GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III EXAMINATION – SUMMER 2025

Subject Code:3131307   **Date:06-06-2025**
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.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Define: (i) specific gravity (ii) viscosity (iii) mass density	**03**
	(b)	Compare steady vs unsteady flow and laminar vs turbulent flow.	**04**
	(c)	Explain different types of fluids with figure.	**07**
Q.2	**(a)**	Differentiate between: cohesion and adhesion	**03**
	(b)	State and explain Pascal's law.	**04**
	(c)	A rectangular plate 3 m wide and 4 m long is immersed in water in such a way as (i) Horizontally 1 m below the free surface of water (ii) vertically, 3 m side is parallel to the water surface and 1 m below the free surface of water. Find (a) Total pressure on the plate (b) position of centre of pressure.	**07**

OR

	(c)	A reservoir of carbon tetrachloride has a mass of 600 kg and volume of 0.35 m^3. Find weight, mass density, specific weight and relative density.	**07**
Q.3	**(a)**	State Bernoulli's theorem and write down the assumptions for it.	**03**
	(b)	List the major and minor losses of energy in pipes.	**04**
	(c)	Derive an expression for equation of continuity in a 3D flow in cartesian coordinates system.	**07**

OR

Q.3	**(a)**	Draw simple sketch and explain working of piezometer with its limitations.	**03**
	(b)	Explain the EGL and HGL.	**04**
	(c)	Derive an expression for Euler's equation of motion.	**07**
Q.4	**(a)**	Differentiate between open channel and pipe flow.	**03**
	(b)	Explain small orifice and vena contracta.	**04**
	(c)	A vertical sharp-edged orifice of 140 mm diameter is discharging water at the rate of 100 lit/s under a constant head of 10 m. A point, on the jet, measured from the vena-contracta of the jet has co-ordinates 4.3 m horizontal and 0.6 m vertical. Determine the co-efficient Cc, Cv and Cd of the orifice.	**07**

OR

Q.4	**(a)**	Define: (i) depth of flow (ii) wetted perimeter (iii) hydraulic radius	**03**
	(b)	Give classification of orifices and mouthpieces.	**04**
	(c)	Derive an expression for discharge through a large rectangular orifice.	**07**
Q.5	**(a)**	Give the classification of notches and weirs.	**03**
	(b)	A rectangular weir of crest length 60 cm is used to measure the rate of flow of water in rectangular channel. The channel is 90 cm wide and 80 cm deep. Find the discharge in the channel if the water level is 90 mm above the crest of weir. Take velocity of approach in to consideration and value of C$_d$ =0.63.	04
	(c)	What do you mean by "most economical section" of an open channel? How it is determined? What are the conditions for the rectangular channel for best conditions?	**07**

OR

Q.5	**(a)**	Explain the concept of velocity of approach.	**03**
	(b)	A cipolletti weir of crest length 80 cm discharges water. The head of water over the weir is 340 mm. determine the discharge over the weir if the channel is 60 cm wide and 60 cm deep. Assume C$_d$ =0.62.	**04**

(c) Derive an expression for most efficient and economical cross section for rectangular cross section of open channel. **07**

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