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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec – 2016**

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|  |  | **Semester :** | **5** |
| **Code :** | **14BT2015** | **Duration :** | **3hrs** |
| **Sub. Name :** | **BIOREACTOR ENGINEERING** | **Max. marks :** | **100** |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | Marks |
| 1. |  | Assume that experimental measurement for a certain organism have shown that cells can convert 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. Also, comment on the differences. | CO-1 | 20 |
| (OR) | | | | |
| 2. |  | Derive the expression various types of toxic compound inhibition models for growth? | CO-2 | 20 |
| 3. |  | The production of penicillin was carried out in a batch reactor and the following data were obtained.   |  |  |  |  | | --- | --- | --- | --- | | **Time (hr)** | **Glucose concentration (g/l)** | ***Penicillium notatum* concentration (g/l)** | **Penicillin concentration**  **(g/l)** | | 0 | 100 | 1 | 0 | | 10 | 94 | 2.5 | 2 | | 20 | 83 | 3.2 | 3.5 | | 30 | 76 | 6.7 | 6.1 | | 40 | 62 | 12.1 | 8.4 | | 50 | 50 | 16.8 | 10.7 | | 60 | 40 | 25.7 | 15.9 | | 70 | 26 | 39.3 | 21.7 |   Determine net specific growth rate, growth rate @40hrs, biomass and product yield coefficient, doubling time and max cell concentration if 5 gm/l of biomass is used as inoculum . | CO-2 | 20 |
| (OR) | | | | |
| 4. |  | Write a detailed notes on batch growth kinetics of microorganisms and derive the kinetic equation for various stages of growth? | CO-2 | 20 |
| 5. |  | Explain in detail about various methods to determine KLa? | CO-3 | 20 |
| (OR) | | | | |
| 6. |  | 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 | CO-1 | 20 |
| 7. |  | Explain the Working and principle of various air lift loop bioreactor also state its advantages and disadvantages.. | CO-2 | 20 |
| (OR) | | | | |
| 8. |  | Explain the bioreactor consideration of Packed bed bioreactor with a neat sketch. | CO-2 | 20 |
|  | | **Compulsory:** |  |  |
| 9. |  | Elaborate on main parameters to be monitored and controlled in fermentation processes. | CO-1 | 20 |

ALL THE BEST