

Chemical Engineering 436

Exam #3 Review

Chapter 8

PID controller transfer functions
Ideal derivative vs. practical
Reverse acting vs. direct acting

Chapter 11 Block Diagrams

Get block diagram from physical diagram
Closed loop transfer functions
Block diagram algebra
Closed loop behavior

- time constants
- final values as t approaches ∞ ($Y/Y_{sp}=?$, $Y/D=?$)
- offset (P-control only)

Stability

Definition of stability
Characteristic equation
Methods

- Roots of Polynomial (Charact. Eqn.)
- Routh
 - Padé approximation for time delay

$$e^{-\theta s} = \frac{1 - \frac{\theta}{2}s}{1 + \frac{\theta}{2}\theta s}$$

- Direct substitution
 - Euler identity for time delay ($e^{-j\omega\theta} = \cos(\omega\theta) - j\sin(\omega\theta)$)
- Root locus
- Bode plots

Chapter 19&20 – Optimization and Model Predictive Control

- Numerical methods for optimization
 - Excel Solver
 - Algebraic Modeling Languages (AMPL, GAMS, APMonitor)
 - http://apmonitor.com/online/view_pass.php
- Introduction to Model Predictive Control
 - Excel vs. Manual Move Horizon
 - Linear Models
 - Nonlinear Models
 - Constraints