Report for Auto Control Lab6

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1 Introduction

This is the third Experiment of Auto Control Lab where TAs taught us more of the plot of transfer functions, and the use of combinations of feedback loops.

2 LAB6

2.1 Feedback arithmetics and its codes

Objective:To perform basic operations on different systems and output their results.

These are the stated Homework problems

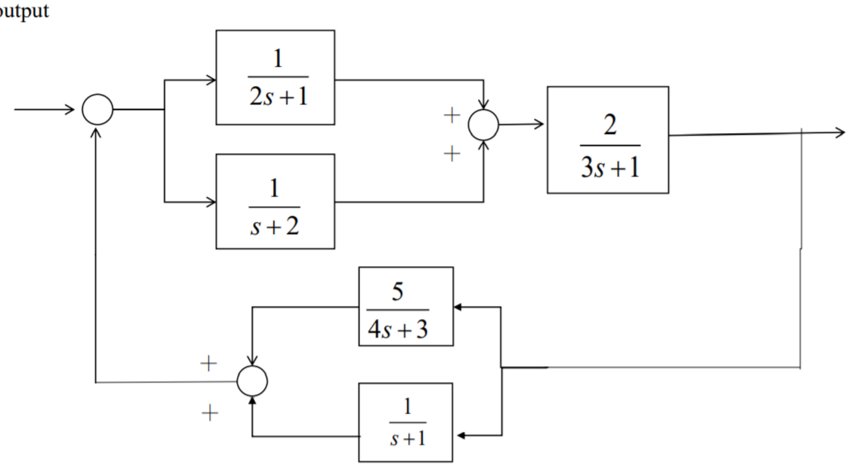
Lab6 Homework

P1.

Consider the feedback system depicted in the figure.

(a) Compute the closed-loop transfer function using the series/parallel and feedback functions.

(b) Obtain the closed-loop system unit step response with the step function, and find the final value of output



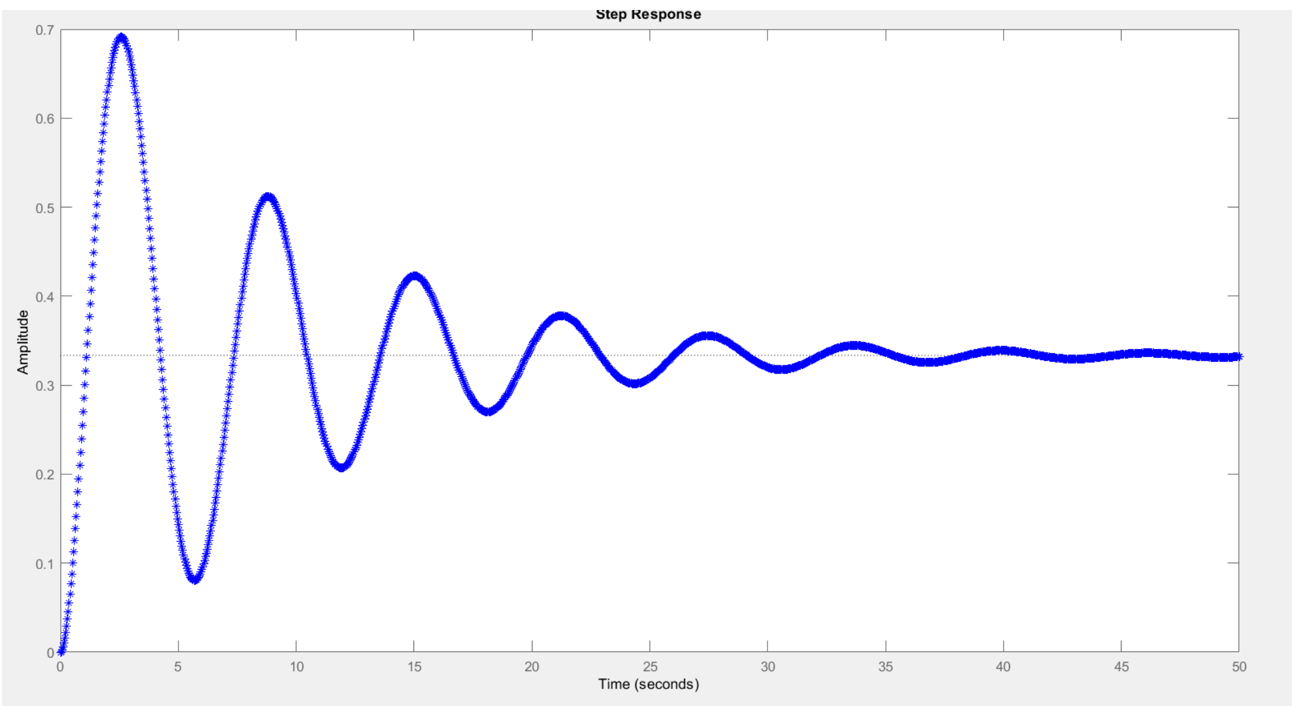
2.2 CODES FOR PROBLEM1

In order to perform the tasks, Matlab codes are needed. The following is the code needed for generating the transfer function and feedback loops for HW problem 1

```
%a)

sys1 = tf(1,[2 1]);
sys2 = tf(1,[1 2]);

sys3 = tf(2,[3 1]);

sys4 = tf(5,[4 3]);
sys5 = tf(1,[1 1]);

%Add sys1 and 2 together
sys_add1 = parallel(sys1,sys2)

%Times with sys3
sys_conv = tf(sys_add1 * sys3)

%Add sys4 and 5 together
sys_add2 = parallel(sys4,sys5)


%Whole output
disp("The whole transfer function is");
F1 = feedback(sys_conv,sys_add2)
```

2.3 Results OF the given feedback transfer functions

```
The whole transfer function is

F1 =

              24 s^3 + 66 s^2 + 60 s + 18
  ---------------------------------------------------
  24 s^5 + 110 s^4 + 181 s^3 + 190 s^2 + 149 s + 54

Continuous-time transfer function.
```



2.4 PROBLEM2

Objective:To perform basic operations on different systems and output their results.
These are the stated HW problems.

