****

**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

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

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

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

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **09BT230** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **BIO REACTION ENGINEERING** | **Max. marks :** | **100** |

|  |  |  |
| --- | --- | --- |
| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | What is an elementary reaction. | (1) |
| 2. | State Arrhenius equation. | (1) |
| 3. | Draw a neat diagram of CSTR connected in series. | (1) |
| 4. | Write a general material balance equation. | (1) |
| 5. | RTD means\_\_\_\_\_\_\_\_. | (1) |
| 6. | Name two common methods of tracer input. | (1) |
| 7. | Give an example of series and parallel reaction. | (1) |
| 8. | What is reversible reaction? Give example. | (1) |
| 9. | State law of conservation of mass. | (1) |
| 10. | Define a biochemical reaction. | (1) |

|  |  |  |
| --- | --- | --- |
| **PART B(5 X 3= 15 MARKS)** | | |
| 11 | Differentiate molecularity and order of a reaction. | (3) |
| 12 | Write the performance equation of PFR connected in series. | (3) |
| 13 | Name some factors which makes flow pattern non-ideal. | (3) |
| 14 | What is Denbigh reaction for batch reactor? | (3) |
| 15 | List out the man factors that affects the biochemical reaction. | (3) |

|  |  |  |  |
| --- | --- | --- | --- |
| **PART C(5 X 15= 75 MARKS)** | | | |
| 16. | a. | Explain in detail the classification of chemical reactions. | (15) |
| (OR) | | | |
| 17. | a. | The pyrolysis of ethane produces with an activation energy of about75000 cal. How much faster is decomposition at 6500C than at 5000C? | (15) |
| 18. | a. | Derive the performance equation for CSTR and PFR. | (15) |
| (OR) | | | |
| 19. | a. | Derive the performance equation for CSTR connected in parallel. | (15) |
| 20. | a. | The concentration readings in given table represent a continuous response to a pulse input into a closed vessel which is to be used as a chemical reactor. Calculate the mean residence time of fluid in the vessel *t,* and tabulate and plot the exit age distribution E.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Time *t,* min** | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | | **Tracer Output Concentration, Cpulse**  **gm/liter fluid** | 0 | 3 | 5 | 5 | 4 | 2 | 1 | 0 | | (15) |
| (OR) | | | |
| 21. | a. | Derive the expression for tanks in series model | (15) |
| 22. | a. | Elaborately explain and derive the expression for zeroth order reaction followed by first order reaction | (15) |
| (OR) | | | |
| 23. | a. | Derive the performance equation for irreversible first order reaction connected in series | (15) |
| 24. | a. | A continuous process is set up for treating waste water. Each day 105kg cellulose and 103 kg bacteria enter in the feed stream, while 104 kg cellulose in the feed and 1.5x104 kg bacteria leave inefficient. The rate of cellulose digestion by bacteria is 7x104 kg/d. The rate of bacterial growth is 2x104 kg/d. The rate of cell death by lysis is 5x102 kg/d. Write balance for cellulose and bacteria in the system. | (15) |
| (OR) | | | |
| 25. | a. | Fermentation slurry containing *Streptomyces species* is filtered using a rotary vacuum filter. 120 Kg/hr slurry is fed to the filter. 1 kg of slurry contains 60 g of cell solids. To improve filtration rates, particles of diatomaceous earth filter aid are added at a rate of 10 kg/hr. The concentration of cells in slurry is 0.05% by wt. Liquid filtrate is collected at a rate of 112 kg/hr. Concentration of cells in filtrate is 0.045% by wt. Filter cake containing cells and filter aid is continuously removed from the filter broth.  Calculate,   1. Percentage of liquid found n filter cake. 2. The concentration of cells n filter cake s same as in filtrate, how much cells are absorbed per kg filter aid? | (15) |

ALL THE BEST