Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2018

Subject Code:2161306 **Date:30/11/2018**

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)**	What is the difference between Acceptable and Permissible Limit as IS 10500-2012? Give 3 Examples to support your answer.	**03**
	(b)	Draw neat sketch of conventional treatment train for Surface water with function of unit operations/processes.	**04**
	(c)	Enlist different types of Flow measuring devices for water treatment. Explain any 3 in detail.	**07**
Q.2	**(a)**	Determine the headloss for clean and half 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; $C_{for\ clean}$ = 0.7 and $C_{for\ half\ clogged}$ = 0.6	**03**
	(b)	50 mg/L of alum is added to 50,000 m^3/day of raw water containing 60 mg/L of suspended solids. Assuming that sufficient natural alkalinity is present, how many kilograms sludge is produced per day? Assuming that the specific gravity of sludge is 1.04, how many cubic meters of sludge is produced per day? Assume the settling basin removal efficiency as 65%.	**04**
	(c)	Enlist and explain types of rapid mixers. Write down the design criteria for Rapid Mixer.	**07**
		OR	
	(c)	Design a rapid mixing device for 15 MLD flow also include impeller design in it.	**07**
Q.3	**(a)**	Write a short note on layout and hydraulic profile of water treatment plant.	**03**
	(b)	Write down design criteria for tube settler. Explain the design steps for tube settler.	**04**
	(c)	Design tube settler module of a square cross section for design flow of 3 MLD. Assume suitable tube cross section, length and angle of inclination.	**07**
		OR	
Q.3	**(a)**	Write down design criteria for Paddle Flocculator.	**03**
	(b)	Design a circular flow sedimentation tank for a town with population 43000. Assume average water flow is 180 lit/capita/day. Design for 2.5 hrs. detention time at 115% of average flow. Determine tank depth & diameter to produce an overflow rate of 35 m^3/m^2-d. Check the design for WOR.	**04**
	(c)	Design a clarifier for 10 MLD flow for water treatment plant.	**07**
Q.4	**(a)**	Write a short note on Deflouridation systems.	**03**
	(b)	Draw the neat diagram of rapid sand filter showing all important components with proper labeling.	**04**
	(c)	Design a Rapid Sand Filter for a city water treatment plant for average flow of 18 MLD.	**07**
		OR	
Q.4	**(a)**	Write a short note on water softeners with various equations involved in it.	**03**

(b) Explain Chlorination system of a water treatment plant with a neat sketch. **04**

(c) Design a chlorine contact tank for peak water flow of 24 MLD. **07**

Q.5 **(a)** Write down design criteria for Circular Sedimentation tank. **03**

(b) Enlist selection criteria for source of water and water treatment schemes. **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) Explain iron and manganese removal from a ground water source. **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. **07**

Ca^{+2} =149.2	Mg^{+2} =65.8	Na^{+} = 17.4
SO_4^{-2} =29.9	Cl^{-} =17.8	HCO_3^{-} =185
CO_2 =29.3.		

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