Chemical Reaction Engineering I

Self Test 2

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QUESTION 1

(a) The following liquid phase reaction

$A + B \rightarrow C + D$

has the reaction kinetics (initial concentration of A is 0.05 mol dm^{-3}), shown in Table 2

C_A(mol dm^{-3})	0.05	0.04	0.03	0.02	0.01
$-r_A$ (mol dm^{-3} s^{-1})	0.005	0.0042	0.003	0.0025	0.00125

The same reaction now will be conducted in a 1200 dm^3 CSTR with its exit connected in-series to a PFR with volume of 600 dm^3. The entering C_{A0} and C_{B0} to a CSTR are 0.05 mol dm^{-3} and 1 mol dm^{-3}, respectively. In addition, the entering total volumetric flowrate is 100 dm^3 s^{-1}. The exit conversion from the PFR is 80%.

(i) Develop the Levenspiel Plot associated with the given data (refers to the table)

(ii) Determine the intermediate conversions that can be achieved.

QUESTION 2

Pure gas A enters the reactor at 830 kPa, having a volumetric flow rate, v_0 of 4 dm^3/s at 450 K. Find the initial concentration of A, C_{A0} and the entering molar flow rate, F_{A0}. Assume A is an ideal gas.

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