GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3171309 **Date:16-12-2024**
Subject Name: Advanced Wastewater Treatment Technologies
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)**	Write the applications of advanced wastewater treatment for water treatment.	**03**
	(b)	Explain the need of advanced wastewater treatment technologies.	**04**
	(c)	Write a note on "air stripping" as chemical process for nitrogen removal from wastewater with neat sketch.	**07**
Q.2	**(a)**	Highlight the need for removal of nutrients from wastewater.	**03**
	(b)	Enlist the sources of phosphorous in wastewater. Mention the forms in which phosphorous occur.	**04**
	(c)	With the help of neat sketches explain the modes of operation in membrane filtration unit of MBR.	**07**

OR

	(c)	With the help of neat sketches explain the procedure of membrane cleaning of MBR.	**07**
Q.3	**(a)**	Explain the factors that reduce membrane performance.	**03**
	(b)	Write a note on "Membrane fouling."	**04**
	(c)	Write a short note: Anaerobic Membrane Bioreactors.	**07**

OR

Q.3	**(a)**	How does MBR process differ from conventional ASP?	**03**
	(b)	Discuss the application of microfiltration, ultra-filtration and reverse osmosis.	**04**
	(c)	The following laboratory data were collected in batch adsorption study. Plot the data according to Langmuir isotherm and determine the values of constants a and b. A volume of 500 ml is placed in each flask and wastewater has initial COD is 100 mg/L.	**07**

Flask No.	Mass of carbon (mg)	Final COD in mg/L
1	960	3.5
2	740	5.2
3	545	8.0
4	385	12.5
5	260	20.5
6	170	33
7	0	100

Q.4	(a)	Enlist the applications of Advanced oxidation process.	03
	(b)	Explain the Fenton oxidation process for removal of refractory organics from waste water.	04
	(c)	A wastewater containing Co=25 mg/L of phenol is to be treated using PAC to produce effluent concentration Ce=0.1 mg/L. The constants for Langmuir isotherm are to be determined using results given below. The volume of waste in each beaker is 1 L. If the flow rate of 0.11m3 /s is to be treated, calculate the quantity of PAC needed per day.	07

Test	PAC added (g)	Concentration remaining (mg/L)	Test	PAC added (g)	Concentration remaining (mg/L)
1	0.25	6.0	5	1.5	0.06
2	0.32	1.0	6	2.0	0.06
3	0.5	0.25	7	2.6	0.06
4	1.0	0.09			

OR

Q.4	(a)	Explain in detail the concept of "Electro floatation".	03
	(b)	Enlist and explain factors affecting Electro floatation.	04
	(c)	Enlist the operating parameters to be maintained during electro-coagulation and explain all in detail.	07

Q.5	(a)	Enlist the types of Ion exchange resins.	03
	(b)	Explain the process of resin regeneration.	04
	(c)	Enlist the methods for chemical precipitation of phosphorous. Explain any one method with equation.	07

OR

Q.5	(a)	Explain the mechanism of adsorption with neat sketch.	03
	(b)	Explain the Langmuir and Frendluich isotherm along with assumptions.	04
	(c)	Explain the mechanism involved in the softening of non carbonate hardness of magnesium.	07

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