Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI(NEW) – EXAMINATION – SUMMER 2019
Subject Code:2160508   **Date:18/05/2019**
Subject Name:Biochemical Engineering
Time:10:30 AM TO 01:00 PM   **Total Marks: 70**
Instructions:
1. **Attempt all questions.**
2. **Understand the question carefully and write in proportion to marks it carries.**
3. **Provide explanation wherever required.**
4. **Figures to the right indicate full marks.**

Q.1	**(a)**	State three differences between a chemical reaction and its biochemical counterpart.	**03**
	(b)	Explain with a diagram various phases of microbial growth. Which phase is the longest?	**04**
	(c)	Discuss with examples the application of fermentation technology in food and beverage, industrial solvents, and antibiotics production.	**07**
Q.2	**(a)**	Name three industrially important biochemical reactions and mention the name(s) of the microorganism involved therein.	**03**
	(b)	State and explain different types of solid and liquid media used for microbial growth.	**04**
	(c)	Discuss various methods of cell disruption to get intracellular products. Give two examples of such intracellular products.	**07**

OR

	(c)	State and briefly explain various steps, either sequential or concurrent, of an integrated bioprocess in general.	**07**
Q.3	**(a)**	State three methods for the measurement of microbial growth.	**03**
	(b)	Write down Monod equation of microbial growth kinetics. Explain various terms in the same equation. How do you determine the kinetic parameters of the above equation graphically?	**04**
	(c)	Using substrate and biomass balance derive the design equation for a continuous stirred tank system for biochemical process. State the assumptions. Comment on critical dilution rate and washout factor.	**07**

OR

Q.3	**(a)**	What are the temperature, pressure and time conditions for steam sterilization? Name a few methods for sterilization of medium other than using steam.	**03**
	(b)	Calculate the steady state substrate and biomass concentration in a continuous fermenter which has an operating volume of 25 L. When the sterile feed stream contains limiting substrate at 2000 mg/L and enters the vessel at 8L/h. The values of K_s and μ_m are 10.5 mg/L and 0.45 h^{-1} respectively and the yield coefficient may be taken as 0.48.	**04**
	(c)	Illustrate various probable configurations of fed-batch bioreactors with schematic diagrams.	**07**

Q.4	(a)	Write down the differences between prokaryotic and eukaryotic cells with examples.	03
	(b)	How does an enzyme work? Classify enzymes with examples.	04
	(c)	Draw a schematic diagram of a fermenter, label its different parts and state the functions of major parts.	07

OR

Q.4.	(a)	What are different types of controlling system in fermenter?	03
	(b)	Write a note on biosensors for fermentation control.	04
	(c)	Discuss various monitoring and control parameters of an ideal fermenter.	07
Q.5	(a)	Explain why oxygen needs to be supplied at a sufficient rate during aerobic fermentation.	03
	(b)	Explain various physico-chemical parameters affecting volumetric mass transfer coefficient K_La.	04
	(c)	State various methods of determination of volumetric mass transfer coefficient K_La in a fermenter and explain any one.	07

OR

Q.5	(a)	Name various unit operations used in upstream and down stream processing in fermentation.	03
	(b)	Discuss briefly the rheological behaviour of fermentation broth with appropriate examples.	04
	(c)	Explain differential centrifugation method for separation of cells from fermentation broth.	07

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