

Code No: R05312301

R05**Set No. 2**

III B.Tech I Semester Examinations, November 2010
BIOCHEMICAL REACTION ENGINEERING
Bio-Technology

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. (a) What are the advantages and disadvantages of fed batch reactors over continuous reactors?
 (b) Explain in detail what are the feeding mechanisms for fed batch reactor. [16]
2. A batch fermenter was operated for the production of alcohol from glucose using yeast. The following data were obtained in the fermenter.

Time (h)	0	2	4	6	8	10	12	14
Concentration of glucose	70	68	66	63	58	52	44	36
Yeast count ($\times 10^6$ cenn/ml)	-	6	10	20	38	180	117	140
Alcohol production (kg mol/ m^3)	0	1	5	11	20	30	41	55

Find out whether the above rate data could be interpreted by a simple kinetic equation of the type.

$$-r_A = k_n C_A^n$$

where C_A stands for substrate concentration. If so, find k_n and n . if not, indicate the reasons thereof. [16]

3. Compute K_y at 10 atm if K_p at this pressure is 0.00381 atm^{-1} for ammonia synthesis reaction from hydrogen and nitrogen at 500°C . (assume ideal gas holds good). [16]
4. A "closed" vessel has flow for which $D/uL = 0.2$. We wish to represent this vessel by the tanks in series model. What value of N should we select? [16]
5. (a) Why do airlift bioreactors often produce higher productivities than gas stirred tank bioreactors? Explain in detail.
 (b) State what are the measuring devices used for the parameters of ongoing large-scale fermentation. [16]
6. Using colour indicator which shows when concentration of A falls below 0.1 mol/l , the following scheme is devised to explore the kinetics of decomposition of A. The feed containing 0.6 mol A/l is introduced into the first of the two CSTRs in series, each having a volume of 400 cm^3 . The colour change occurs in the first reactor (single reactor) for a steady state feed rate of $10 \text{ cm}^3 / \text{min}$, and in second reactor in series (two reactors setup) for a steady state feed rate of $50 \text{ cm}^3 / \text{min}$. Find the rate expression that represents the decomposition of A from the information provided. [16]

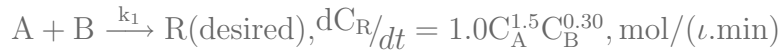
Code No: R05312301

R05

Set No. 2

7. Write about the stability of the Chemostat with substrate inhibition using various stability methods? [16]

8. Consider the liquid phase reaction



equal volumetric flow rates of A and B streams with each stream of concentration of 20 mol/l of reactant are fed to the reactor.

For 90% conversion of A, find the concentration of R in the product stream if flow in the reactor follows:

- (a) plug flow,
- (b) mixed flow,
- (c) plug flow with side streams of B and $C_{Bf} = 1 \text{ mol/l}$ every where in a reactor. [16]

Code No: R05312301

R05

Set No. 4

III B.Tech I Semester Examinations, November 2010
BIOCHEMICAL REACTION ENGINEERING
Bio-Technology

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Why do airlift bioreactors often produce higher productivities than gas stirred tank bioreactors? Explain in detail.
(b) State what are the measuring devices used for the parameters of ongoing large-scale fermentation. [16]
2. Write about the stability of the Chemostat with substrate inhibition using various stability methods? [16]
3. A batch fermenter was operated for the production of alcohol from glucose using yeast. The following data were obtained in the fermenter.

Time (h)	0	2	4	6	8	10	12	14
Concentration of glucose	70	68	66	63	58	52	44	36
Yeast count ($\times 10^6$ cenn/ml)	-	6	10	20	38	180	117	140
Alcohol production ($\text{kg mol}/m^3$)	0	1	5	11	20	30	41	55

Find out whether the above rate data could be interpreted by a simple kinetic equation of the type.

$$-r_A = k_n C_A^n$$

where C_A stands for substrate concentration. If so, find k_n and n . if not, indicate the reasons thereof. [16]

4. Compute K_y at 10 atm if K_p at this pressure is 0.00381 atm^{-1} for ammonia synthesis reaction from hydrogen and nitrogen at 500°C . (assume ideal gas holds good). [16]
5. Using colour indicator which shows when concentration of A falls below $0.1 \text{ mol}/l$, the following scheme is devised to explore the kinetics of decomposition of A. The feed containing $0.6 \text{ mol A}/l$ is introduced into the first of the two CSTRs in series, each having a volume of 400 cm^3 . The colour change occurs in the first reactor (single reactor) for a steady state feed rate of $10 \text{ cm}^3 / \text{min}$, and in second reactor in series (two reactors setup) for a steady state feed rate of $50 \text{ cm}^3 / \text{min}$. Find the rate expression that represents the decomposition of A from the information provided. [16]
6. A "closed" vessel has flow for which $D/u L = 0.2$. We wish to represent this vessel by the tanks in series model. What value of N should we select? [16]
7. (a) What are the advantages and disadvantages of fed batch reactors over continuous reactors?

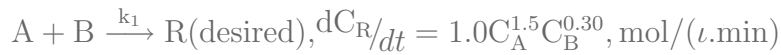
Code No: R05312301

R05

Set No. 4

(b) Explain in detail what are the feeding mechanisms for fed batch reactor. [16]

8. Consider the liquid phase reaction



equal volumetric flow rates of A and B streams with each stream of concentration of 20 mol/l of reactant are fed to the reactor.

For 90% conversion of A, find the concentration of R in the product stream if flow in the reactor follows:

- (a) plug flow,
- (b) mixed flow,
- (c) plug flow with side streams of B and $C_{Bf} = 1 \text{ mol/l}$ every where in a reactor. [16]

FIRSTRANKER

Code No: R05312301

R05**Set No. 1**

III B.Tech I Semester Examinations, November 2010
BIOCHEMICAL REACTION ENGINEERING
Bio-Technology

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. A batch fermenter was operated for the production of alcohol from glucose using yeast. The following data were obtained in the fermenter.

