

## 8. semester course: Robust Control

- Lecture 5.
- Emne: Methods for controller design.
- Literature: Chapter 7 of the notes is optional and will not be treated in detail in the course. The solution of the  $\mathcal{H}_\infty$  problem will be presented. Design methods will be used on the water tank plant.
- Exercise:
  1. The datafile `augsys.mat` which is available on the web is a MATLAB file with a state space realisation  $(A, B, C, D)$  of the augmented system  $N(s)$  shown in Figure 2 in the description for exercise 4. Now try to design an  $\mathcal{H}_\infty$  optimal regulator for the water tank system using `hinfopt.m` from MATLAB robust control toolbox. Why does it not work.
  2. To get around the problems you must make sure that there are direct terms from the control inputs  $u(s)$  to the external outputs to give  $D_{12}$  full column rank (the rank should be equal to the number of columns). Further there must be direct terms from the external inputs to the measured outputs to give  $D_{21}$  full row rank. Extensions to ensure this will be given in the file `augsys2.mat` which will be available. Now use the  $\mathcal{H}_\infty$  algorithm to design a regulator for this system.
  3. Check whether the conditions for nominal performance robust stability and robust performance are fulfilled.

Kind regards

Jakob and Palle.