Scilab Textbook Companion for
Signals and Systems
by P. R. Babu and R. Anandanatarajan[1]

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Scilab numbering policy used in this document and the relation to the above book.

Exa Example (Solved example)

Eqn Equation (Particular equation of the above book)

AP Appendix to Example(Scilab Code that is an Appednix to a particular Example of the above book)

For example, Exa 3.51 means solved example 3.51 of this book. Sec 2.3 means a scilab code whose theory is explained in Section 2.3 of the book.

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List of Scilab Codes

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Chapter 1

Signals an introduction

Scilab code Exa 1.7 Sketch the following signals

```
1  //Example 1_7_<i>
2  //Sketch the following signal.
3  clc;
4  clear all;
5  t=-5:1/1000:5;
6  for i=1:length(t)
7      if t(i)>1 then
8          x(i)=0;
9      else
10         x(i)=1;
11     end
12 end
13 f=scf(0);
14 plot2d(t,x);
15 plot(t,x,'red');
16 xtitle('Required figure','t','x(t)');
17 xgrid();
18 xs2jpg(0, 'problem1_7_i-plot.jpg');
19 //Example 1_7_<ii>
20 //Sketch the following signal.
21 clc;
```

```
22  t = -5:1/1000:5;
23  for i =1:length(t)
24      if t(i)<1 then
25          x(i)=0;
26      else
27          x(i)=1;
28      end
29  end
30  for i =1:length(t)
31      x1(i)=-2*x(i);
32  end
33  //figure
34  f=scf(0);
35  plot2d(t,x);
36  xtitle('required figure','t','x(t)');
37  xs2jpg(0, 'problem1.7.2-plot-a.jpg');
38  //figure
39  f=scf(1);
40  plot2d(t,x1);
41  plot(t,x1,'blue');
42  xtitle('Required figure','t','x1(t)');
43  xs2jpg(1, 'problem1.7.2-plot-b.jpg');
```

Scilab code Exa 1.8 Sketch the following signals

```
1   //Example 1.8.<i>
2   //Sketch the following signal
3   clc;
4   clear all;
5   t = -10:.001:10;
6   for i =1:length(t)
7       if t(i)>=-2 & t(i)<3 then
8           x(i)=1;
9       else
10          x(i)=0;
```

```
11        end
12 end
13 //figure
14 f=scf(0);
15 plot2d(t,x);
16 xtitle('Required figure','t','x(t)');
17 xs2jpg(0, 'EX1_8_1-plot.jpg');
18 //Example 1.8.<ii>
19 //Sketch the following signal.
20 clc;
21 clear all;
22 t=-10:.001:10;
23 for i=1:length(t)
24     if t(i)>=0 & t(i)<=2 then
25         x(i)=1;
26     else
27         x(i)=0;
28     end
29 end
30 //figure
31 f=scf(0);
32 plot2d(t,x,1);
33 xtitle('Required figure','t','x(t)');
34 xs2jpg(0, 'EX1_8_2-plot.jpg');
```

Scilab code Exa 1.12 Check whether the given signal is periodic or not

```
1 //Example 1.12<i>
2 //check whether the given signal is periodic or not
3 clc;
4 t=-5:.01:5;
5 x=%i*(exp(%i*5*t));
6 subplot(311)
7 plot(t,x);
8 disp('(a)This shows that the given signal is
```

```
           periodic  with  priod (.4 ∗ %pi) ');
 9  //Example  1.12< ii >
10  //Show  whether  the  given  signal  is  periodic  or  not
11  clc ;
12  t = -1/5:0.001:1/5;
13  x= sin (50*%pi*t);
14  subplot (312)
15  plot (t,x);
16  disp ( '(b) the  plotting  shows  that  the  given  signal  is
          periodic  with  period  1/25 ');
17  //Example  1.12.< iii >
18  //Check  whether  the  given  signal  is  periodic  or  not
19  clc ;
20  t = -1:0.01:1;
21  x =20* cos ((10*%pi*t)+(%pi/6));
22  subplot (313)
23  plot (t,x);
24  disp ( '(c) Plot  shows  that  the  given  signal  is
        periodic  with  period  .2 ');
25
26  disp ( 'In  the  figure  we  have  the  plots  of  part  (a) −
        (c)  in  clockwise  order  strating  from  the  top  left
        ')
```

