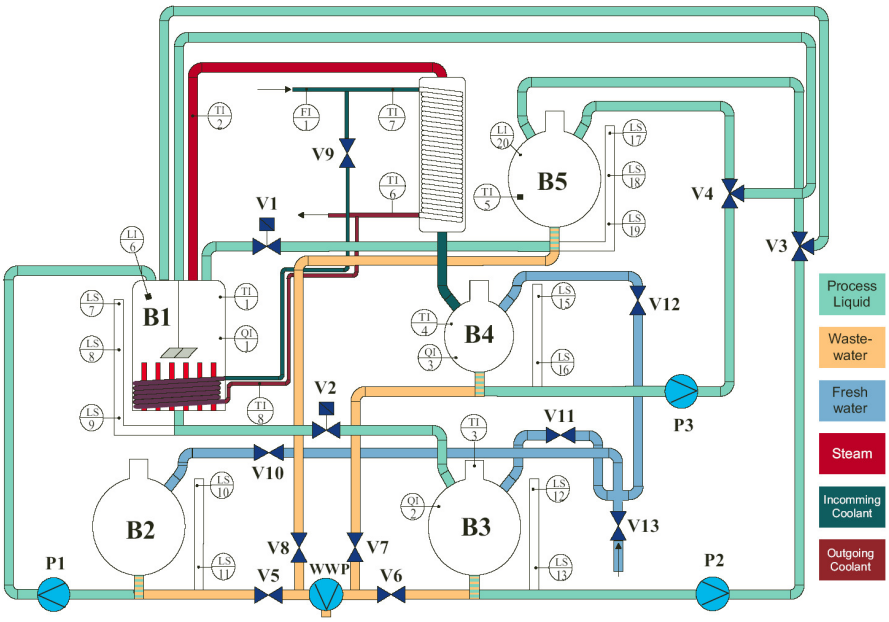
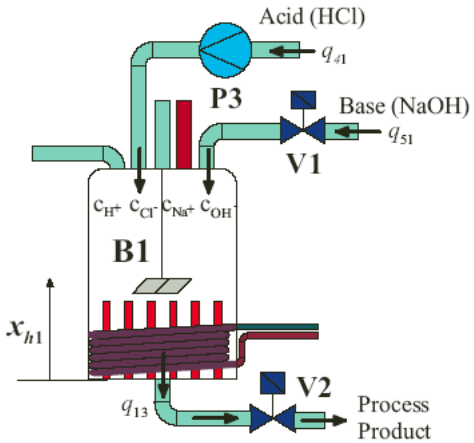
INC 691 Linear and Nonlinear System Identification **Final Project**
Assign: Fri 8 June 2012 **Due: Thu r 21 June 2012**

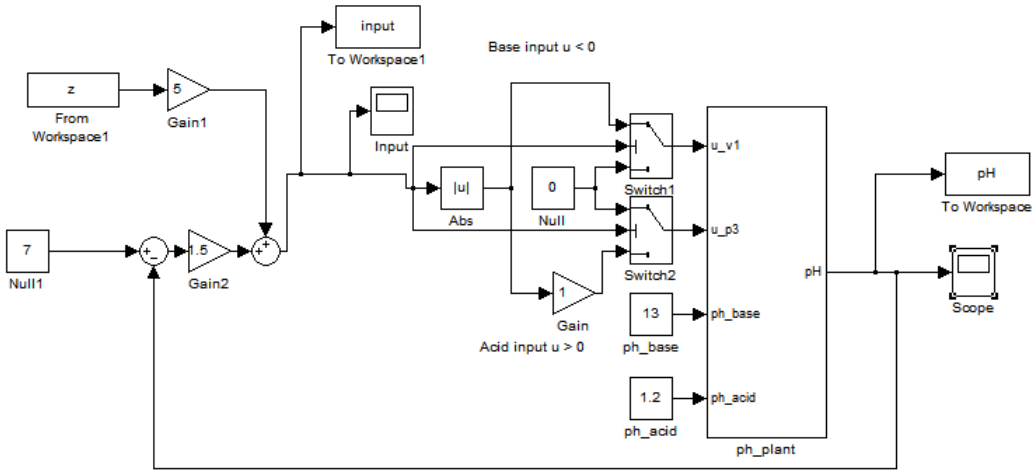
Instruction: Hand in your work in the mail box labeled INC691 by 4 pm. or submit it via email. DO NOT copy homework from your classmates or lend it to others. Anyone who violates this regulation will be given zero for the homework.

1. A Titration and Neutralization plant is shown in the figure below.



The project will investigate modelling of the chemical reactions of a neutralization process occurring in the stirred reactor tank B1, which is shown in more detail below. In this case the acid and base inflows from tanks B4 and B5 are controlled variables that influence the pH value in the reactor. Acid is pumped into the reactor via the gearwheel pump P3 and base can flow into the reactor when the control valve V1 is opened. Both actuators are controlled by voltage inputs. The control signal u represents a voltage controlling the pump P3 when positive, and a voltage controlling the valve V1 when negative. Then the system can be considered as a SISO system.





Task:

- From the given SIMULINK model `pH_plant.mdl`, Design a suitable excitation signal. The sampling time must be followed your design. Substitute z in the model with your excitation signal and collect output and input data from `input` and `ph`, respectively. (10 points)
- Identify a linear model and validate the model by checking the model output and correlation tests. (10 points)
- With the same data set, train a NNARX model that captures the nonlinear dynamic behaviour of the process. Test the model by checking the model output and correlation tests. (40 points)