GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2023
Subject Code:3161304   **Date:04-07-2023**
Subject Name:Biological Processes for Wastewater Treatment
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)	Explain the terminology used in BOD test: (i) Ultimate BOD, (ii) BOD exerted and (iii) BOD remaining	03
	(b)	Draw a neat sketch of UASB and highlight its components.	04
	(c)	Write a short note on Rotating biological contactor with neat sketch.	07
Q.2	(a)	Why incubation period is fixed for 5 days at 20°C in BOD test as per the Standard method?	03
	(b)	Write down the difference between Biological and Physico-chemical analysis.	04
	(c)	Draw the BOD progression curve and explain the different phases of it.	07
		OR	
	(c)	Write down the mass balance for CFSTR without recycle.	07
Q.3	(a)	Draw a neat sketch of Constructed Wetland system and explain in brief.	03
	(b)	A sample of wastewater was incubated for 7 days at 20°C and BOD results is 490 mg/L. BOD rate constant K = 0.1 day^{-1}. Calculate (i) 5 day BOD (ii) 10 day BOD and (iii) Ultimate BOD.	04
	(c)	Write down the mass balance for Substrate for CFSTR with recycle and hence Derive the equation for finding biokinetic constant.	07
		OR	
Q.3	(a)	Explain the Bio sloughing phenomena of trickling filter.	03
	(b)	Differentiate between Anoxic and Anaerobic process.	04
	(c)	Draw a neat sketch of activated sludge process & explain the process in detail.	07
Q.4	(a)	Give the difference between extended aeration and tapered aeration.	03
	(b)	Determine the volume in liters of methane gas generated per kg COD consumed at STP.	04
	(c)	An anaerobic reactor, operated at 35°C, processes a wastewater stream with a flow of 3000 m^3/d and a bsCOD conc. of 3000 g/m^3. At 95% bsCOD removal & a net biomass synthesis yield of 0.04 g VSS/g COD used, what is the amount of methane and total gas produced in m^3/d? If 65% part of gas is methane.	07
		OR	
Q.4	(a)	Explain when anaerobic conditions will develop in a trickling filter.	03
	(b)	Define reaction rates & explain zero, first & second order types of reaction rates.	04
	(c)	The following data were obtained using four bench scale continuous flow activated sludge units to treat a milk processing waste. Using these data determine Y and k_d.	07

Units	X	r$_g$	U
1	20	1.2	0.2
2	7	1.6	0.5
3	8	1.9	0.47
4	3	2.1	1.28

Q.5	(a)	Write a brief note: Root zone treatment	03
	(b)	Name the types of reactors & explain any one type with neat sketch.	04
	(c)	Enlist and explain the advantages and disadvantages of anaerobic treatment processes.	07

OR

Q.5	(a)	Write a brief note on "bulking of sludge in ASP".	03
	(b)	Explain in detail anaerobic sludge digestion.	04
	(c)	Enlist and explain the basic steps involved in the overall anaerobic oxidation of a waste.	07

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