

# Course Control and System Theory of Rational Systems Motivated by the Life Sciences

## Homeworkset 6

Date issued: 11 October 2018.

Date due: 18 October 2018.

1. Investigate the stability of a polynomial cyclic positive reaction system of state-space dimension  $n_x = 3$  of which the reaction network is irreducible and of which the system is also irreducible. Questions to be discussed include: (1) Does there exist a unique steady state within each stoichiometric compatibility subset? (2) If there exists a unique steady state with a stoichiometric compatibility subset, is that state globally asymptotically stable for initial states in that subset possibly intersected with the interior of the positive orthant?
2. Investigate the stability of a polynomial mammillary positive reaction system of state-space dimension  $n_x = 3$  of which the reaction network is irreducible and of which the system is also irreducible.

Contact the lecturer J.H. van Schuppen if you have problems with these problems. Possibly additional assumptions have to be imposed to make the problem solvable.

## Reading advice for Lecture 6

Please read of the lecture notes the Sections 6.5, 6.6, 6.7, and 6.8.

## Reading advice for the future Lecture 7

On Thursday 18 October, Lecture 7 will be presented. Please read of the lecture notes the Sections 7.1 - 7.6. As mentioned before, this is a recommendation only.