ECE 388

Automatic Control

LAB 10

PID Controller

Objectives: The aim of a control system is to ensure good reference signal tracking and disturbance rejection properties, meeting given quality specifications. Specifications - what is considered as "good" - have to be formulated. PI controller is used, when zero steady-state error is required in the closed-loop step response, therefore an integrator has to be included in the control loop. PD controller is used if the system needs to be accelarated. In case of an ideal PD controller the value of the T1 parameter is zero, however an ideal PD controller can not be realized. Clearly, a PID structure is to be used if both steady-state and transient performances are to be met. The purpose of this experiment is to show series P, PI, PD, PID controller design effect on a specific plant.

List of Equipment/Software

MATLAB, Simulink

TASK: Consider the plant given by :

$$G_p(s) = \frac{1}{(1+10s)(1+s)(1+0.2s)}$$

Design series P,PI,PD,PID type controllers for 60° phase margin. Calculate the quality parameters. Display the step response.

	$G_c(s)$	$G_c(s)G_p(s)$	k_c	ω_c	e_{ss}	T_R	Max
Plant		$\frac{1}{(1+10s)(1+s)(1+0.2s)}$					
P	k_c	$\frac{k_c}{(1+10s)(1+s)(1+0.2s)}$					
PI	$\frac{k_c(1+10s)}{s}$	$\frac{k_c}{s(1+s)(1+0.2s)}$					
PD	$\frac{k_c(1+s)}{(1+0.1s)}$	$\frac{k_c}{(1+10s)(1+0.2s)(1+0.1s)}$					
PID	$\frac{k_c(1+s)(1+10s)}{s(1+0.1s)}$	$\frac{k_c}{s(1+0.2s)(1+0.1s)}$					

Comment on your Result.