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Total number of printed pages - 02

B.TECH  
PCCH4402

**7<sup>th</sup> Semester Regular / Back Examination 2015-16**  
**FUNDAMENTALS OF BIOCHEMICAL ENGINEERING**

**BRANCH : Chemical**

**Time : 3 Hours**

**Max Marks : 70**

**Question Code : T574**

**Answer Question No. 1 which is compulsory and any FIVE from the rest.**

**The figures in the right-hand margin indicate marks.**

**Assume suitable notations and any missing data wherever necessary.**

**Answer all parts of a question at a place.**

1. Answer the following questions : 2 x 10
- (a) What is Malthus' Law?
  - (b) What are the various applications of heat transfer in biotechnology?
  - (c) What are the various unit operations involved in downstream processing?
  - (d) What do you mean by crude and synthetic media? Give one example of each.
  - (e) What do you mean by impeller flooding?
  - (f) Derive an expression for settling velocity.
  - (g) Distinguish between precipitation and sedimentation?
  - (h) What are the complexities in the case of biochemical reactions?
  - (i) Define  $\Sigma$  factor for a centrifuge.
  - (j) Define the term catabolism and anabolism.
2. (a) What are the different methods of air sterilization? 05
- (b) Describe the growth associated and non-growth associated product formation in fermentation process. 05
3. (a) During the growth of *Saccharomyces cerevisiae* on glucose in a 20 l fermenter, the following data were observed on the glucose concentration (s) versus the specific growth ( $\mu$ ). The growth can be reasonably represented by Monod growth kinetics. Find the maximum specific growth rate ( $\mu_m$ ) and Monod constant ( $K_s$ ), following the linearized Monod equation procedure. 07

(s), (g/l)	10	5	3.3	2.25	2.0	1.7	1.4
$\mu$ ( $h^{-1}$ )	0.4	0.36	0.3	0.27	0.25	0.22	0.2

- (b) Define the term yield, selectivity, and conversion. 03
4. Describe briefly the concept of design of a fermenter. What factors are essential for successful design and operation of a fermenter? 10
5. With a neat diagram briefly explain the process of biogas production unit. 10
6. (a) Distinguish between critical and non-critical process parameters which need to be controlled in a bioreactor. 03  
(b) What are the different methods of controlling fermenter process parameters? Describe them briefly. 07
7. (a) Describe different methods of immobilization of enzyme and its advantages. 05  
(b) What are the various factors affecting oxygen transfer in fermentation broths. 05
8. Write short notes on any **TWO**: 5 x 2  
(a) Cell disruption  
(b) Chromatography  
(c) Plate and frame filter press  
(d) Five kingdom classification

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