

Kem-90.148 Process modeling and simulation I (2cr)

Matlab-exam 28.10.2004

Save your files under student a number folder in usb memory. Also mention if you already have passed the normal pen&paper examination.

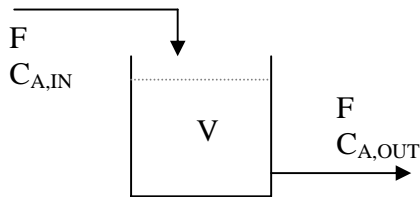
1. The process is described by equations:

$$\frac{dx_1}{dt} = -2(x_2^2 x_1 - u) - x_2$$

$$\frac{dx_2}{dt} = x_1 - 0.45x_2$$

where u is a unit step function (change at time $t=10s$). Initial values of the system are $x_1(0)=1$ and $x_2(0)=0$. Make a Simulink model, that simulates the system and draws graphs of x_1 and x_2 as a function of time. Set the simulation time 30s. Save your model with name prob1.mdl.

2. Consider the mixing tank below:



Volume $V = 2 \text{ m}^3$, $F = 0,8 \text{ m}^3/\text{min}$, $C_{A,IN} = 0,1 \text{ mol/m}^3$. Assumption: an ideal mixer, initial condition $C_{A,OUT} = 0$.

In the tank a reaction $a \rightarrow b$ happens, and the system behavior can be presented as follows:

$$V \frac{dC_{A,OUT}}{dt} = F(C_{A,IN} - C_{A,OUT}) - V \cdot k \cdot C_{A,OUT} \quad (1)$$

where the constant $k = 0,14 \text{ mol/min}$.

Construct a Simulink model of the system, that draws variable $C_{A,OUT}$ as a function of time. Set the simulation time to 30 sec. Save your model with name prob2.mdl.