Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3171309 Date:19-12-2023

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)**	Name the technique used for advanced wastewater treatment.	**03**
	(b)	Give overview of biological nitrogen removal process.	**04**
	(c)	Discuss the application of microfiltration and ultrafiltration.	**07**
Q.2	**(a)**	Enlist the principal processes used for biological phosphorous removal.	**03**
	(b)	Discuss the technologies used to produce Hydroxyl (HO◦) radical.	**04**
	(c)	Explain in detail activated carbon adsorption kinetics.	**07**
		OR	
	(c)	Discuss in detail fundamentals of Adsorption.	**07**
Q.3	**(a)**	Enlist the advanced oxidation processes for wastewater treatment.	**03**
	(b)	Explain the types of synthetic ion-exchange resin.	**04**
	(c)	Define the terms : (i) Permeate (ii) Retentate (iii) Membrane fouling (iv) Recovery (v) Trans membrane pressure (vi) Flux (vii) Influent.	**07**
		OR	
Q.3	**(a)**	Explain advantage and disadvantages of Advanced oxidation process which use combination of hydrogen peroxide and ozone.	**03**
	(b)	Define: Bed life, Carbon usage rate, EBCT.	**04**
	(c)	Differentiate between : (i) Maintenance cleaning and Recovery cleaning. (ii) External MBR and Immersed MBR.	**07**
Q.4	**(a)**	Draw flow diagram for removal of ammonia by zeolite.	**03**
	(b)	Write a short note on membrane material.	**04**
	(c)	Enlist and explain factors affecting Electo coagulation process	**07**
		OR	
Q.4	**(a)**	What is mass transfer zone? Explain with figure.	**03**
	(b)	Compare Hollow fiber and plate & frame membrane.	**04**
	(c)	Explain the Fenton’s process for wastewater treatment along with equations.	**07**
Q.5	**(a)**	Discuss in brief theory of Electrodialysis	**03**
	(b)	Explain modes of operation of MBR.	**04**
	(c)	Explain nitrification and denitrification processes with equations.	**07**
		OR	
Q.5	**(a)**	Discuss in brief theory of Reverse Osmosis.	**03**

(b)	Draw only a neat sketch of MBR unit.	**04**
(c)	Explain the need of advanced wastewater treatment technologies.	**07**