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

Solutions provided by
Dr R. Anjana
Electrical Engineering
Gujarat Technological University

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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

```
// VERSION: Scilab: 5.5.2
// OS: windows 7
// CAPTION: DC motor Response

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


clc;
clear all;
p = input('enter the Co-efficient of numerator
   polynomial for p:');
a = input('enter the Co-efficient of denominator
   polynomial for p:');
```

```
q=input('enter the Co-efficient of numerator polynomial for q:');
b=input('enter the Co-efficient of denominator polynomial for q:');

C = poly([p], 's',"coeff")
D = poly([q], 's',"coeff")
X = poly([a], 's',"coeff")
Y =poly([b], 's',"coeff")

G1 = syslin('c',C,X)
G2 = syslin('c',D,Y)

x = G1*G2;
y = G1 + G2
 z =  G1 /. G2
disp(x, 'the series function of G1 & G2 is:')
disp(y,'the Parallel function of G1 & G2 is:')
disp(z,'the Feedback function of G1 & G2 is:')


// Sample output
//enter the Co-efficient of numerator polynomial for p:[1]
//enter the Co-efficient of denominator polynomial for p:[1  2]
//enter the Co-efficient of numerator polynomial for q:[4]
//enter the Co-efficient of denominator polynomial for q:[1]

// the series function of G1 & G2 is:

//       4
//     ------
  //   1 + 2s

 //the Parallel function of G1 & G2 is:
```

```
//       5 + 8s
//       ------
 //      1 + 2s

// the Feedback function of G1 & G2 is:

//         1
//       -----
 //      5 + 2s
```

Experiment: 4

Routh Stability Criterion

Scilab code Solution 4.04 Routh Hurwitz Criterion

```
// VERSION: Scilab: 5.4.2
// OS: windows 7
// CAPTION: Routh-Hurwitz Criterion

clc;
disp('            ')
D=input('Input coefficients of characteristic
   equation,i.e:[an an-1 an-2 ... a0]= ');
l=length (D);

disp('                                                  ')
disp('--------------------------------------------------')
disp('Roots of characteristic equation is:')
roots(D)
if modulo(l,2)==0
    m=zeros(l,l/2);
    [cols,rows]=size(m);
    for i=1:rows
        m(1,i)=det(1,(2*i)-1);
        m(2,i)=det(1,(2*i));
    end
```

```
else
    m=zeros(l,(l+1)/2);
    [cols,rows]=size(m);
    for i=1:rows
        m(1,i)=D(1,(2*i)-1);
    end
    for i=1:((l-1)/2)
        m(2,i)=D(1,(2*i));
    end
end

for j=3:cols

    if m(j-1,1)==0
        m(j-1,1)=0.001;
    end

    for i=1:rows-1
        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)]);
    end
end

disp('————————The Routh—Hurwitz array is:————————',m)
//% ————————————————————End of Bulding array ————————————————————————————————


//% Checking for sign change
Temp=sign(m);a=0;
for j=1:cols
    a=a+Temp(j,1);
end
if a==cols
    disp('          ———> System is Stable <——— ')
else
    disp('          ———> System is Unstable <——— ')
```

```
end

    ///Sample Input for unstable system

    //input coefficients of characteristic equation, i.e:[an an-1 an-2 ... a0]= [1 2 3 4 5]



// ----------------------------------------------------------

// Roots of characteristic equation is:

//     1.     3.     5.
 //    2.     4.     0.
 //    1.     5.     0.
//  - 6.     0.     0.
//     5.     0.     0.

// ------------The Routh-Hurwitz array is:----------

 //           ----> System is Unstable <----


// === Check for stable system ====

//Input coefficients of characteristic equation,i.e:[an an-1 an-2 ... a0]= [ 1 1 1]


// ----------------------------------------------------------

// Roots of characteristic equation is:

//     1.     1.
 //    1.     0.
 //    1.     0.

```

```
// ------------The Routh-Hurwitz array is:----------

//              ----> System is Stable <----
```

Experiment: 12

DC motor Response

Scilab code Solution 12.0 DC motor Response

```
// VERSION: Scilab: 5.5.2
// OS: windows 7
// CAPTION: DC motor Response


clc;
clear;
format('v',7)
// given data :
V=input('Enter the value of voltage:');// enter 230 vs
Vm=sqrt(2)*V; // in volts
Ka=input('Enter the value of ka:'); // enter Ka = 1;
QR=input('Enter the value of QR:');// enter QR = 1;
Ra=input('Enter the value of Ra:');// enter Ra = 0.05
Alpha=input('Enter the angle');// enter angle = 30 (in degree)
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
```