Scilab Manual for Control System Engineering by Dr R. Anjana Electrical Engineering Laxmi Institute of Technology[1]

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Experiment: 2

To obtain overall transfer function of a system connected in series, parallel and feedback configuration

Scilab code Solution 2.02 Block Diagram Reduction

```
1 // VERSION: Scilab: 5.5.2
2 // OS: windows 7
3 // CAPTION: DC motor Response
4
5 //To obtain overall transfer function of a system
     connected in series, parallel and feedback
     configuration
6
7
8 clc;
9 clear all;
10 p = input('enter the Co-efficient of numerator
     polynomial for p:');
11 a = input('enter the Co-efficient of denominator
     polynomial for p:');
```

```
12 q=input('enter the Co-efficient of numerator
      polynomial for q:');
13 b=input('enter the Co-efficient of denominator
      polynomial for q:');
14
15 C = poly([p], 's',"coeff")
16 D = poly([q], 's',"coeff")
17 X = poly([a], 's',"coeff")
18 Y =poly([b], 's',"coeff")
19
20 G1 = syslin('c',C,X)
21 G2 = syslin('c',D,Y)
22
23 x = G1*G2;
24 y = G1 + G2
25  z =  G1 /. G2
26 disp(x, 'the series function of G1 & G2 is:')
27 disp(y,'the Parallel function of G1 & G2 is:')
28 disp(z,'the Feedback function of G1 & G2 is:')
29
30
31 // Sample output
32 //enter the Co-efficient of numerator polynomial for
       p:[1]
33 //enter the Co-efficient of denominator polynomial
      for p:[1 2]
34 //enter the Co-efficient of numerator polynomial for
       q:[4]
35 //enter the Co-efficient of denominator polynomial
      for q:[1]
36
37 // the series function of G1 & G2 is:
38
39 //       4
40 //    -------
41   //   1 + 2s
42
43  //the Parallel function of G1 & G2 is:
```

```
44
45 //      5 + 8s
46 //     -------
47  //    1 + 2s
48
49 // the Feedback function of G1 & G2 is:
50
51 //        1
52 //     -------
53  //    5 + 2s
```

Experiment: 4

Routh Stability Criterion

Scilab code Solution 4.04 Routh Hurwitz Criterion

```
1  // VERSION: Scilab: 5.4.2
2  // OS: windows 7
3  // CAPTION: Routh-Hurwitz Criterion
4
5  clc;
6  disp('           ')
7  D=input('Input coefficients of characteristic
       equation,i.e:[an an-1 an-2 ... a0]= ');
8  l=length (D);
9
10 disp('                                              ')
11 disp('----------------------------------------------')
12 disp('Roots of characteristic equation is:')
13 roots(D)
14 if modulo(l,2)= =0
15     m=zeros(l,l/2);
16     [cols,rows]=size(m);
17     for i=1:rows
18         m(1,i)=det(1,(2*i)-1);
19         m(2,i)=det(1,(2*i));
20     end
```

```
21 else
22     m=zeros(l,(l+1)/2);
23     [cols,rows]=size(m);
24     for i=1:rows
25         m(1,i)=D(1,(2*i)-1);
26     end
27     for i=1:((l-1)/2)
28         m(2,i)=D(1,(2*i));
29     end
30 end
31
32 for j=3:cols
33
34     if m(j-1,1)==0
35         m(j-1,1)=0.001;
36     end
37
38     for i=1:rows-1
39         m(j,i)=(-1/m(j-1,1))*det([m(j-2,1) m(j-2,i
               +1);m(j-1,1) m(j-1,i+1)]);
40     end
41 end
42
43 disp('----------The Routh-Hurwitz array is:----------',
     m)
44 //% ------------------------End of Bulding array
     ------------------------------------
45
46
47 //% Checking for sign change
48 Temp=sign(m);a=0;
49 for j=1:cols
50     a=a+Temp(j,1);
51 end
52 if a==cols
53     disp('          ----> System is Stable <----')
54 else
55     disp('          ----> System is Unstable <----')
```

```
56 end
57
58     ///Sample Input for unstable system
59
60     //input coefficients of characteristic equation,
         i.e:[an an-1 an-2 ... a0]= [1 2 3 4 5]
61
62
63
64 // ------------------------------------------------
65
66 // Roots of characteristic equation is:
67
68 //    1.    3.    5.
69  //   2.    4.    0.
70  //   1.    5.    0.
71 //  - 6.    0.    0.
72 //    5.    0.    0.
73
74 // ---------The Routh-Hurwitz array is:----------
75
76  //          ------> System is Unstable <------
77
78
79 // === Check for stable system ====
80
81 //Input coefficients of characteristic equation,i.e
     :[an an-1 an-2 ... a0]= [ 1 1 1]
82
83
84 // ------------------------------------------------
85
86 // Roots of characteristic equation is:
87
88 //    1.    1.
89  //   1.    0.
90  //   1.    0.
91
```

```
92 // ----------The Routh-Hurwitz array is:----------
93
94 //              ------> System is Stable <------
```

Experiment: 12

DC motor Response

Scilab code Solution 12.0 DC motor Response

```
1 // VERSION: Scilab: 5.5.2
2 // OS: windows 7
3 // CAPTION: DC motor Response
4
5
6 clc;
7 clear;
8 format('v',7)
9 // given data :
10 V=input('Enter the value of voltage:');// enter 230
     vs
11 Vm=sqrt(2)*V; // in volts
12 Ka=input('Enter the value of ka:'); // enter Ka = 1;
13 QR=input('Enter the value of QR:');// enter QR = 1;
14 Ra=input('Enter the value of Ra:');// enter Ra =
     0.05
15 Alpha=input('Enter the angle');// enter angle = 30 (
     in degree)
16 Y=(60/(2*%pi)); //
```

```
Z=((Vm/%pi)*(1+cosd(Alpha))); //
X=(Ra/(0.5)^2)
for i=1:8
Wm(i)= (Z -(i)*X)*Y; //
end
Wm=[(Y*Z);Wm(1);Wm(2);Wm(3);Wm(4);Wm(5);Wm(6);Wm(7);
Wm(8)]
disp(Wm ," Varoius values of speed in RPM is ")
T=[0;1;2;3;4;5;6;7;8];
plot2d(T,Wm)
xlabel("Torque ,N*m")
ylabel(" Speed ( rpm) for alpha=30 degree ")

// ==  Sample output ===//

//Enter the value of voltage:230
//Enter the value of ka:1
//Enter the value of QR:1
//Enter the value of ra:0.05
//Enter the angle30

//  Varoius values of speed in RPM is

 //    1844.9
 //    1843.
 //    1841.1
 ///    1839.2
 //    1837.3
 //    1835.4
 //    1833.5
 //    1831.6
 //    1829.7
```