CHE 444/544, CBE 544- REACTOR DESIGN

Homework#6
(Due by Tuesday Nov 20)

P1 A tubular reactor has been designed to produce 95% conversion of a first order irreversible isomerization reaction and to process 0.02 m$^3$/s. The reactor length and cross sectional area are 3 m and 25 dm$^3$. A pulse tracer data on this reactor gave $t_m=9$ sec, $\sigma^2=60$s$^2$. What conversion we should expect in a real reactor.

[ ] 50%
[ ] 75%
[ ] 90%
[ ] 65%
[ ] none of the above

P2 A gas-phase reaction is carried out in a tubular reactor (i.d.: 6 cm, L: 1.5 m). The diffusivity of reacting species is 0.004 cm$^2$/s. The gas velocity inside a reactor is 3 cm/s and kinematic viscosity of gas is 0.015 cm$^2$/s. How many tanks in series would you suggest to model this reactor?

[ ] 1
[ ] 2
[ ] 5
[ ] 6
[ ] none of the above

P3 For the catalytic reaction A decomposing into B and C, the rate law can be written as $-r_A = k C_A / (1 + K_A C_A)^2$ with initial concentration of reacting species ‘A’ as 2.1 mol/cm$^3$. The specific reaction rate is 0.01 dm$^3$/mol.s and $K_A = 0.25$ dm$^3$/mol. Which model will predict the highest conversion, the maximum mixedness model or segregation?