Scilab code Exa 1.13 Check whether the given signal is periodic or not

```
1  //Example  1.13< i >
2  //Check  whether  the  given  signal  is  periodic  or  not
3  clc ;
4  t = -10:.01:10;
5  y =2* cos (10*t+1) - sin (4*t-1);
6  subplot (221)
7  plot (t,y);
8  disp ( '(a)  The  following  signal  is  periodic  with
        period  %pi '  );
```

```
9  //Example 1.13<ii>
10 //Show whether the given signal is periodic or not
11 clc;
12 t=-1:.01:1;
13 x=cos(60*%pi*t)+sin(50*%pi*t);
14 subplot(222)
15 plot(t,x);
16 disp('(b)Ther following figure shows that the given
       signal is periodic with the following period');
17 //Example1.13<iv>
18 //Check whether the given signal is periodic or not
19 clc;
20 t=-10:0.01:10;
21 x=3*cos(4*t)+2*sin(%pi*t);
22 subplot(223)
23 plot(t,x);
24 disp('(c)The signal is not periodic since ratio of
       two time periods is %pi/4 which is not rational
       number');
25 //Example 1.13<V>
26 //Check whether the given signal is periodic or not
27 clc;
28 t=0:10;
29 for i=1:length(t)
30     u(i)=1;
31 end
32 x=u(i)-(1/2);
33 subplot(224)
34 plot(t,x);
35 disp('(d)The signal is not periodic as seen from
       figure');
36
37 disp('In the figure we have the plots of part (a)-
       (d) in clockwise order strating from the top left
       ')
```

Scilab code Exa 1.14 Check whether the given signal is periodic or not

```
1  //Example 1.14<i>
2  //Find whether the following signal is periodic or
        not
3  clc;
4  n=-10:10;
5  x=cos(2*%pi*n);
6  subplot(321)
7  plot2d(n,x);
8  f=(2*%pi)/(2*%pi);//where f is the no of cycles/
        sample.
9  N=1/f;//where N is the no of samples per cycle.
10 disp('samples',N,'(a)The given signal is periodic');
11 //Example 1.14<ii>
12 //Find whether the following signal is periodic or
        not.
13 clc;
14 n=-20:20;
15 x=exp(%i*6*%pi*n);
16 subplot(322)
17 plot2d3(n,x);
18 f=(6*%pi)/(2*%pi);//where f is the no of cycles per
        sample.
19 N=1/f;//where N is the no of samples per cycle.
20 disp('samples',N,'(b)the given signal is periodic');
21 //example 1.14<1v>
22 //Find whether the given signal is periodic or not
23 clc;
24 n=-30:30;
25 x=exp(%i*(2*%pi/3)*n)+exp(%i*(3*%pi/4)*n);
26 subplot(323)
27 plot2d3(n,x);
28 disp('(c)The given signal is periodic');
```

```
29  //Example 1.14<v>
30  //Find whether the given signal is periodic or not;
31  clc;
32  n=-20:20;
33  x=exp(%i*(3*%pi/5)*(n+1/2));
34  subplot(324)
35  plot(n,x);
36  f=(3*%pi/5)/(2*%pi);//where f is the no of cycles
        per sample.
37  N=1/f;//where n is the no of samples per cycle.
38  disp('samples',N,'(d)the given signal is periodic');
39  //Example1.14<vi>
40  //whether the given signal is periodic or not
41  clc;
42  n=-40:40;
43  x=12*cos(20*n);
44  subplot(325)
45  plot(n,x);
46  f=20/(2*%pi);//where f is the no of cycles per
        sample
47  N=1/f;//where n is the no of sample per cycle
48  disp('samples',N,'(e)the given signal is not peridic
        ');
49
50  disp('In the figure we have the plots of part (a)-
        (d) in clockwise order strating from the top left
        ');
```

