Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3161304 Date:02-12-2023

Subject Name:Biological Processes for Wastewater Treatment

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.**

			Marks
Q.1	**(a)**	Classify various types of biological treatment technologies with examples.	**03**
	(b)	Write a short note on bacterial growth curve with neat sketch.	**04**
	(c)	Enlist the different types of natural treatment system & describe any	**07**
Q.2	**(a)**	Define the terms: (1) F/M Ratio (2) MCRT (3) organic volumetric loading rate.	**03**
	(b)	A sample of wastewater was incubated for 7-days at 20°C and showed a BOD of 208 mg/L. assuming k=0.15/day calculate: 1. Its 5-day BOD 2. Ultimate BOD	**04**
	(c)	Enlist and explain factors affecting BOD test.	**07**
		OR	
	(c)	Differentiate between (1) aerobic and anaerobic process of wastewater treatment. (2) BOD and COD	**07**
Q.3	**(a)**	Define : (1) Substrate utilization rate (2) specific growth rate (3) biomass yield	**03**
	(b)	Make a list of possible modifications in activated sludge process.	**04**
	(c)	Determine the values of Co-efficient K,Ks,Y,kd,μm From the following data. Derive From a bench Scale activated Sludge Study using CFSTR Without Recycle.	**07**

Unit no.	S_0(mg/l)	S_e(mg/l)	$\Theta=\Theta_c$(days)	X(mg/l)
1	300	7	3.2	128
2	300	13	2.6	125
3	300	18	1.6	133
4	300	13	1.1	129
5	300	41	1.1	121

OR

Q.3	**(a)**	Distinguish between aerobic, anaerobic & facultative microorganism and their role in decomposition of organic matter.	**03**
	(b)	Compare fine bubble & coarse bubble aeration system.	**04**
	(c)	A series of BOD determination was made on a sample to calculate ultimate BOD and rate constant. Incubation was carried out on a 5% dilution of the sample at 20 ºC when initial DO for the samples and blank was 9.17 mg/l. ,determine L & K by using least square method.	**07**

Day	Final DO in sample mg/L	Blank BOD in mg/L
1	7.1	9.0
2	6.1	9.0
3	5.1	8.9
4	4.2	8.9
5	3.9	8.8
6	3.5	8.7
7	3.0	8.6

Q.4 **(a)** Explain when anaerobic conditions are developed in a trickling filter. **03**

(b) Explain with neat sketch subsurface flow system. **04**

(c) Discuss the mechanism of working of UASB with neat sketch. **07**

OR

Q.4 **(a)** Determine the volume in liters of methane gas generated per kg COD consumed at STP **03**

(b) Explain effect of any three characteristics of wastewater on natural treatment system **04**

(c) Write a short note on Rotating biological contactor with neat sketch. **07**

Q.5 **(a)** Define reaction rates & explain first & second order types of reaction rates. **03**

(b) Differentiate between packed bed reactor and fluidized bed reactor. **04**

(c) Write down the mass balance for CFSTR with recycle and hence derive the equation for finding biokinetic constant. **07**

OR

Q.5 **(a)** Enlist different types of reactors and explain any one. **03**

(b) Draw a neat sketch of Bio tower and explain Bio tower **04**

(c) Write down the mass balance for CFSTR without recycle and hence derive the equation for finding biokinetic constant. **07**