Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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|  |  |  |  |
| **Code :** | **17BT2019** | **Duration :** | **3hrs** |
| **Sub. Name :** | **BIOREACTOR ENGINEERING** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** |  | **Questions** | | **Course**  **Outcome** | **Marks** |
| 1. |  | Assume that experimental measurement for a certain organism have shown that cells can convert 2/3rd substrate carbon to biomass.   1. Calculate the stoichiometric coefficients for following biological reactions:   **C6H12O6 + aO2 + bNH3 cC4.4H7.3N0.86O1.2 + dH2O + eCO2**  **C16H34+ a O2 + b NH3 cC4.4H7.3N0.86O1.2 + d H2O + e CO2**   1. Calculate the yield coefficients biomass with respect to substrate   and oxygen supply for both the reactions. | | CO1 | 20 |
| **(OR)** | | | | | |
| 2. |  | Find the stoichiometric coefficients, Biomass yield co-efficient and oxygen yield coefficient (Yx/o2) degrees of reduction of substrate and bacteria for the given biological reaction when RQ = 0.66.  **C2H5OH + a O2 + b NH3 cCH1.704N0.149O0.408 + d CO2 + eH2O** | CO1 | | 20 |
|  |  |  |  | |  |
| 3. |  | Derive the substrate inhibition on cell growth and product formation. | CO2 | | 20 |
| **(OR)** | | | | | |
| 4. |  | A strain of mold was grown in batch culture on glucose and the following data were obtained,   |  |  |  |  | | --- | --- | --- | --- | | **Time (Hrs)** | **Cell Conc. (g/L)** | **Ethanol Conc. (g/L)** | **glucose Conc. (g/L)** | | 0 | 1.25 | 0 | 100 | | 9 | 2.45 | 2.5 | 97 | | 16 | 5.1 | 7.5 | 90.4 | | 23 | 10.5 | 20 | 76.9 | | 30 | 22 | 34 | 48.1 | | 34 | 33 | 43 | 20.6 | | 36 | 37.5 | 47 | 9.38 | | 40 | 41 | 50 | 0.63 |     Calculate:   1. By fitting biomass data to logistic equation, determine carrying capacity coefficient k. 2. Biomass yield coefficient. 3. Product yield coefficient | CO3 | | 20 |
|  |  |  |  | |  |
| 5. |  | Elaborate on various methods to determine volumetric mass transfer coefficient. | CO4 | | 20 |
| **(OR)** | | | | | |
| 6. |  | With a neat diagram, explain the various types of aerators and agitators. | CO4 | | 20 |
|  |  |  |  | |  |
| 7. |  | Explain the Multistage Chemostat systems with a neat sketch. | CO5 | | 20 |
| **(OR)** | | | | | |
| 8. |  | Elucidate the working principle, variants and applications of air lift and loop bioreactor. | CO5 | | 20 |
|  | | **Compulsory**: |  | |  |
| 9. |  | Elaborate on various types of sensors and any five parameters that can be monitored and controlled during fermentation process. | CO6 | | 20 |