Scilab code Exa 1.15 Find the even and odd components of the signals

```
1  //Example 1.15<i>
2  //Find the even and odd components of the signal
3  clc;
4  clear;
5  t=-10:.1:10;
```

```
 6  for j=1:length(t)
 7      i=t(j);
 8      x(j)=cos(i)+sin(i)+cos(i)*sin(i);
 9      y(j)=cos(-i)+sin(-i)+cos(-i)*sin(-i);
10      e(j)=(1/2)*(x(j)+y(j));
11      o(j)=(1/2)*(x(j)-y(j));
12  end
13  disp('In the plot even component is in red and odd
        component is in blue')
14  plot(t,e,'red')
15  plot(t,o,'blue')
16  //Example 1.15<ii>
17  //Find the even and odd components of the signal
18  clc;
19  clear;
20  n=-2:2;
21  c=3;
22  x=[-2 1 2 -1 3];
23  for j=1:length(n)
24      i=n(j);
25      xe(j)=(1/2)*(x(c+i)+x(c-i));
26      xo(j)=(1/2)*(x(c+i)-x(c-i));
27  end
28  xe=[xe(c-2),xe(c-1),xe(c+0),xe(c+1),xe(c+2)];
29  xo=[xo(c-2),xo(c-1),xo(c+0),xo(c+1),xo(c+2)];
30
31  disp(xo,'odd component')
32  disp(xe,'even component')
```

Scilab code Exa 1.16 Determine power and rms value of the following signal

```
 1  //Example 1.16
 2  //Determine the power of the signal
 3  clc;
```

```
 4  A =2;
 5  theta =0;
 6  t =0:0.001:10;
 7  y=A*cos(2*%pi*t+theta);
 8  P=(integrate('A^2*(cos(2*%pi*t))^2','t',0,2*%pi))
       /(2*%pi);
 9  disp(P,'power of the signal is :');
10  y=round(P);
11  disp(y,'The given signal is power signal as power is
         finite ');
```

Scilab code Exa 1.17 Determine power and rms value of the signals

```
 1  //Example 1.17<i>
 2  //Determine the power and the rms value of the
        signal
 3  clc;
 4  t =0:0.001:10;
 5  y=5*cos(50*t+%pi/3);
 6  P=(integrate('5^2*(cos(50*t))^2','t',0,2*%pi))/(2*
       %pi);
 7  rmsvalue=sqrt(P);
 8  disp(P,'The power of the given signal is :');
 9  disp(rmsvalue ,'the rms value is :');
10  //Example 1.17<ii>
11  //Determine the power amd rms value of the signal
12  clc;
13  t =0:0.001:10;
14  x1=10*sin(50*t+%pi/4);
15  x2=16*cos(100*t+%pi/3);
16  P1=(integrate('10^2*(sin(50*t))^2','t',0,2*%pi))/(2*
       %pi);
17  P2=(integrate('16^2*(cos(100*t))^2','t',0,2*%pi))
       /(2*%pi);
18  P=P1+P2;
```

```
19  rmsvalue = sqrt (P ) ;
20  disp (P , 'The power of the given signal is : ') ;
21  disp ( rmsvalue , 'the rms value is : ') ;
22  // Example 1.17 < i i i >
23  // Determine the power and rms value of the signal
24  clc ;
25  t =0:0.001:10;
26  x1 =5* cos (15* t ) ;
27  x2 =5* cos (5* t ) ;
28  P1 =( integrate ( '5^2*( cos (15* t ) ) ^2 ' , 't ' ,0 ,2*%pi ) ) /(2*
        %pi ) ;
29  P2 =( integrate ( '5^2*( cos (5* t ) ) ^2 ' , 't ' ,0 ,2*%pi ) ) /(2*
        %pi ) ;
30  P = P1 + P2 ;
31  rmsvalue = sqrt (P ) ;
32  disp (P , 'The power of the given signal is : ') ;
33  disp ( rmsvalue , 'the rms value is : ') ;
```

Scilab code Exa 1.19.a Sketch the followins signal and calculate the energy

```
1   // Example 1.19.1
2   // whether the signal is energy signal or power
        signal
3   clc ;
4    t =0:0.001:10;
5    y= exp (-10* t ) ;
6    E= integrate ( ' ( exp(-10*t)) ^2 ' , ' t ' ,0 ,2*
        %pi ) ;
7   disp (E , ' Energy o f the s i g n a l i s ' ) ;
8    disp ( 'since the energy is finite hence it is
        energy signal ') ;
9    figure
10  plot (t ,y , 'red ') ;
11  xtitle ( 'Required figure ') ;
```

