Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 5 – EXAMINATION – SUMMER 2026

Subject Code: 3151303 **Date: 25/05/2026**

Subject Name: Physico-chemical Treatment Technology

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)**	List six major physical and chemical characteristics of wastewater.	**03**
	(b)	Discuss the components of wastewater flows and why statistical analysis is required for treatment design.	**04**
	(c)	Analyze the relationship between pH, alkalinity, and the optimum Alum dose using the Jar Test procedure.	**07**
Q.2	**(a)**	List the different types of screens based on their opening sizes and cleaning mechanisms.	**03**
	(b)	Explain why screens are fundamentally necessary before any subsequent treatment of wastewater.	**04**
	(c)	Compare and contrast the four types of settling in sedimentation tanks.	**07**
		OR	
Q.2	**(c)**	What is Stokes Law? Apply it to calculate the settling velocity of a discrete particle with a diameter of 0.1 mm and specific gravity of 2.65.	**07**
Q.3	**(a)**	State the primary assumptions made for an ideal sedimentation tank.	**03**
	(b)	Illustrate the mechanism of 'Charge Neutralization' versus 'Interparticle Bridging' in coagulation.	**04**
	(c)	With the help of a neat sketch, explain the construction and working of Slow Sand Filter.	**07**
		OR	
Q.3	**(a)**	Describe the term 'Zeta Potential' and its role in colloidal stability.	**03**
	(b)	A rectangular sedimentation tank has a length of 12 m and a width of 10 m. For a flow rate of 2.5 MLD, calculate the Weir Overflow Rate.	**04**
	(c)	Analyze the operational difficulties of a Rapid Sand Filter, including air binding and sand boiling.	**07**
Q.4	**(a)**	Explain the phenomenon of 'Mud-ball formation' in rapid sand filters.	**03**
	(b)	Describe the chemistry of metallic coagulants (like Alum) and their reaction with alkalinity.	**04**
	(c)	Define and explain following terms: (i) Free available chlorine, (ii) Super chlorination, (iii) Plain chlorination, (iv) Post chlorination, (v) Pre chlorination and (vi) Double chlorination.	**07**
		OR	

Q.4	**(a)**	Summarize the factors that influence the efficiency of the disinfection process.	**03**
	(b)	Explain the mechanism of headloss in screens and how it affects plant operation.	**04**
	(c)	Analyze the different disinfection methods based on their mechanisms and byproduct formation.	**07**
Q.5	**(a)**	Identify the various sources of sludge generated in a conventional treatment plant.	**03**
	(b)	Explain the design considerations for sludge drying beds to minimize odor and maximize drying efficiency.	**04**
	(c)	Mention the type of digester and explain them with neat diagram.	**07**

OR

Q.5	**(a)**	Briefly explain the principle behind the thickening of waste sludges.	**03**
	(b)	Compare the suitability of aerobic vs. anaerobic sludge digestion methods for large-scale plants.	**04**
	(c)	Write down the definitions: Dewatering, Thickening, Leachate, Sludge conditioning, Bio solid, Landfill and Incineration.	**07**

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