Homework assignment 1 - EL2450

Adam Lang
Gabriel Andersson Santiago

January 22, 2016

1 Exercise 1

1.1 1

This is the tap that connects the upper tank to the water reservoir. If the gain is set to 0, this means that there is no contribution from this when the upper tank is being emptied, i.e. the tap is closed.

1.2 2

The transfer functions was implemented in the presented code.

1.3 3

The step block, the initial value for the step block is set to 0 meaning that the step will start with this value. The step time is set to 100 meaning that the step will come at $t = 100$ and the final value is set to 10 meaning that the step will step from 0 to 10.
The constant block, this will give a constant output of 40.
The summation block, this will add together both the step- and constant block and the output will be the sum of these to. The reference block will therefore at time 100 have a step from 40 to 50.

1.4 4

The function and the transfer function was added to the script.

1.5 5

ζ	χ	ω_0	T_r	M	$T_{settling}$
0.5	0.7	0.1	8.4	14.0	45,4
0.5	0.7	0.2	4.9	26.9	37.0
0.5	0.8	0.2	5.0	31.7	26.5

The last control parameters will give values that is within the requirements. Therefore will this be the best controller for us.

1.6 6

The crossover frequency for the open loop system, $F(s)G(s)$ can be found by solving for $0dB$ when $s = j\omega$,

$$|F(j\omega)G(j\omega)| = 1 \tag{1}$$

This will give the crossover frequency $\omega_c = 0.916 \, rad/s$.