Scilab code Exa 1.21 Sketch the followins signal and calculate the energy

```
1  //Example 1.21<i>
2  //whether the signal is energy signal
3  clc ;
4   t =0:0.001:10;
5   y= exp (-3*t);
6   E= integrate ( ' ( exp(-3*t)) ^2 ' , ' t ' ,0 ,2*
       %pi );
7  disp (E, ' Energy o f the s i g n a l i s ' );
8   disp ( 'since the energy is finite , hence it is
       energy signal ');
9   //example1.21<iii>
10 //show whethet x(t)=cost is a power or energy signal
11 clc;
12 t=0:0.01:100;
13 x=cos(t);
14 P=(integrate('cos(t)^2','t',0,2*%pi))/(2*%pi);
15 disp(P,'The power of the signal is:');
16 E=(integrate('cos(t)^2','t',0,2*%pi));
17 disp(E,'The energy is:');
18 disp('As t tends to infinity energy also tends to
       iinfinity but power remains finite.hence it is
       power signal');
19 //Example 1.21<iv>
20 //Find the energy of the signal
21 clc;
22 E=0;//initialize
23 for n=0:200
24     x(n+1)=(1/3)^n;
25 end
26 for n=0:200
27     E=E+x(n+1)^2;
28 end
```

```
29 if E<%inf then
30     disp(E,'The energy of the signal is;');
31 else disp('The given signal is not energy signal');
32 end
```

Scilab code Exa 1.22 Find which of the following signal is causal or non causal

```
1  //Example 1.22<i>
2  //Find whether the given signal is causal or not.
3  clear all;
4  clc;
5  t=-10:10;
6  a=.5;
7  for i=1:length(t)
8      if t(i)<0 then
9          x1(i)=0;
10     else
11         x1(i)=exp(a.*t(i));
12     end
13 end
14 causal=%t;
15 for i=1:length(t)
16     if t(i)<0 & x1(i)~=0 then
17         causal=%f;
18     end
19 end
20 disp(causal,"The statement that the system is causal
       is:");
21 //Example 1.22<ii>
22 //Find whether the given signal is causal or not.
23 clear all;
24 clc;
25 t=-10:10;
26 for i=1:length(t)
```

```scilab
27      if t(i)>0 then
28          x2(i)=0;
29      else
30          x2(i)=exp(-2.*t(i));
31      end
32 end
33 causal=%t;
34 for i=1:length(t)
35      if t(i)<0 & x2(i)~=0 then
36          causal=%f;
37      end
38 end
39 disp(causal,"The statement that the system is causal
       is:");
40 //Example 1.22<iii>
41 //Find whether the given signal is causal or not.
42 clear all;
43 clc;
44 t=-10:10;
45 c=2;
46 for i=1:length(t)
47      x3(i)=sin(c.*t(i));
48      end
49 causal=%t;
50 for i=1:length(t)
51      if t(i)<0 & x3(i)~=0 then
52          causal=%f;
53      end
54 end
55 disp(causal,"The statement that the system is causal
       is:");
56 //Example 1.22<iv>
57 //Find whether the given signal is causal or not.
58 clear all;
59 clc;
60 n=-10:10;
61 for i=1:length(n)
62      if n(i)<-3 | n(i)>2 then
```

```
63            x1(i)=0;
64      else
65            x1(i)=1;
66      end
67      end
68 causal=%t;
69 for i=1:length(n)
70      if n(i)<0 & x1(i)~=0 then
71            causal=%f;
72      end
73 end
74 disp(causal,"The statement that the system is causal
       is:");
75 //Example 1.22<v>
76 //Find whether the given signal is causal or not.
77 clear all;
78 clc;
79 n=-10:10;
80 for i=1:length(n)
81      if  n(i)>-2 then
82            x2(i)=(1/2)^n(i);
83      else
84            x2(i)=0;
85      end
86      end
87 causal=%t;
88 for i=1:length(n)
89      if n(i)<0 & x2(i)~=0 then
90            causal=%f;
91      end
92 end
93 disp(causal,"The statement that the system is causal
       is:");
```

