Nonlinear Control Systems
Exam questions

The exam for the Nonlinear Control Systems course will be a 20 minutes oral exam. It consists of two parts:
In the first part (approximately 10 minutes) you will be asked to discuss/explain one of questions 5, 6 or 7 below.
In the second part (approximately 10 minutes) you will be asked to discuss/explain one of questions 1, 2, 3, or 4 below.
For each of questions 1-4, an exercise from Khalil's book is given as a possible illustrative example. You may present a solution to the exercise in question in order to explain the method, but the focus shall be on the methodology more than the specific result.

1) Explain how Lyapunov functions can be used in connection with Backstepping control synthesis.
   To illustrate the method you may present Exercise 9.6 (b).
2) Explain the State Feedback Linearization method.
   To illustrate the method you may present Exercise 9.2 (1).
3) Explain the Sliding Mode control method.
   To illustrate the method you may present Exercise 10.6.
4) Explain the Passivity and Passivity-Based control method.
   To illustrate the method you may present Exercise 9.6 (c).

5) Extended/Unscented Kalman Filter
   What is the theoretical foundation for EKF/UKF ?
   When is this estimation methods needed ?
   What are the differences in theory and practice ?
6) Model uncertainty
   How can a model be validated ?
   If the model is not acceptable/validated, what approaches can be used ?
7) Particle Filter
   What is the differences between PF and EKF/UKF from a theory/methodology point of view ?
   What is the differences between PF and EKF/UKF from a application/practice point of view ?