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GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019

Subject Code: 2160508 **Date: 11/12/2019**

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.**

			MARKS
Q.1	**(a)**	List various unit operation encountered in bioprocessing operation.	**03**
	(b)	What are the various methods used for immobilization of enzymes.	**04**
	(c)	Write in brief notes on various steps involved in integrated bioprocessing.	**07**
Q.2	**(a)**	How does internal feedback system work for biomass?	**03**
	(b)	Explain with a diagram different phases of microbial growth.	**04**
	(c)	Explain growth of a typical microbial culture in a batch conditions.	**07**
		OR	
	(c)	Discuss the relative advantages and disadvantages of continuous culture.	**07**
Q.3	**(a)**	Explain the following valve: (1) Plug valve (2) Butterfly valve (3) Ball Valve.	**03**
	(b)	Write in brief the air sterilization technique used for aerobic fermentation process.	**04**
	(c)	Draw a schematic of a fermenter vessel. Label the major components and briefly explain their functions.	**07**
		OR	
Q.3	**(a)**	State various strategies of aeration in fermentation vessel.	**03**
	(b)	Enlist various process and monitoring parameters for a control of a fermenter.	**04**
	(c)	Discuss the different types of spargers used for aeration in fermenter.	**07**
Q.4	**(a)**	Define fluid rheology and its importance in fermentation process.	**03**
	(b)	Explain in short oxygen supply in fermentation process.	**04**
	(c)	List out various methods for determination of K_La value. Explain any one in detail.	**07**
		OR	
Q.4	**(a)**	Explain briefly the principle of scale up in bioprocess operation.	**03**
	(b)	Explain the effect of various physico chemical parameter on K_La.	**04**

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(c) The following rheological data were obtained with a fermentation broth in the very initial stage of fermentation. **07**

(i) Find out whether the fluid is Newtonian or non-Newtonian. If it is non- Write in short on drying and crystallization process for separation and purification of product Newtonian fluid, find the rheological constants.

(ii) If it is a Newtonian fluid, find the viscosity of the fluid.

τ, N/m^2	γ,S^{-1}
100	5
210	10
295	15
410	20
620	32
1000	50

Q.5 **(a)** Write in short on drying and crystallization process for separation and purification of products. **03**

(b) Write a short note on crystallizer. **04**

(c) What is the purpose of cell disruption? Discuss various methods of cell disruption briefly. **07**

OR

Q.5 **(a)** Explain range of fermentation process. **03**

(b) Explain different types of membrane process and their specification. **04**

(c) Explain single stage liquid-liquid extraction. **07**

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