Chapter 2

Systems an introduction

Scilab code Exa 2.2 Find which of the following signal is causal or non causal

```
1  //Example 2.2<i>
2  //Find whether the given signal is causal or not.
3  clear all;
4  clc;
5  n=10; x1(1)=1; x2(1)=1;
6  for i=2: length(n)
7     x1(i)=i;
8      x2(i)=i-1;
9      y(i)=x1(i)+1 ./x2(i);
10       end
11  causal=%t;
12  for i=1: length(n)
13      if n(i)<0 &y(i)~=0 then
14          causal=%f;
15      end
16  end
17  disp(causal,"The statement that the system is causal is:");
18  //Example 2.2<ii>
19  //Find whether the given signal is causal or not.
```

```
20  clear all;
21  clc;
22  n=10;x1(1)=1;x2(1)=-1;
23  for i=2:length(n)
24    x1(i)=i;
25     x2(i)=i-2;
26     y(i)=x1(i).*x1(i)+x2(i);
27        end
28  causal=%t;
29  for i=1:length(n)
30      if n(i)<0 &y(i)~=0 then
31            causal=%f;
32      end
33  end
34  disp(causal,"The statement that the system is causal
        is:");
35  //Example 2.2<vi>
36  //Find whether the given signal is causal or not.
37  clear all;
38  clc;
39  n=-10:10;
40  for i=1:length(n)
41    x(i)=i;
42     y(i)=(i.^2);
43        end
44  causal=%t;
45  for i=1:length(n)
46      if n(i)<0 &y(i)~=0 then
47            causal=%f;
48      end
49  end
50  disp(causal,"The statement that the system is causal
        is:");
```

Scilab code Exa 2.3 Check whether the following systems are linear or not

```scilab
1  //Example 2.3<v>
2  //Check whether the following signal is linear or
       not.
3  clear;
4  close;
5  clc;
6  T=20;//length of the signal
7  A=5;
8  B=4;
9  for n=1:T
10      x(n)=n;
11      y(n)=A*x(n)+B;
12  end
13  x1=x;
14  y1=y;
15  for n=1:T
16      x2(n)=2;y2(n)=A*x2(n)+B;
17  end
18  z=y1+y2;
19  for n=1:T
20      y3(n)=A*(x1(n)+x2(n))+B;
21  end
22  if z==y3 then
23      disp('The following signal is linear');
24  else
25      disp('The following signal is non linear');
26  end
27  //Example 2.3<vi>
28  //Check whether the following signal is linear or
       not.
29  clear;
30  close;
31  clc;
32  T=20;//length of the signal
33  x1(1)=1;
34  x2(1)=2;
35  for n=2:T
36      x1(n)=n;
```

```scilab
37      x2(n)=2*n;
38      y1(n)=(2*(x1(n)))+(1/x1(n-1));
39      y2(n)=(2*(x2(n)))+(1/x2(n-1));
40 end
41 z=y1+y2;
42 for n=2:T
43     y3(n)=(2*(x1(n)+x2(n)))+(1/(x1(n-1)+x2(n-1)));
44 end
45 if z==y3 then
46     disp('The following signal is linear');
47 else
48     disp('The following signal is non linear');
49 end
50 //Example 2.3<vii>
51 //Check whether the following signal is linear or
      not.
52 clear;
53 close;
54 clc;
55 T=20;//length of the signal
56 for n=1:T
57     x(n)=n;
58     y(n)=n*x(n);
59 end
60 x1=x;
61 y1=y;
62 for n=1:T
63     x2(n)=2;y2(n)=n*x2(n);
64 end
65 z=y1+y2;
66 for n=1:T
67     y3(n)=n*(x1(n)+x2(n));
68 end
69 if z==y3 then
70     disp('The following signal is linear');
71 else
72     disp('The following signal is non linear');
73 end
```

