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

G:\logo and QP Template\logo 3 Feb 2018 final.tif

**End Semester Examination – Nov/Dec – 2018**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Code :** | **14BT2019** | **Duration :** | **3hrs** |
| **Sub. Name :** | **CHEMICAL REACTION ENGINEERING** | **Max. marks :** | **100** |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | Briefly explain the classification of chemical reactions with suitable examples? | CO1 | 20 |
| (OR) | | | | |
| 2. | a. | Explain temperature dependency from Arrhenius law and collision  theory? | CO1 | 10 |
| b. | Derive the equation of irreversible reactions in series (consider  unimolecular first order reactions) | CO1 | 10 |
|  |  |  |  |  |
| 3. | a. | Give the performance equation of irreversible unimolecular third order reactions A+B+C P reaction? | CO1 | 10 |
| b. | Write the performance equation of nth order reaction? | CO1 | 10 |
| (OR) | | | | |
| 4. | a. | Show the performance equation of irreversible unimolecular third order reactions 3A P reaction? | CO1 | 10 |
| b. | Derive the performance equation of zeroth order reaction? | CO1 | 10 |
|  |  |  |  |  |
| 5. | a. | Write the performance equation for continuous stirred tank reactor? | CO1 | 10 |
| b. | Indicate the performance equation for ideal batch reactor? | CO1 | 10 |
| (OR) | | | | |
| 6. |  | Find a rate equation for the gas phase decomposition A R+S occurring isothermally in a mixed flow reactor from the following data: CA0=0.002 mol/l.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Trail No. | 1 | 2 | 3 | 4 | 5 | | τ (based on inlet feed conditions in sec.) | 0.423 | 5.1 | 13.5 | 44 | 192 | | XA(fractional decomposition of A) | 0.22 | 0.63 | 0.75 | 0.88 | 0.96 | | CO2 | 20 |
|  |  |  |  |  |
| 7. |  | Calculate the mean residence time and the variance for a vessel from the following data   |  |  | | --- | --- | | t (min) | E (min-1) | | 1 | 0.02 | | 2 | 0.1 | | 3 | 0.16 | | 4 | 0.20 | | 5 | 0.16 | | 6 | 0.12 | | 7 | 0.08 | | 8 | 0.06 | | 9 | 0.044 | | 10 | 0.03 | | 12 | 0.012 | | 14 | 0 | | CO2 | 20 |
| (OR) | | | | |
| 8. |  | The data given below represent a continuous response to a pulse input into a closed vessel which is to be used as chemical reactor. Calculate the mean residence time of fluid in the vessel tˉ and tabulate and construct the E curve.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | t (min) | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | | C (g/l) | 0 | 3 | 5 | 5 | 4 | 2 | 1 | 0 | | CO2 | 20 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. |  | A sample a tracer hytane was injected as a pulse into a vessel and the effluent concentration is measured as a function if time. The following data are obtained   |  |  | | --- | --- | | t (min) | C (g/m3) | | 2 | 5 | | 4 | 10 | | 6 | 6 | | 8 | 3 | | 10 | 1.5 | | 12 | 0.6 | | 14 | 0 |   Construct the C and E curves and determine the fraction of material leaving the vessel that has sent between 3 and 6 min in the vessel and fraction of material leaving that has spent between 7.75 and 8.25min in the vessel. | CO3 | 20 |