KSU – Chemical Engineering Department ChE 320 (Chemical Reactor Engineering) – TUT #5 Name: ID:

ID: SN: 1. The gas-phase reaction $A + B \rightarrow C + D$ takes place isothermally at 300 K in a packed-bed reactor in which the feed is equal molar in A and B with $C_{A0} = 0.1$ mol/dm³. The reaction is second order in A and zero order in B. Currently, 55% conversion is achieved in a reactor with 100 kg of catalysts for a volumetric flow rate 100 L/min. The pressure-drop parameter, is $\alpha = 0.0099$ kg⁻¹. If the activation energy is 10,000 cal/mol, what is the specific reaction rate constant at 450 K?

2. The reaction $A + B \rightarrow C + D$, is first-order in A and pseudo-zero-order in B. The total volumetric feed rate is 20 L/min, the initial pressure is 10 atm, the temperature is 223°C, and the pressure-drop parameter, α , equals 0.01 kg For an equal molar feed rate of A and B, the specific reaction rate is 1.2 L/kg-cat min. Write a Polymath program to plot and analyze X, $p = P/P_o$, as a function of catalyst weight down the packed-bed reactor. Initial concentration of A = 0.156 mol/L.