Lab6 Homework

P2.

A system has a transfer function

$$\frac{X(s)}{R(s)} = \frac{(15/z)(s+z)}{s^2+3s+15}$$

Plot the response of the system when $R(s)$ is a unit step for the parameter $z = 3, 6,$ and 12.

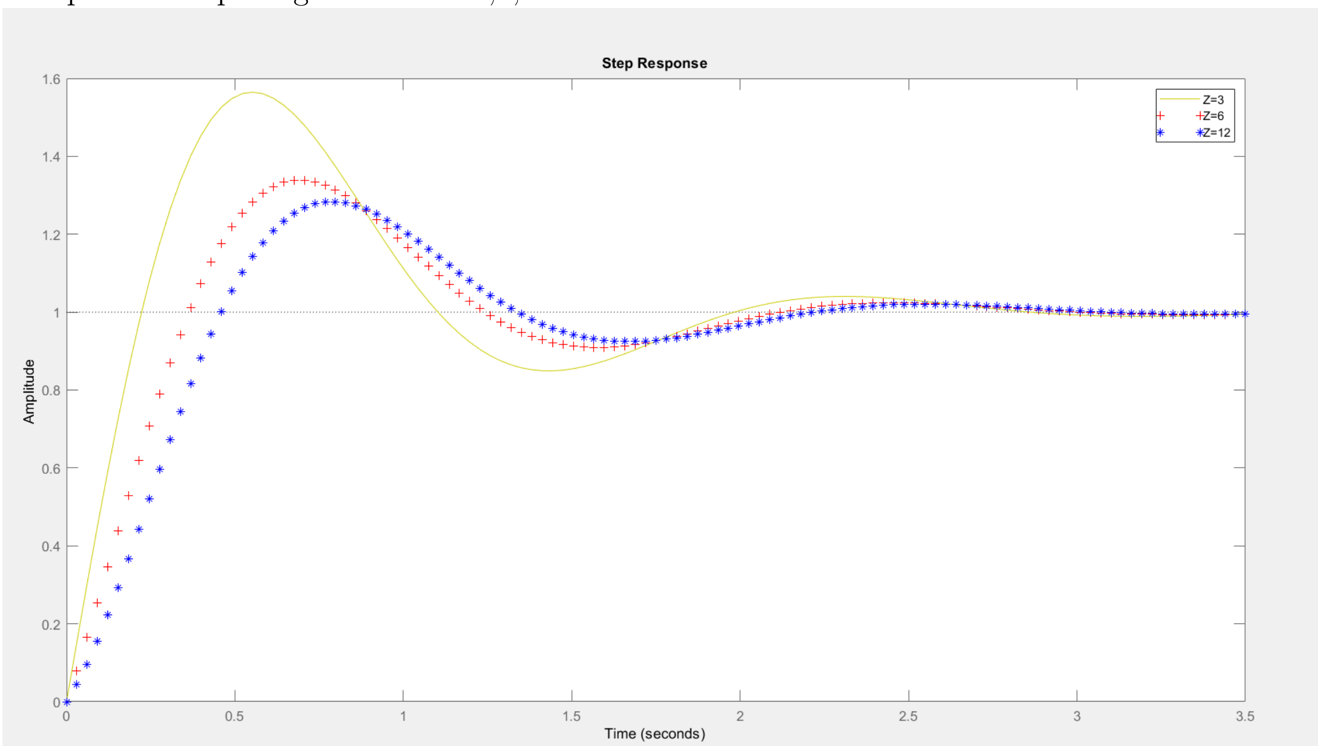
2.5 CODES FOR PROBLEM1

In order to perform the tasks, Matlab codes are needed. The following is the code needed for generating the transfer function of HW problem 2 and output the result as different step response as input

```
clear;
clc;
%Enter the value with z equals 3 , 6 , 12


  z1 = input('Type the value of z1');
  n1 = 15/z1; n2 = [1 z1];
  nt = conv(n1,n2);
  d1 = [1 3 15];

  T1 = tf(nt , d1);

  z2 = input('Type the value of z2');
  n3 = 15/z2; n4 = [1 z2];
  d2 = [1 3 15];
  nt2=conv(n3,n4);

  T2 = tf(nt2 , d2);


  z3 = input('Type the value of z3');
  n5 = 15/z3; n6 = [1 z3];
  nt3=conv(n5,n6);
  d3 = [1 3 15];

  T3 = tf(nt3 , d3);

  step(T1,'y-',T2,'r+',T3,'b*')
  legend('Z=3','Z=6','Z=12')
```

2.6 Plot Results OF the given transfer functions with different step responses

The plots for 3 plots given as z = 3,6,12



3 Conclusion

Today we learn the function plotting of transfer function and more ways to calculate the feedback loops for a certain transfer functions.Now we have successfully plot out almost everything we taught during Signal and System courses and those taught in Engineering math.As always these operations performed on the transfer function and graph plotting is essential for future usages, otherwise more advanced topics cannot be grasped easily without these prerequisite

This concludes the fourth Week of Auto Control LAB