Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019

Subject Code: 2161306 **Date: 11/12/2019**

Subject Name: Design of Water Treatment Units

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	**(a)**	Draw the neat sketch of a treatment train for a ground water source when cations concentration is high.	**03**
	(b)	Enlist different types of Flow measuring devices for water treatment. Explain any 1 in detail.	**04**
	(c)	Make a bar diagram in terms of $CaCO_3$ for a water with following composition and soften the water by a suitable method and calculate the dosage of relevant chemicals. Ca^{+2} =75 mg/L Mg^{+2} =40 mg/L Na^{+} = 10 mg/L SO_4^{-2} =109 mg/L Cl^{-} =10 mg/L HCO_3^{-} =300 mg/L.	**07**
Q.2	**(a)**	Determine the headloss for clean and 60 percent clogged screen for following conditions: V = 0.9 m/s; v = 0.6 m/s; open area for flow through clear bar screen = 0.19 m^2; $C_{\text{for clean}}$ = 0.7 and $C_{\text{for 60\% clogged}}$ = 0.6	**03**
	(b)	Write down chemical reactions involved with Alum and Ferric chloride; (i) When bicarbonate alkalinity present and (ii) When Lime added.	**04**
	(c)	Design a Rapid Mixer with impeller for 20 MLD flow of water.	**07**
		OR	
	(c)	Write down design criteria for tube settler. Explain the design steps for tube settler.	**07**
Q.3	**(a)**	Write a short note on layout and hydraulic profile of water treatment plant.	**03**
	(b)	What is Velocity Gradient? Write down the design criteria for Paddle Flocculator.	**04**
	(c)	A coagulation-sedimentation plant clarifies 40 MLD water. The quantity of alum required at plant is 18 mg/L. If the raw water is having an alkalinity equivalent to 5 mg/L of $CaCo_3$, determine the quantity of alum and the quick lime (containing 85 % CaO) required per year by the plant.	**07**
		OR	
Q.3	**(a)**	Write a short note on layout and hydraulic profile of water treatment plant.	**03**
	(b)	The maximum daily demand at a water treatment plant has been estimated 12 MLD. Design the dimensions of a suitable sedimentation tank. Assuming detention time 6 hrs. & velocity of flow as 20 cm/min.	**04**
	(c)	Design a Flocculator for 20 MLD flow for water treatment plant.	**07**
Q.4	**(a)**	Write a short note on Nalgonda Technique.	**03**
	(b)	Draw the neat diagram of slow sand filter showing all important components with proper labeling.	**04**
	(c)	Design a chlorine contact tank for peak water flow of 20 MLD.	**07**
		OR	

Q.4	**(a)**	Write a short note on Demineralization Plant.	**03**
	(b)	Design tube settler module of a square cross section for design flow of 5 MLD. Assume tube cross section = 0.05 m x 0.05 m, length = 1 m and angle of inclination = 60°.	**04**
	(c)	Design a Rapid Sand Filter for a city water treatment plant for average flow of 20 MLD.	**07**
Q.5	**(a)**	Write down design criteria for Rectangular Sedimentation tank.	**03**
	(b)	Explain iron and manganese removal from a ground water source.	**04**
	(c)	Write down detailed note on water treatment residuals with neat diagram showing various sources.	**07**

OR

Q.5	**(a)**	Write a short note on application of activated carbon filters in water treatment plant.	**03**
	(b)	What are the drawbacks of single media filter? How can we overcome them?	**04**
	(c)	Write and explain selection criteria for source of water and water treatment schemes.	**07**

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