Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- VII EXAMINATION-SUMMER 2023

Subject Code: 3171306 Date: 27/06/2023

Subject Name: Wastewater Engineering

Time: 10:30 AM TO 01:00 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.**

			MARKS
Q.1	**(a)**	Enlist and explain operational problems of suspended growth processes.	**03**
	(b)	Design an aerated grit chamber for the treatment of Municipal waste water. The average flow rate is 0.50 m^3/s and the peaking factor is 2.5.	**04**
	(c)	Explain the types of Grit chamber with neat sketch.	**07**
Q.2	**(a)**	What is Bio tower? Explain its working.	**03**
	(b)	Explain the benefits and disadvantages of Flow Equalization.	**04**
	(c)	Write down design consideration for Upflow Anaerobic Sludge Blanket (UASB).	**07**
		OR	
	(c)	Design a circular sedimentation tank for design flow of 30,000 m^3/day. Assume detention time 3 hrs. Determine tank depth and diameter to produce an overflow rate of 35 m^3/m^2.day. Check for WOR and Horizontal velocity.	**07**
Q.3	**(a)**	Explain the factors responsible for foaming in Activated Sludge Process.	**03**
	(b)	Design an oil and grease trap to remove 180 mg/L of oil and grease from a flow of 45000 m^3/day of wastewater.	**04**
	(c)	Describe about design criteria of Primary Settling Tank.	**07**
		OR	
Q.3	**(a)**	Write a short note on extended aeration.	**03**
	(b)	Differentiate between standard rate and high rate anaerobic digesters.	**04**
	(c)	Design a rotating biological contactor to treat a flow of 50 MLD flow of primary treated wastewater having BOD_5 of 200 mg/L. Desired effluent BOD_5 is 30 mg/L.	**07**
Q.4	**(a)**	Explain various methods of dewatering of sludge.	**03**
	(b)	A bar screen is inclined at 30˚ angle from vertical. The rectangular bars have width 20 mm & spacing 25 mm. Total Number of spacing are 30. Determine the headloss when the bars are clean & Velocity approaching the screen is 1 m/s. Assume bar shape factor is 1.83.	**04**
	(c)	Enlist and explain drawbacks and benefits of SBR.	**07**
		OR	
Q.4	**(a)**	Explain briefly about basic processes for sludge treatment.	**03**
	(b)	Enlist and explain the operational problems of Physical Unit operations.	**04**
	(c)	Design a square degritter tank for a flow of 0.56 m^3/s. The design overflow rate is 950 m^3/m^2/day to remove 0.21 mm particle at 15˚C. The detention time is 2 minute. The design should include dimensions of the basin & the influent and effluent sturctures.	**07**
Q.5	**(a)**	Write the Eckenfelder equations (with & without recirculation) for Bio tower design.	**03**
	(b)	Design the dimensions of a septic tank for a small colony of 150 persons provided with an assured water supply from the municipal head works at a rate of 120 litres per person per day. Assume any data, you may need.	**04**

	(c)	Design sludge drying beds to dewater the digested sludge produced from wastewater treatment plant based on the activated sludge process designed for 60000 population. Assume other suitable data.	**07**

OR

Q.5	**(a)**	Enlist the types of filter presses.	**03**
	(b)	Write a short note on mixing and air requirement in Equalization Tank.	**04**
	(c)	Assuming suitable design criteria and following characteristics of domestic wastewater, design a UASB reactor system to treat an average 7.5 MLD flow of wastewater. Assume up flow velocity is 0.5 m/h. Given Data: Influent BOD = 420 mg/L, Influent COD = 950 mg/L, Influent TSS = 500 mg/L, Influent VSS = 400 mg/L and Desired Effluent BOD = 100 mg/L or less.	**07**

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