

M.TECH FOOD TECHNOLOGY AND BIOCHEMICAL ENGINEERING
1ST YEAR 2ND SEMESTER EXAMINATION ,2017

ADVANCED FERMENTATION TECHNOLOGY Time : Three hours

Full Marks : 100

Part I (50 Marks)

Answer Q.1 and any two from the rest

1a) Explain about sterilization of air by filtration.

b) What is meant by solid state fermentation? Explain about biochemical engineering aspect and design of bioreactor of solid state fermentation 10+(3+7)

2. Why medium sterilization is needed? What is del factor? Explain about determination of del factor for batch sterilization of medium. 4+3.5+7.5

3a) What is Biostat? Mention the advantages of batch and continuous sterilization of medium.

b) Discuss about continuous sterilizer. 5+10

4a) Explain the following:

i) Extraction of Tetracycline from fermentation broth using aqueous two phase systems.

ii) Bacterial resistance mechanism of tetracycline.

b) What is chemostat and turbidostat? 7+3+5

5. Write short note on any two of the following : 2x7.5

a) Fed batch culture

b) modification of basic chemostat.

c) microbial growth in batch fermentation.

[Turn over

**M.TECH. FOOD TECHNOLOGY AND BIO-CHEMICAL ENGINEERING FIRST YEAR
SECOND SEMESTER – 2017**

Subject: ADVANCED FERMENTATION TECHNOLOGY
Full Marks: 100

Time: Three Hours

Use Separate Answer Scripts for Part I and Part II

Part II (Marks-50)

Question No.1 is Compulsory and answer any **three** questions from rest

1. How microbial cell disruption occurs by Non mechanical methods? 5

or

What is Growth associated, Non growth associated and Mixed growth associated product? What is Luedeking-Piret Equation? 3+2=5

2. A stirred tank reactor is to be scaled down from 10 m^3 to 0.1 m^3 . The dimensions of the large tank are : $D_t = 2\text{m}$, $D_i = 0.5\text{m}$, $N = 100\text{rpm}$

(a) Determine the dimensions of the small tank (D_t , D_i , H) using geometric similarity.

(b) What would be the required rotational speed of the impeller in the small tank if the following criteria were used?

i) Constant P/V

ii) Constant tip speed.

iii) Constant impeller Reynolds Number

(b) How Turbidostat is used as a CSTR. Explain with the diagram of Turbidostat.

10+5=15

3. What is doubling time of cell mass? Prove that doubling time $(\tau_d) = \ln 2 / \mu_{net}$. 1+2=3

A strain of mold was grown in a batch culture on glucose and the following data were obtained.

Time (h)	Cell Concentration (g/L)	Glucose Concentration (g/L)
0	1.25	100
9	2.45	97
16	5.1	90.4
23	10.5	76.9
30	22.0	48.1
34	33.0	20.6
36	37.5	9.38
40	41.0	0.63

(a) Calculate maximum net specific growth rate.

(b) Calculate the apparent growth yield.

(c) What maximum cell concentration could one expect if 150g of glucose were used with the same size of inoculum? 12

4. Write the principle of any **three** method of separation of soluble products from fermented broth. 3x5=15

5. (a) Derive the Ruth equation for constant pressure filtration.

(b) What is Terminal Velocity? Find out the expression of Terminal Velocity for a Centrifugation process. 7+(1+7)=15

6. Explain the Dynamic method for determination of Volumetric Oxygen Transfer Coefficient ($k_L a$) of a fermenter.

The following data were obtained for dissolve oxygen measurement in a glucose-gluconic acid fermentation system using a 5L fermenter.

Time (sec)	D.O. (mg/L)
10	3.5
15	3.5
25	3.5
30	3.5
35	3.5
40 (air off)	3.5
45	3.0
50	2.5
55	2.0
60	1.5
65 (air on)	1.0
68	1.4
73	1.85
80	2.25
88	2.55
95	2.75
103	3.00
111	3.25
117	3.30
122	3.40
130	3.45

Determine the values of

- i) $k_L a$
- ii) r_X
- iii) C^*

5+10=15