Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) EXAMINATION – WINTER 2022

Subject Code:3161304 Date:13-12-2022

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**.

Q.1 **(a)** Define: Anoxic process, HRT and SRT **03**

(b) Draw a neat figure of bacterial growth phases curve and explain any two phases. **04**

(c) Differentiate between aerobic and anaerobic process of wastewater treatment. **07**

Q.2 **(a)** Explain the role of microorganism in wastewater treatment. **03**

(b) Give the difference between Coarse bubble and fine bubble diffused aeration. **04**

(c) The 5-day BOD of a wastewater is 210mg/l at 20^0C. What will be the ultimate BOD and 10-day BOD? If the sample has been incubated at 30^0C what would the 5-day BOD have been. (k at 20^0C = $0.^{-1}$) **07**

OR

(c) BOD result of sewage at 37^0C are **07**

t, day	0	1	2	3	4	5
y, mg/l	0	60	108	151	182	201

Determine the values of rate constant and ultimate BOD using least square method.

Q.3 **(a)** Why incubation period is fixed for 5 days at 20 °C in BOD test as per the Standard method. **03**

(b) Draw a neat sketch of Constructed wet lands system and explain in brief. **04**

(c) Prepare mass balance for CFSTR with recycle for biomass & hence derive the equation to find volume of tank. **07**

OR

Q.3 **(a)** Draw a neat sketch of Overland flow system and explain wastewater distribution method in same. **03**

(b) Describe in brief the operating problems involved with following: **04**
(i) trickling filter and (ii) Rotating biological contactor

(c) Determine the value of bio-kinetic constants using data in given table below. **07**

Sr. No.	Influent S_0 (mg/l)	Outlet conc. Se (mg/l)	θ_c (d)	HRT (d)	X (mg/l)
1	350	8	7	0.18	3900
2	350	12	4.5	0.18	2850
3	350	18	3	0.18	2050
4	350	48	1.6	0.18	1025
5	350	98	1.2	0.18	650

Q.4 **(a)** Explain the terms: (i) F/M ratio, (ii) MCRT/SRT, (iii) Specific growth rate, **03**

(b) Explain the procedure for determination of kinetic constant for BOD in laboratory **04**

(c) Enlist an explain the fundamental requirements of natural treatment systems. **07**

OR

Q.4	**(a)**	Draw a neat sketch of single stage digester and enlist operational parameters to be maintained.	**03**
	(b)	Explain the how relationship between different types of bacteria present is important for stabilization in anaerobic process.	**04**
	(c)	Draw a neat sketch of up-flow anaerobic sludge blanket reactor and explain it.	**07**
Q.5	**(a)**	Which factors affect the biological reactions?	**03**
	(b)	Differentiate between plug flow reactor and continuous flow stirred tank reactor.	**04**
	(c)	Draw a neat sketch of Bio tower and explain Bio tower	**07**

OR

Q.5	**(a)**	Differentiate between homogeneous and heterogeneous reactions with example.	**03**
	(b)	Differentiate between packed bed reactor and fluidized bed reactor.	**04**
	(c)	Draw a neat sketch of Sequential batch Reactor and explain it	**07**

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