REPORT ON REGELTECHNIEK WPO SESSION

Date
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# third session - Exercises

## Consider the following control setup using *Simulink*

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|  | 1. Realize the systems with the following parameters $G\_{controller}\left(s\right)=1, G\_{system}\left(s\right)=\frac{5}{10s+1}e^{-5s}, G\_{sensor}\left(s\right)=1$.
2. Design a PID controller according to the open loop Ziegler-Nichols method.
3. What is the delay and the time constant?
4. What are the PID parameters?
5. Analyze the output (rise time, settling time, error, overshoot) and the bode Characteristic (phase margin, gain margin).
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## Consider the following control setup using *Simulink*

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|  | 1. Realize the systems with the following parameters $G\_{controller}\left(s\right)=1, G\_{system}\left(s\right)=\frac{1}{s(s+1)(s+2)}, G\_{sensor}\left(s\right)=1$.
2. Design a PID controller according to the closed loop Ziegler-Nichols method.
3. Use a gadget to tune the gain of the controller.
4. What is Kcrit and Pcrit?
5. What are the PID parameters?
6. Analyze the output (rise time, settling time, error, overshoot) and the bode Characteristic (phase margin, gain margin).
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## Consider the following control setup using *Simulink*

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|  | 1. Realize the systems with the following parameters $G\_{controller}\left(s\right)=1, G\_{system}\left(s\right)=\frac{1}{s-2}, G\_{sensor}\left(s\right)=1$
2. Is the open-loop system stable? Show the unit step response.
3. Is the closed-loop system stable? Show the unit step response.
4. Display the Bode plot of the underlying system.
5. Estimate the gain margin, phase margin, crossover frequency using the Bode plot figure.
6. Design a P controller. At what minimum gain value is the system already stable?
7. What gain is needed? Why? Define the controller accordingly
8. Design a PI controller with a phase margin of 60 degrees.
9. What in the integration time and the gain?
10. Analyze the output (rise time, settling time, error, overshoot) and the bode Characteristic (phase margin, gain margin).
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