

the amplitude ratio of the measured variable to the disturbance. Recalling that only the measured variable is known to the plant personnel, discuss the differences in the results and their importance in analyzing plant performance.

- 13.17.** The transfer function between the set point and the controlled variable is given in equation (13.4). Apply the following controller design method to arrive at an algorithm other than PID. Assume the input-output response is defined at some good performance [i.e., $CV(s)/SP(s) = T(s)$ is specified]. Solve for the controller transfer function that would give this performance. Discuss whether this controller can be implemented in analog or digital form.
- 13.18.** The process design in Example 13.8 with a parallel structure is considered in this question. The concentration at the outlet of the second reactor is to be controlled as in Example 13.8, except that the flow rate of stream A (not the solvent) is to be manipulated.
- (a) Based on the different dynamics between the manipulated and controlled variables, predict the control performance and whether it would be better than the system in Example 13.8. (Hint: The results from end-of-appendix question I.3 will help in answering this question.)
 - (b) Develop a dynamic simulation for this design, tune the feedback PI controller, and compare the control performance with Example 13.8.
- 13.19.** The process with recycle was analyzed in end-of-chapter question 5.14. Determine the value of the recycle for which a feedback PI control system, controlling the outlet composition C_{A2} by adjusting C_{A0} , would give the best performance.
- 13.20.** Chemical reactors were analyzed in question 5.7 for two different reaction kinetics. For both kinetics (answered separately), determine which feedback control system, controlling C_A or C_B by adjusting C_{A0} , would provide the best performance. Base your answer entirely on the feedback dynamics, not the process gain.