

# GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-VII (NEW) EXAMINATION – WINTER 2020

**Subject Code:2170407**

**Date:25/01/2021**

**Subject Name:Biochemical Engineering-I**

**Time:10:30 AM TO 12:30 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
<b>Q.1</b>	(a) How are cells classified?	<b>03</b>
	(b) What is central dogma of life? Explain in brief.	<b>04</b>
	(c) Derive the equation for batch reaction time required to reduce the substrate concentration from $s_0$ to $s_f$ in an enzymatic process.	<b>07</b>
<b>Q.2</b>	(a) What do you mean by recycle stream, bypass stream and purge stream?	<b>03</b>
	(b) A continuous process is set up for treatment of wastewater. Each day, $10^5$ kg cellulose and $10^3$ kg bacteria enter in the feed stream, while $10^4$ kg cellulose and $1.5 \times 10^4$ kg bacteria leave in the effluent. The rate of cellulose digestion by the bacteria is $7 \times 10^4$ kg $d^{-1}$ . The rate of bacterial growth is $2 \times 10^4$ kg $d^{-1}$ ; the rate of cell death by lysis is $5 \times 10^2$ kg $d^{-1}$ . Write balances for Cellulose and bacteria in the system.	<b>04</b>
	(c) Explain different modes of sterilization of liquids.	<b>07</b>
<b>Q.3</b>	(a) What do you mean by state properties?	<b>03</b>
	(b) Draw a neat diagram of stirred tank reactor with proper annotations.	<b>04</b>
	(c) Classify the fluids according to their rheological behaviour. Also show their flow curve.	<b>07</b>
<b>Q.4</b>	(a) Compare packed bed, fluidized bed and trickel bed reactors.	<b>03</b>
	(b) What is Reynold's number? Give its equation and significance.	<b>04</b>
	(c) Explain various factors affecting broth viscosity.	<b>07</b>
<b>Q.5</b>	(a) Explain the terms bubble formation, gas dispersion and coalescence	<b>03</b>
	(b) Explain Michaelis Menten Kinetics.	<b>04</b>
	(c) Explain role of diffusion in a bioprocess.	<b>07</b>
<b>Q.6</b>	(a) What is total reaction rate, volumetric reaction rate and specific reaction rate?	<b>03</b>
	(b) Compare Lineweaver-Burk plot, Eadie-Hofstee plot, Langmuir plot and Direct liner plot.	<b>04</b>
	(c) Explain film theory in detail.	<b>07</b>
<b>Q.7</b>	(a) How the Cell Senses Its Extracellular Environment?	<b>03</b>
	(b) What do you mean by overall yield, instantaneous yield, theoretical and observed yield?	<b>04</b>
	(c) Draw and explain Typical batch growth curve and state values of $\mu$ in different phases.	<b>07</b>

- Q.8** (a) What is  $\mu_{\max}$  and  $k_s$ ? Give relation between them. **03**  
(b) What is  $k_{La}$ ? What are ways to measure it? **04**  
(c) Explain principle and working of Cone-and-Plate Viscometer. **07**

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