Scilab code Exa 2.4 Check whether the following systems are linear or not

```
1  //Example 2.4<i>
2  //Check whether the following signal is linear or
       not.
3  clear;
4  close;
5  clc;
6  T=20;//length of the signal
7  for n=1:T
8      x1(n)=n;x2(n)=2*n;
9      y1(n)=exp(x1(n));
10     y2(n)=exp(x2(n));
11 end
12 z=y1+y2;
13 for n=1:T
14     y3(n)=exp(x1(n)+x2(n));
15 end
16 if z==y3 then
17     disp('The following signal is linear');
18 else
19     disp('The following signal is non linear');
20 end
21 //Example 2.4<ii>
22 //Check whether the following signal is linear or
       not.
23 clear;
24 close;
25 clc;
26 T=20;//length of the signal
27 for n=1:T
28     x1(n)=n;x2(n)=2*n;
29     y1(n)=x1(n)*x1(n);
30     y2(n)=x2(n)*x2(n);
```

```
31  end
32  z=y1+y2;
33  for n=1:T
34      y3(n)=(x1(n)+x2(n))^2;
35  end
36  if z==y3 then
37      disp('The following signal is linear');
38  else
39      disp('The following signal is non linear');
40  end
41  //Example 2.4<iii>
42  //Check whether the following signal is linear or
        not.
43  clear;
44  close;
45  clc;
46  T=20;//length of the signal
47  for n=1:T
48      x1(n)=n;x2(n)=2*n;
49      y1(n)=n^2*(x1(n));
50      y2(n)=n^2*(x2(n));
51  end
52  z=y1+y2;
53  for n=1:T
54      y3(n)=n^2*(x1(n)+x2(n));
55  end
56  if z==y3 then
57      disp('The following signal is linear');
58  else
59      disp('The following signal is non linear');
60  end
```

Scilab code Exa 2.5 Determine whether the following systems are time invariant or not

```
1  //Example 2.5<i>
2  //Determine whether the following system is time
        invariant or not.
3  clc;
4  clear  all;
5  T=20;//length of the signal.
6  s=2;//shift
7  for n=1:T
8       x(n)=n;
9       y(n)=n*x(n);
10 end
11 IP=x(T-s);
12 OP=y(T-s);
13 if IP==OP then
14      disp('The given system is time invariant');
15 else
16      disp('The given system is  time variant');
17 end
18 //Example 2.5<ii>
19 //Determine whether the following system is time
        invariant or not.
20 clc;
21 clear  all;
22 T=-10:10;//length of the signal.
23 s=2;//shift
24 for n=1:length(T)
25      x(n)=2;
26      y(n)=x(n)*cos(50*%pi.*T(n));
27 end
28 IP=x(T(n)-s);
29 OP=y(T(n)-s);
30 if IP==OP then
31      disp('The given system is time invariant');
32 else
33      disp('The given system is  time variant');
34 end
35 //Example 2.5<vi>
36 //Determine whether the following signal is time
```

```scilab
       invariant  or  not .
37  clc ;
38  clear  all ;
39  N=10;
40  s=1// shift ;
41  k=2;
42  for  n=1:N
43      x(n)=n;
44  end
45  for  n=1:(N/k)
46      y(n)=x(k*n);
47  end
48  ip=x(N-s);
49  op=y((N/k)-s);
50  if(ip==op)  then
51      disp('the  following  signal  is  time  invariant ');
52  else
53      disp('The  given  signal  is  time  variant ');
54  //Example  2.5<vii>
55  //Determine  whether  the  following  signal  is  time
       invariant  or  not .
56  clc ;
57  clear  all ;
58  T=20;
59  s=4;// shift
60  x(1)=1
61  for  n=2:T
62      x(n)=n;
63      y(n)=x(n-1).*x(n-1);
64  end
65  inputshift=x(T-s);
66  outputshift=y(T-s);
67  if  (inputshift==outputshift)  then
68      disp('The  given  signal  is  time  invariant ');
69  else
70      disp('The  given  signal  is   time  variant ');
71  end
```

