

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VII (New) EXAMINATION – WINTER 2019****Subject Code: 2170407****Date: 28/11/2019****Subject Name: Biochemical Engineering-I****Time: 10:30 AM TO 01:00 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) Define Newton's law of viscosity.	03
	(b) How to find out the stoichiometric coefficient for cell growth?	04
	(c) Xanthan gum is produced using <i>Xanthomonas campestris</i> in batch culture. Laboratory experiments have shown that for each gram of glucose utilized by the bacteria, 0.23 gm oxygen and 0.01 gm ammonia are consumed, while 0.75 gm gum, 0.09 gm cells, 0.27gm gaseous CO ₂ and 0.13 gm H ₂ O are formed. Other components of the system such as phosphate can be neglected. Medium containing glucose and ammonia dissolved in 20000 liters water is pumped into a stirred fermenter and inoculated with <i>X.campestris</i> . Air is sparged into the fermenter; the total amount of off-gas recovered during the entire batch culture is 1250 kg. Because of the high viscosity and difficulty in handling xanthan-gum solution, the final gum concentration should not be allowed to exceed 3.5 wt%.	07
	1. How much glucose and ammonia are required?	
	2. What percentage excess air is provided?	
Q.2	(a) Write about the Monod model.	03
	(b) Define Bingham and casson body fluids, with examples.	04
	(c) Explain the sterilization of liquids.	07
	OR	
	(c) Write the equation for energy balances in a typical fermentor and explain the significance of heat utilization in steady state.	07
Q.3	(a) Give the meaning of 'substrate limiting' substances in context to reaction kinetics.	03
	(b) What is yield factor and conversion? Give a suitable example to explain it.	04
	(c) What are the similarities between heat and mass transfer, when you consider the bioprocess design?	07
	OR	
Q.3	(a) Draw the neat sketch of fermentor to show its control.	03
	(b) Derive the suitable equation representing first order kinetics.	04
	(c) Narrate the factors affecting broth viscosity.	07
Q.4	(a) Discuss the oxygen absorption rate.	03
	(b) How do you sterilize the media?	04
	(c) Explain the concept of air lift bioreactor.	07

OR

- Q.4 (a) With the help of enzyme kinetics, explain the batch reaction for substrate conversion. **03**
- (b) Compare distribution and dispersion phenomena for mixing the substrates. **04**
- (c) Write a note on the medial applications of enzymes. **07**
- Q.5 (a) Define half life period and in the same context, derive the suitable equation for batch process in fermentation. **03**
- (b) Justify the kinetics consideration for turbidostate reactor arrangement. **04**
- (c) Briefly explain the inhibition of enzymes with suitable equations. **07**
- OR**
- Q.5 (a) When to use what? - axial and radial propellers. **03**
- (b) Enlist the chemical methods to sterilize the bioreactor. **04**
- (c) Distinguish between Biotechnology, biochemical engineering and biomedical engineering. **07**

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