

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2160508

Date:05/05/2018

Subject Name:Biochemical Engineering

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.**

- Q.1**
- (a) Draw the differences between a chemical and Biochemical reaction. **03**
- (b) Write down Monod Equation explaining each term in it. How do you determine the constant parameters of Monod equation? Is there any limitation of this equation? **04**
- (c) Derive the design equation for a chemostat system (continuous stirred tank fermenter) for biochemical process. Show the schematic and material balance with assumptions. Explain 'critical dilution rate' and 'wash out' conditions. **07**

- Q.2**
- (a) Define/explain the following term: **03**
(i) Pasteurization, (ii) Oxygen uptake rate, (iii) respiratory quotient,
- (b) Explain with a diagram different phases of microbial growth. **04**
- (c) Discuss the relative advantages and disadvantages of continuous culture. **07**

OR

- (c) What is a fed-batch reactor? Explain with diagram various configurations of fed-batch bioreactor. **07**

- Q.3**
- (a) Explain briefly the range of fermentation process. **03**
- (b) Enlist various process and monitoring parameters for control of a fermenter. **04**
- (c) Draw a schematic of a fermenter vessel. Label the major components and briefly explain their functions. **07**

OR

- Q.3**
- (a) What is denaturation of proteins? State three factors responsible for denaturation of protein. **03**
- (b) What is meant by 'Aseptic conditions'? State important considerations for maintenance of aseptic conditions. **04**
- (c) Discuss the air sterilization process for a large scale aerobic fermenter with a schematic diagram. Name a few materials used as air filters. **07**

- Q.4**
- (a) Explain briefly the principle of scale-up in bioprocess operation. **03**
- (b) Explain the effect of various physico-chemical parameters on K_{1a} . **04**
- (c) State various methods of K_{1a} determination for aerobic system. Discuss any one in details. **07**

OR

- Q.4**
- (a) Give two examples of industrially important biochemical reaction and name the microorganisms involved thereon. **03**
- (b) Name various unit operations involved in upstream and downstream of bioprocess and cite industrial examples of each of them. **04**

- (c) Present a schematic outlines of various steps involved in an integrated bioprocess. Elaborate any two steps with industrial examples. **07**
- Q.5** (a) Explain what is meant by limiting substrate concentration in the growth. **03**
- (b) State various strategies of aeration and agitation in fermenter vessel. **04**
- (c) State the importance of rheology in fermentation. Explain rheological behavior of fermentation broth with examples. **07**
- OR**
- Q.5** (a) Name different types of solid media used for growth. **03**
- (b) Discuss briefly various constituents of a liquid media used for growth of yeast and give examples. **04**
- (c) What is the purpose of cell disruption? Discuss various methods of cell disruption briefly. **07**
