

Homework 11: Lag Compensator and PID Control**Note: This homework assignment is due on Thursday 17.05.2012, 15:40.****Problem 24:**

- a. Design a lag-compensator for the plant in Problem 23. We want a phase margin of $\Phi_m = 45^\circ$ and a static position error of approximately 0.0063.
- b. Compare the controllers in Problem 23 d. and Problem 24 a. In which case do you expect a faster response? Justify your answer!

Problem 25:

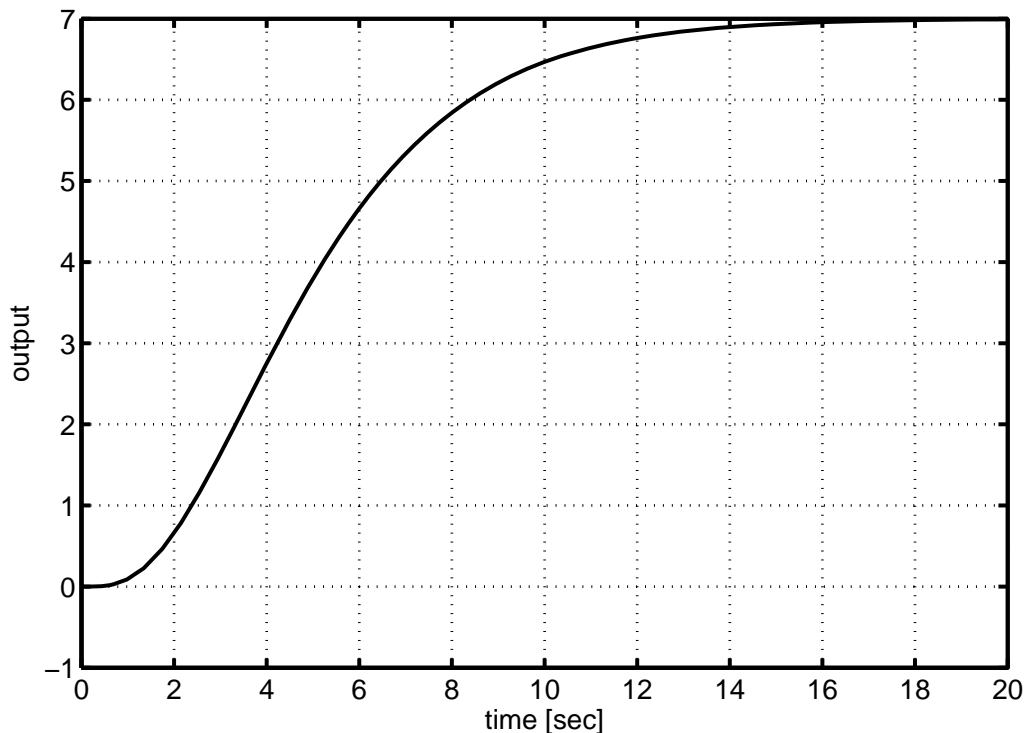
Consider the following 3 plants:

$$G_1(s) = \frac{5}{s^2 + 4s + 1} \quad G_2(s) = \frac{e^{-5s}}{(1+s)^4(1+15s)^3} \quad G_3(s) = \frac{1+20s}{1+4s^2+5s^3+10s^4}$$

Which of the above plants can be controlled using a Ziegler-Nichols design? Justify your answer!

Problem 26:

Consider the following reaction curve that was measured for a unit step input.



- a. Determine the characteristic plant parameters for a Ziegler-Nichols Reaction Curve design.
- b. Compute the PI controller parameters for a Ziegler-Nichols design.
- c. Compute the PID controller parameters for a Ziegler-Nichols design.