

Scilab Manual for
Control Systems and Simulation
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Experiment: 1

Linear System Analysis (Time domain analysis, Error analysis)

Scilab code Solution 1.1 Linear System Analysis

```
1 //Created using Ubuntu 14.04 and Scilab 5.5.0
2 //Time Domain Analysis
3 clear
4 num=poly([12.811 18 6.3223], "s", "coeff"); //
   Defines the numerator of the transfer function
5 den=poly([12.811 18 11.3223 6 1], "s", "coeff"); //
   Defines the denominator of the transfer function
6 s1=syslin('c', num, den); //
   Defines the transfer function
7 t=[0:0.001:25]; //The
   time of simulation is set from 0 to 25 seconds
8 plot2d(t, csim('step', t, s1)) //It
   plots the step response of the transfer function
   s1
9 xgrid(5,1,7)
10 xtitle('Time Domain Analysis', 'Time(sec)', 'C (t)')
11
```

```
12
13
14 //Error Analysis
15 clear
16 clc
17 num=poly([240 120], "s", "coeff"); //Defines the
    numerator of G(s)
18 den=poly([12 7 1], "s", "coeff"); //Defines the
    denominator of G(s)
19 G=num/den; //Defines G(s)
20 Ess=1/(1+horner(G,0)); //Evaluates Steady
    state error for step input
21 mprintf('The steady state error is ')
22 disp(Ess)
```

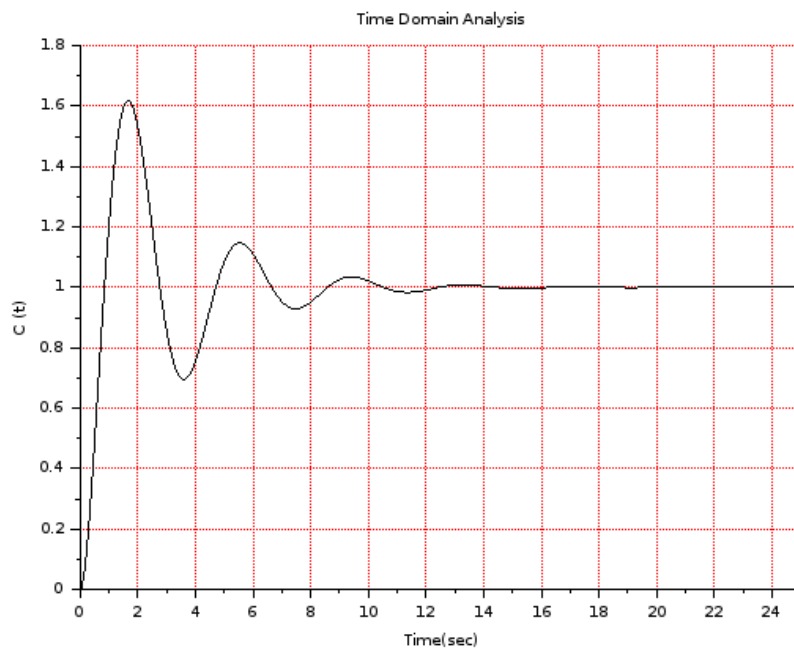


Figure 1.1: Linear System Analysis

Experiment: 2

Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant System

Scilab code Solution 2.2 Stability Analysis

```
1 //Created using Ubuntu 14.04 and Scilab 5.5.0
2 //Bode Plot
3 clear
4 num=poly([9 1.8 9], "s", "coeff"); //Defines the
   numerator of G(s)
5 den=poly([0 9 1.2 1], "s", "coeff"); //Defines the
   denominator of G(s)
6 sl=syslin('c', num, den); //Defines G(s)
7 subplot(2,2,1)
8 bode(sl,0.01,100) //It plots the
   Bode plot from 0.01 Hz to 100 Hz
9
10
11 //Root Locus
12 clear
```

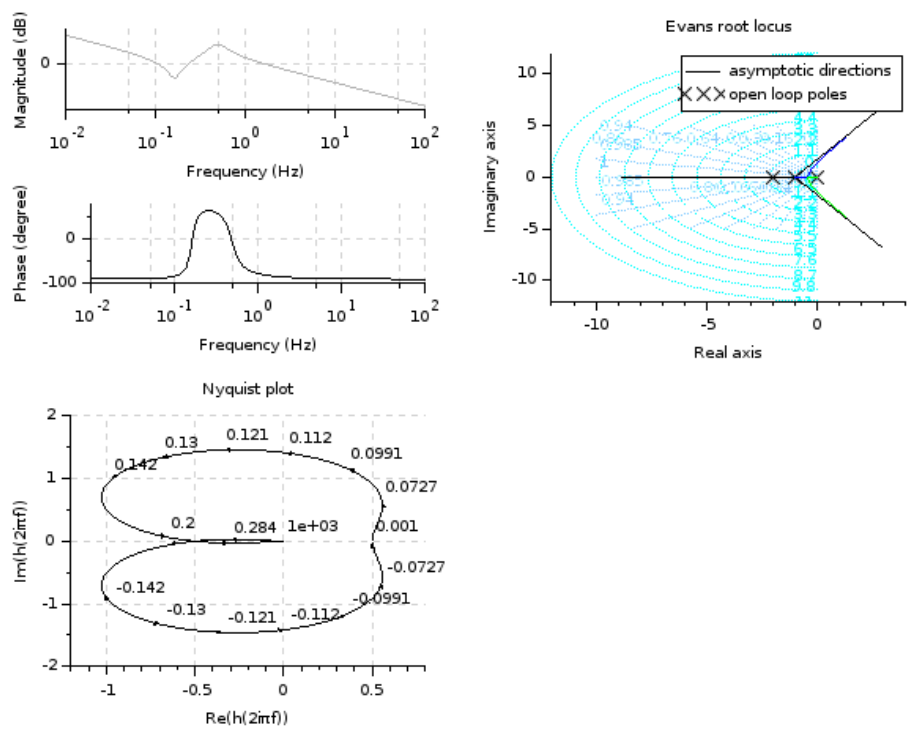


Figure 2.1: Stability Analysis

```

13 num=1;                                //Defines the
    numerator of G(s)
14 den=poly([0 -1 -2], "s", "roots"); //Defines the
    denominator of G(s)
15 s1=syslin('c', num, den);             //Defines G(s)
16 subplot(2,2,2)
17 evans(s1,100)                          //Plots the root
    locus for a maximum gain of 100
18 sgrid()
19
20
21 //Nyquist Plot
22 clear
23 num=poly([0.5 1], "s", "coeff");     //Defines the
    numerator of G(s)
24 den=poly([1 0 1 1], "s", "coeff"); //Defines the
    denominator of G(s)
25 s1=syslin('c', num, den);             //Defines G(s)
26 subplot(2,2,3)
27 nyquist(s1)                            //Plots the Nyquist
    plot for G(s)

```

Experiment: 3

State space model for classical transfer function - Verification

Scilab code Solution 3.3 Statespace model for Classical transfer function

```
1 //Created using Ubuntu 14.04 and Scilab 5.5.0
2 clear
3 clc
4 num=poly([10 10], "s", "coeff"); //Defines the
    numerator of the transfer function
5 den=poly([10 5 6 1], "s", "coeff"); //Defines the
    denominator of the transfer function
6 sl=syslin('c', num, den); //Defines the
    transfer function
7 sys=tf2ss(sl); //Converts
    transfer function to space model and stores the
    result in "sys"
8 disp(sys)
```
