Reaction Engineering (CH31009)

Class Test-2 Marks: 20

Q1. The homogeneous gas phase reaction A→ 3R follows second-order kinetics. For a feed rate of 4 m^3/h of pure A at 350^0C and 5 atm, an experimental reactor(size: 25 mm IDpipe × 2 meter length) gives 60% conversion of A. A commercial plant is to be designed to process 320 m^3/h of feed containing 50 mole % A and 50 mole% inerts at 350 ^{0}C and 25 atm for obtaining 80% conversion of A. Assume plug behavior in the pipe.

How many 2-m lengths of 25 mm ID pipes are needed for 80% conversion? (10)

Q2. At present the elementary liquid-phase reaction A + B $\rightarrow$ R + S takes place in a plug-flow reactor feeding A and B in equimolar quantities with $C_{Ao} = C_{Bo} = 0.9$ mol/liter. The conversion is 94% in this reactor.

If a mixed-rector ten times as large as the plug-flow reactor were hooked up in series with the existing unit, which unit should come first and by what fraction could production be increased for that setup? (10)