

UNIVERSITY OF CALIFORNIA SANTA BARBARA
DEPARTMENT OF CHEMICAL ENGINEERING

CHE 152B: Advanced Process Control
Winter Quarter 2008 Homework # 4
(Due Feb 4, 2008)

- 1) Problem 16.15 from Seborg/Edgar/Mellichamp 2nd edition
- 2) Problem 16.17 from Seborg/Edgar/Mellichamp 2nd edition

The following exercises involve the PCM software (download the files from the 152B www site)

3. Use PCM/Diabetes/Bergman to model the glucose response to changes in the rates of insulin and glucose infusion
 - a. Estimate the parameters of a first order plus time delay model
 - b. Estimate the parameters of a second order model
 - c. Which model is best for modeling insulin infusion? Glucose infusion?
4. Compare your model predictions with step changes in
 - a. Insulin of 1, 5, 10 mU/min
 - b. Glucose infusion of 1, 2, 3 mg/dL/min
 - c. Glucose infusion of 2 mg/dL/min and insulin infusion of 5 mU/L
 - d. Which step changes in glucose and insulin infusion are best modeled? Why?
5. Use PCM/Diabetes/PID to tune the feedback PID controller manipulating insulin infusion using IMC-tuning rules using your best model to
 - a. Track setpoint changes of +/- 20 mg/dL
 - b. Reject disturbances of 25, 50, 100 g CHO
6. Use PCM/Diabetes/FF to implement a feedforward controller using the disturbance variable U_g . You should test disturbances of 25, 50, 100 g CHO
 - a. Design and test a FF controller based on steady-state analysis
 - b. Design and test a FF controller based on dynamic analysis