

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-VI (NEW) EXAMINATION – WINTER 2020****Subject Code:2161304****Date:22/01/2021****Subject Name:Biological Processes for Wastewater Treatment****Time:02:00 PM TO 04:00 PM****Total Marks: 56****Instructions:**

1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		Marks
Q.1	(a) Differentiate between Biological and Physicochemical analysis	03
	(b) Explain clearly the difference between BOD, COD and TOC.	04
	(c) Derive the relationship to find the amount of methane per gram of COD.	07
Q.2	(a) Define the terms: (i) SVI (ii) organic loading (iii) yield coefficient	03
	(b) A sample of wastewater was incubated for 7 days at 20 °C and BOD result is 208 mg/l, BOD rate constant $K = 0.15 \text{ day}^{-1}$. Calculate (i) 5 – day BOD (ii) 10 – Day BOD (iii) Ultimate BOD	04
	(c) Explain mass balance for substrate for CFSTR with recycle.	07
Q.3	(a) Explain about stuck reactor.	03
	(b) With reference to attached growth processes explain mass transfer limitations.	04
	(c) Explain the Thomas method for determination of reaction rate constant and ultimate BOD.	07
Q.4	(a) Explain the role of microorganism in wastewater treatment?	03
	(b) Give classification of biological treatment processes.	04
	(c) Compute the mean cell residence time, recirculation ratio, and volume of a reactor from the following data to design a conventional activated sludge process. Compare the recirculation ratio if the effluent biomass concentration of 15 mg/L is considered in the mass balance analysis. Given data: • Daily average wastewater flow, $Q_{avg} = 20 \text{ MLD}$ • Sludge wasting flow, $Q_w = 140 \text{ m}^3/\text{d}$ • Biomass concentration in reactor, $X = 4000 \text{ mg/L}$ •	07

Returned sludge concentration, $X_r = 10000 \text{ mg/L}$ Hydraulic retention time, $\Theta = 4 \text{ hours}$

- Q.5** (a) Differentiate between Anoxic and Anaerobic process. **03**
- (b) Write the Difference Between Aerobic & Anaerobic Treatment Process. **04**
- (c) Enlist the modifications of Activated sludge Process and explain any two with sketch. **07**
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- Q.6** (a) Discuss the problems of bulking in ASP **03**
- (b) Enlist the parameters affecting anaerobic digestion and explain alkalinity requirement. **04**
- (c) Explain anaerobic treatment process as a four stage process. **07**
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- Q.7** (a) Discuss about multistage anoxic digester. **03**
- (b) Explain single stage and two stage trickling filter. **04**
- (c) Write a short note on systems with packaged (pre-engineered) treatment plants. **07**
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- Q.8** (a) Write a brief note on slow sand filter. **03**
- (b) Discuss the mechanism of working of RBC with neat sketch. **04**
- (c) Explain the major problems faced by small communities to treat the domestic wastewater **07**
