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



**End Semester Examination – Nov/Dec – 2017**

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

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

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| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Assume that experimental measurement for a certain organism has shown that cells can convert substrate carbon to biomass.  i. Calculate the stoichiometric coefficients for following biological reactions:    ii.Calculate the yield coefficients biomass with respect to substrate and oxygen supply for both the reactions. Also, comment on the differences. | CO1 | 15 |
| b. | Consider the growth of baker’s yeast on glucose  C6H12O6+3O2+0.48NH3 0.48C6H10NO3+4.32H2O+3.12CO2  (Yeast)  Determine the degrees of reduction for the substrate and microorganism. Determine the Respiratory Quotient. | CO1 | 5 |
| (OR) | | | | |
| 2. | a. | The growth of *S cervisiae* on glucose under anaerobic conditions can be described by the following overall reaction  C6H12O6+βNH3 0.59CH1.74N0.2O0.45 (biomass)+0.43  C3H8O3+1.54CO2+1.3C2H5OH+0.036H2O   1. Determine the biomass yield coefficient Yx/s 2. Determine the product yield coefficients YEtOH/S, YCO2/S, YC3H8O3/S. 3. Determine the coefficient β | CO1 | 5 |
| b. | C2H5OH+aO2+bNH3cCH1.704N0.149O0.408+dCO2+eH2O   1. Find the stoichiometric coefficients for the given biological reaction when RQ = 0.66? 2. Find biomass, oxygen and product yield coefficients. 3. Find Degrees of reduction for substrate and biomass. | CO1 | 15 |
|  |  |  |  |  |
| 3. | a. | Derive the expression for Toxic compound Inhibition models for growth. | CO2 | 16 |
|  | b. | The initial and final concentration of biomass in a batch reactor was found to be 2 and 3.5 g/L at time 1.1 and 5.4 hours respectively. Calculate doubling time? | CO2 | 4 |
| (OR) | | | | |
| 4. | a. | 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 | 0.5 | 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 | 11.9 | | 70 | 22 | 29.3 | 15.7 |   Determine net specific growth rate, growth rate @40hrs, biomass and product yield coefficient, doubling time and maximum cell concentration if 2gm/l of biomass is used as inoculum. | CO2 | 16 |
|  | b. | Derive the kinetic equation for log phase. | CO2 | 4 |
|  |  |  |  |  |
| 5. |  | Explain in detail about various methods to determine KLa? | CO3 | 20 |
| (OR) | | | | |
| 6. |  | Explain the bioreactor consideration of fluidized bed bioreactor with a neat sketch. | CO1 | 20 |
|  |  |  |  |  |
| 7. |  | Compare the different types of immobilized cell bioreactors. | CO2 | 20 |
| (OR) | | | | |
| 8. |  | Explain the working and principle of various air lift loop bioreactor also state its advantages and disadvantages. | CO2 | 20 |
|  | |  |  |  |
|  | | **Compulsory:** |  |  |
| 9. |  | Elaborate on main parameters to be monitored and controlled in fermentation processes. | CO1 | 20 |

ALL THE BEST