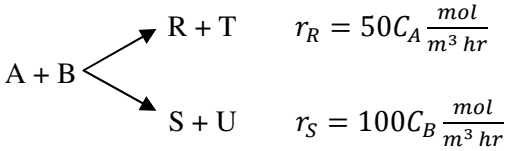
Second Periodical, January 2022
B.E. (Chemical Engg) IIIrd year , Vth sem.
Chemical Reaction Engineering – I

M.M. : 20 Time : 60 mins

Note:

- Mention your Roll number, class and name at the top of all the pages/answer sheets. Put your signatures on the right bottom of each sheet.
- Scan all the pages/answer sheets as a single pdf file and upload the same in the Google form of Google Classroom.
- Attempt all questions.

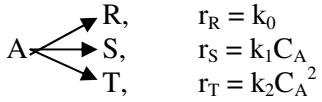
I. When aqueous A and aqueous B ($C_{A0} = C_{B0}$) are brought together they react in two possible ways (7)



to give a mixture whose concentration of active components (A,B,R,S,T,U) is $C_{total} = C_{A0}=C_{B0} =$ 60 mol/m^3.
Find the size of mixed flow reactor needed and the R/S ratio produced for 90% conversion of an equimolar feed of $F_{A0} = F_{B0} = 300$ mol/hr

II. Starting with pure feed A, consider the first order reaction followed by a zero order reaction $A \overset{k_1}{\rightarrow} R \overset{k_2}{\rightarrow} S$ taking place in a plug flow reactor. If intermediate R is the desired product, find $C_{R,\,max} / C_{A0}$ and the time in which maximum R can be reached. (6)

III. The following elementary reactions, having $k_0 = 0.025$, $k_1 = 0.2$ min^{-1}, $k_2 = 0.4$ lt/mol.min are to be run in four equal sized mixed flow reactors.
The feed is $C_{A0} = 1$, feed flow rate ν =100 lts/min (7)



To maximize the fractional yield of S,
(a) How would you arrange the four mixed flow reactors system ?
(b) With your best system, what would be the volume of your four reactors?