Time (h)	0	2	4	6	8	10	12	14
Concentration of glucose	70	68	66	63	58	52	44	36
Yeast count ($\times 10^6$ cenn/ml)	–	6	10	20	38	180	117	140
Alcohol production (kg mol/ m^3)	0	1	5	11	20	30	41	55

Find out whether the above rate data could be interpreted by a simple kinetic equation of the type.

$$-r_A = k_n C_A^n$$

where C_A stands for substrate concentration. If so, find k_n and n . If not, indicate the reasons thereof. [16]

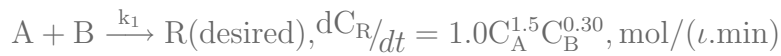
2. (a) What are the advantages and disadvantages of fed batch reactors over continuous reactors?
 (b) Explain in detail what are the feeding mechanisms for fed batch reactor. [16]
3. Write about the stability of the Chemostat with substrate inhibition using various stability methods? [16]
4. Compute K_y at 10 atm if K_p at this pressure is 0.00381 atm^{-1} for ammonia synthesis reaction from hydrogen and nitrogen at 500°C . (assume ideal gas holds good). [16]
5. Using colour indicator which shows when concentration of A falls below 0.1 mol/l , the following scheme is devised to explore the kinetics of decomposition of A. The feed containing 0.6 mol A/l is introduced into the first of the two CSTRs in series, each having a volume of 400 cm^3 . The colour change occurs in the first reactor (single reactor) for a steady state feed rate of $10 \text{ cm}^3 / \text{min}$, and in second reactor in series (two reactors setup) for a steady state feed rate of $50 \text{ cm}^3 / \text{min}$. Find the rate expression that represents the decomposition of A from the information provided. [16]
6. (a) Why do airlift bioreactors often produce higher productivities than gas stirred tank bioreactors? Explain in detail.
 (b) State what are the measuring devices used for the parameters of ongoing large-scale fermentation. [16]

Code No: R05312301

R05

Set No. 1

7. Consider the liquid phase reaction



equal volumetric flow rates of A and B streams with each stream of concentration of 20 mol/l of reactant are fed to the reactor.

For 90% conversion of A, find the concentration of R in the product stream if flow in the reactor follows:

- (a) plug flow,
- (b) mixed flow,
- (c) plug flow with side streams of B and $C_{Bf} = 1$ mol /l every where in a reactor. [16]

8. A “closed” vessel has flow for which $D/uL = 0.2$. We wish to represent this vessel by the tanks in series model. What value of N should we select? [16]

Code No: R05312301

R05**Set No. 3**

III B.Tech I Semester Examinations, November 2010
BIOCHEMICAL REACTION ENGINEERING
Bio-Technology

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. (a) What are the advantages and disadvantages of fed batch reactors over continuous reactors?
 (b) Explain in detail what are the feeding mechanisms for fed batch reactor. [16]
2. A "closed" vessel has flow for which $D/uL = 0.2$. We wish to represent this vessel by the tanks in series model. What value of N should we select? [16]
3. A batch fermenter was operated for the production of alcohol from glucose using yeast. The following data were obtained in the fermenter.

Time (h)	0	2	4	6	8	10	12	14
Concentration of glucose	70	68	66	63	58	52	44	36
Yeast count ($\times 10^6$ cenn/ml)	—	6	10	20	38	180	117	140
Alcohol production ($\text{kg mol}/m^3$)	0	1	5	11	20	30	41	55

Find out whether the above rate data could be interpreted by a simple kinetic equation of the type.

$$-r_A = k_n C_A^n$$

where C_A stands for substrate concentration. If so, find k_n and n . if not, indicate the reasons thereof. [16]

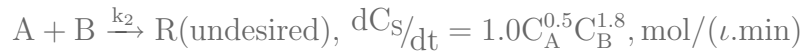
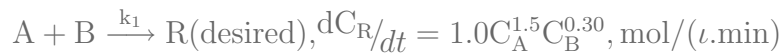
4. Write about the stability of the Chemostat with substrate inhibition using various stability methods? [16]
5. Compute K_y at 10 atm if K_p at this pressure is 0.00381 atm^{-1} for ammonia synthesis reaction from hydrogen and nitrogen at 500°C . (assume ideal gas holds good). [16]
6. (a) Why do airlift bioreactors often produce higher productivities than gas stirred tank bioreactors? Explain in detail.
 (b) State what are the measuring devices used for the parameters of ongoing large-scale fermentation. [16]
7. Using colour indicator which shows when concentration of A falls below $0.1 \text{ mol}/l$, the following scheme is devised to explore the kinetics of decomposition of A. The feed containing $0.6 \text{ mol A}/l$ is introduced into the first of the two CSTRs in series, each having a volume of 400 cm^3 . The colour change occurs in the first reactor (single reactor) for a steady state feed rate of $10 \text{ cm}^3 / \text{min}$, and in second reactor in series (two reactors setup) for a steady state feed rate of $50 \text{ cm}^3 / \text{min}$. Find the rate expression that represents the decomposition of A from the information provided. [16]

Code No: R05312301

R05

Set No. 3

8. Consider the liquid phase reaction



equal volumetric flow rates of A and B streams with each stream of concentration of 20 mol/l of reactant are fed to the reactor.

For 90% conversion of A, find the concentration of R in the product stream if flow in the reactor follows:

- (a) plug flow,
- (b) mixed flow,
- (c) plug flow with side streams of B and $C_{Bf} = 1$ mol /l every where in a reactor.

[16]

FIRSTRANKER