Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI (NEW) EXAMINATION – WINTER 2024

Subject Code:3161306 Date:25-11-2024

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	(a)	Define following terms:(i) SOR (ii) WOR (iii) Scour Velocity	03
	(b)	List down the factors must be considered when designing water treatment systems for surface water sources.	04
	(c)	Draw neat and clean flow diagram for conventional surface water treatment scheme. Explain each unit in detail.	07
Q.2	(a)	Differentiate between Rapid mixer and flocculator	03
	(b)	State the design criteria for Tube settler.	04
	(c)	Design a coarse screen chamber for an average flow of 20 MLD. Assume the following data of incoming pipe attached to approach channel. • Dia of sewer= 1.5 m • Depth of flow at peak design flow= 1 m • Velocity at peak design flow= 1.2 m/s • Drop of screen chamber flow w.r.t sewer invert= 0.08 m Assume rectangular bars= 15 mm invert dia. Spacing between bars= 35 mm	07
		OR	
	(c)	Design of Rapid Mixer for design flow of 25 MLD.	07
Q.3	(a)	Define the following terms: 1. Velocity gradient 2. Tip velocity 3. Relative velocity	03
	(b)	Discuss the advantages and disadvantages of tube settler.	04
	(c)	Design a clariflocculator for average flow of 15 MLD. Assume all necessary suitable data	07
		OR	
Q.3	(a)	What are the advantages of using a Parshall flume over other flow measuring devices like weirs or venturi meters?	03
	(b)	Write the design criteria for coarse screen.	04
	(c)	Design a tube settler module of square cross section with following data: • Design flow= 125 m^3/hr • Dia of tube= 30mm • Length of tube=1 m • Angle of inclination= 60 to horizontal	07
Q.4	(a)	What is the role of flocculation in the water and wastewater treatment process? Explain.	03
	(b)	Differentiate between orthokinetic and perikinetic flocculation.	04
	(c)	Enlist the various types of sludge dewatering devices and explain any one with sketch.	07
		OR	
Q.4	(a)	Write down the chemical reactions involved in water softening process.	03
	(b)	State the design criteria for chlorine contact tank.	04

	(c)	List down methods to control and manage water treatment plant residues and explain any two methods in detail.	07
Q.5	(a)	Write down the specifications of sand to be used in a RSF	03
	(b)	Enlist and explain different types of rapid mixers commonly used in water treatment plants.	04
	(c)	Write a detail note on Cascade Aeration with diagram.	07
		OR	
Q.5	(a)	Explain detention time, flow rate, and disinfectant dose in context of chlorine contact tank.	03
	(b)	State advantages and disadvantages of Nalgonda Technique.	04
	(c)	Write a short note on removal of arsenic from Ground Water.	07

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