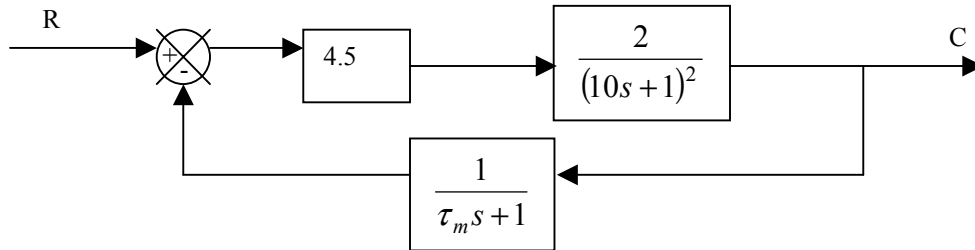


ChEE 413
Homework Handout 10
Spring 2005

1) Problem 11.8 from first edition - A second order process plus measuring element is controlled by a proportional only controller as shown in the drawing:



- a) For what range(s) of τ_m will the resulting system be stable?
- b) What practical arguments might be used to restrict the range(s) of acceptable τ_m even further?
- c) If a PD controller with $\tau_D = \tau_m$ is used, how would your answers to (a) and (b) be affected?

2) Problem 11.9 from first edition - An open loop unstable process is described by the transfer function

$$G(s) = \frac{B(s)}{P(s)} = \frac{e^{-2s}}{3s - 1}$$

Can a proportional feedback controller stabilize such a process? If so, what values of K_c result in a stable closed loop system?

3) Problem 11.14 from first edition - A feedback control system has the open loop transfer function

$$G_{OL}(s) = \frac{K_c(1 + \tau_D s)}{s^2(\tau s + 1)}$$

Determine the stability limits on control parameters K_c and τ_D for the following cases:

- a) Proportional only control.
- b) PD control.