Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI (NEW) EXAMINATION – WINTER 2024

Subject Code:3160512 **Date:05-12-2024**

Subject Name:Biochemical Engineering

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.**

			MARKS
Q.1	**(a)**	Explain Polysaccharides with its examples.	**03**
	(b)	Discuss in detail about various unit operations involved in bioprocess.	**04**
	(c)	Give comparison of Chemical and Biochemical processes with advantages and limitations.	**07**
Q.2	**(a)**	Explain Allosteric enzymes.	**03**
	(b)	The following data have been obtained for initial enzyme concentration [E0] for an enzyme-catalysed reaction.	**04**

$$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_2} E + P$$

Rate of formation r([E0] = 0.015 g/l) (g/l-min)	Substrate Concentration [S] (g/l)
1.14	20.0
0.87	10.0
0.70	6.7
0.59	5.0
0.50	4.0
0.44	3.3
0.39	2.9
0.35	2.5

a. Find *Km*.
b. Find maximum forward velocity of the reaction *Vm* for [E0] = 0.015 g/l.
c. Find rate constant k_2.

	(c)	Give comparison of Eukaryotic and Prokaryotic cells using suitable labelled images.	**07**

OR

	(c)	Explain types of proteins in detail.	**07**
Q.3	**(a)**	Explain: 1) Proximity effect of enzyme 2) Orientation effect of enzyme 3) specific activity	**03**
	(b)	Derive Michaelis and Menten rate equation assuming rapid equilibrium between Enzyme and substrate to form [ES] complex.	**04**
	(c)	Discuss ‘Entrapment’ for immobilization of Enzymes with its types.	**07**

OR

Q.3	**(a)**	What is Damkohler number? Give its significance.	**03**
	(b)	Explain the effect of pH and temperature on enzyme activity.	**04**
	(c)	Describe reactions for competitive inhibitors and derive rate equation for the same.	**07**
Q.4	**(a)**	Explain Monod growth kinetics using equation.	**03**
	(b)	Draw schematic diagram for growth of microorganism in batch culture.	**04**
	(c)	Discuss types of sterilization of media in detail.	**07**
		OR	
Q.4	**(a)**	Discuss 'Chemostat continuous culture' with dilution rate.	**03**
	(b)	Why aeration and agitation is required for fermentation process.	**04**
	(c)	Explain static method of gassing out for determination of mass transfer coefficient K_La value.	**07**
Q.5	**(a)**	Explain Ultrasonication technique for cell disruption.	**03**
	(b)	Discuss the method of media preparation	**04**
	(c)	Discuss various parts and controls of fermenter using suitable diagram.	**07**
		OR	
Q.5	**(a)**	Describe environmental factors affecting microbial growth of microorganisms.	**03**
	(b)	Name various industrial importance enzymes and mention their applications.	**04**
	(c)	Discuss adsorption chromatography for separation and purification of products.	**07**

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