Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VIII (New) EXAMINATION – WINTER 2019

Subject Code: 2181308 **Date: 21/11/2019**

Subject Name: Advanced Wastewater Treatment Technologies

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.**

Q.1	**(a)**	Explain application of Microfiltration and Reverse osmosis.	**03**
	(b)	Highlight the need of advanced wastewater treatment technologies in environmental engineering field.	**04**
	(c)	What is membrane fouling? Explain different fouling phenomenon with sketches.	**07**
Q.2	**(a)**	Define (i) flux (ii) transmembrane pressure (iii) product water	**03**
	(b)	Write a short note on membrane material.	**04**
	(c)	Compare spiral wound membrane and tube membrane	**07**
		OR	
	(c)	Compare Hollow fiber and plate & frame membrane.	**07**
Q.3	**(a)**	Explain types of membrane Bioreactor with figure.	**03**
	(b)	Enlist benefits and limitations of MBR.	**04**
	(c)	Explain the microbiology involved in biological process of phosphorous removal.	**07**
		OR	
Q.3	**(a)**	Explain micro-porous membrane and thin composite membrane.	**03**
	(b)	Explain Nitrification along with chemical reaction.	**04**
	(c)	Enlist chemical methods of phosphorous removal and explain any one method with equations and the process configurations.	**07**
Q.4	**(a)**	Enlist three different types of electro-oxidation mechanism and explain any one in brief.	**03**
	(b)	Write a note on electro-flotation technique of removing sediments.	**04**
	(c)	Explain the Fenton's process for wastewater treatment along with equations. .	**07**
		OR	
Q.4	**(a)**	Differentiate between electro-coagulation and chemical coagulation. (give at least 3 points)	**03**
	(b)	Enlist advanced oxidation processes in which ozone is used. Explain any one with equations.	**04**
	(c)	Highlight applications of ion exchange in wastewater treatment.	**07**

Q.5 **(a)** Enlist photochemical advanced oxidation processes. Explain any one in brief. **03**

(b) Explain modes of operation of MBR. **04**

(c) An adsorption study is set up in laboratory by adding a known amount of activated carbon to six flasks which contain 200 mL of an industrial waste. An additional flask containing 200 mL of waste but no carbon is run as a blank. Plot the Langmuir isotherm and determine the values of the constants. **07**

Carbon dose, mg	804	668	512	393	313	238	0
Residual Conc, mg/L	4.7	7.0	9.31	16.6	12.2	62.8	250

OR

Q.5 **(a)** Define: (i) adsorption, (ii) adsorbent and (iii) adsorbate. **03**

(b) Explain the treatment process of wastewater with powdered activated carbon. **04**

(c) Explain Membrane cleaning mechanisms. **07**

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