q.3	**(a)**	Discuss about discharge through partially submerged orifice.	**03**
	(b)	Derive an expression for triangular notch for flow discharge.	**04**
	(c)	Derive an expression for time of emptying a tank with rectangular notch.	**07**
		OR	
Q.3	**(a)**	Derive relation for Newton's Law of viscosity.	**03**
	(b)	A horizontal pipe of 400 mm diameter is suddenly contracted to 200 mm diameter. The pressure intensities in the large and smaller pipe is given as 140 kN/m^2 and 120 kN/m^2 respectively. If the rate of flow of water is 200 litre/s, calculate head loss due to sudden contraction.	**04**
	(c)	Derive Chezy's equation for head loss due to friction.	**07**
Q.4	**(a)**	Show that $C_d=C_v \times C_c$ for pipe flow.	**03**
	(b)	Derive an expression for total pressure and centre of pressure on a horizontal plane surface under uniform pressure condition.	**04**
	(c)	Derive an expression for equation of continuity for 3D flow condition.	**07**
		OR	
Q.4	**(a)**	Differentiate between open channel and pipe flow.	**03**
	(b)	Discuss different types of manometers which can be used for pipe flow condition.	**04**
	(c)	Derive an expression for rate of flow through Orifice meter.	**07**
Q.5	**(a)**	Compare steady, unsteady, rotational and irrotational flow.	**03**
	(b)	Discuss about the flow condition when pipes are connected in series and parallel.	**04**
	(c)	A horizontal venturimeter with inlet diameter 150 mm and throat diameter 75 mm is employed to measure the discharge of water. The differential manometer connected to inlet gives reading of 150 mm of Hg. Determine the	**07**

rate of flow if the coefficient of discharge is 0.98.

OR

Q.5	**(a)**	Discuss the deviation of viscosity of gases and liquid with respect to change in temperature.	**03**
	(b)	Differentiate between (a) Subcritical, critical and supercritical flow (b) Laminar and Turbulent flow	**04**
	(c)	Derive an expression for time of emptying a circular horizontal tank with an orifice at its bottom.	**07**

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