Scilab code Exa 2.7 Check for the following systems

```
1  //Check for the following system.
2  //Example 2.7 <i>
3  clc;
4  clear ;//a>check whether static or dynamic
5  t=-10:.1:10;T=length(t)
6  s=2;
7  for i=1:length(t)
8      x(i)=i;
9      y(i)=abs(x(i));
10 end
11 if y(2)==x(2)& y(2)==x(1) then
12      disp('The given signal is dynamic' );
13 else
14      disp('the given signal is static');
15 end
16 //b>check whether linear or non linear
17 x1=x;
18 y1=y;
19 for i=1:length(t)
20      x2(i)=-2;
21      y2(i)=abs(x2(i));
22 end
23 for i=1:length(t)
24 z(i)=y1(i)+y2(i);
25 end
26 for i=1:length(t)
27      y3(i)=abs(x1(i)+x2(i));
28 end
29 if z==y3 then
30      disp('The given signal is linear');
31 else
32      disp('Not linear');
```

```
33  end
34  //c>check whether time invariant or not
35  IP=x(T-s);
36  OP=y(T-s);
37  if IP == OP then
38  disp('the given signal is time invariant');
39  else
40      disp('The given signal is not time invariant')
            ;
41      end
42  //Check for the following systems
43  //Example 2.7 <ii>
44  clc;
45  clear all;//a>check whether static or dynamic
46  t=0:5;T=length(t);w=1;
47  s=2;
48  for i=1:length(t)
49      x(i)=i;
50      y(i)=x(i)*cos(w*t(i));
51  end
52  if y(2)==x(2)& y(2)==x(1) then
53      disp('The given signal is dynamic' );
54  else
55      disp('the given signal is static');
56  end
57  //b>check whether linear or non linear
58  x1=x;
59  y1=y;
60  for i=1:length(t)
61      x2(i)=2*i;
62      y2(i)=x2(i)*cos(w*t(i));
63      y3(i)=cos(w*t(i))*(x1(i)+x2(i));
64  end
65  z=y1+y2;
66  if z~=y3 then
67      disp('The given signal is not linear');
68  else
69      disp('linear');
```

```
70  end
71  //c>check whether time invariant or not
72  IP=x(T-s);
73  OP=y(T-s);
74  if IP == OP then
75  disp('the given signal is time invariant');
76  else
77        disp('The given signal is not time invariant')
              ;
78      end
```

Chapter 3

Time domain analysis of discrete time systems

Scilab code Exa 6.0 Example 6 0f question and answer section

```
1  //Example 6 0f question and answer section
2  clc;
3  clear; close;
4  n=-5:.01:5;
5  for i=1:length(n)
6      if n(i)<0 then
7          x(i)=0;h1(i)=0;h2(i)=0;
8      else
9          x(i)=1;h1(i)=2;h2(i)=3;
10     end
11     h3(i)=h1(i)+h2(i)//when in parallel
12     h4(i)=h1(i).*h2(i)//when in series
13 end
14 y1=convol(x,h3);
15 y2=convol(x,h4);
16 subplot(4,2,1);
17 plot(n,x,'black');
18 xtitle('x[n]');
19 subplot(4,2,2);
```

```
20  plot(n,h1,'red');
21  xtitle('h1[n]');
22  subplot(4,2,3);
23  plot(n,h2,'red');
24  xtitle('h2[n]');
25  subplot(4,2,4);
26  plot(n,h3,'blue');
27  xtitle('h3[n]');
28  subplot(4,2,5);
29  plot(n,h4,'blue');
30  xtitle('h4[n]');
31  subplot(4,2,6);
32  n1=-10:.01:10;
33  plot(n1,y1,'green');
34  xtitle('y1[n]');
35  subplot(4,2,7);
36  n1=-10:.01:10;
37  plot(n1,y2,'green');
38  xtitle('y2[n]');
```

Scilab code Exa 3.13 Represent the sequence as sum of shifted unit impulse

```
1  //example 3.13
2  //Represent the sequence as sum of shifted unit
       impulse.
3  clear ;
4   close ;
5   clc ;
6   t= -1:1:4; T=3;
7   x=[3 2 -1 2 4 1];
8   for i =1: length (t)
9   if modulo(t(i),3)==0 then
10  h(i)=1;
11  else
```

```
12    h(i)=0;
13    end
14    end
15    y = convol(x,h);
16    //figure
17    f=scf(0);
18    plot2d (t,h)
19    xtitle ( ' Input Re spons e ' , ' t ' , ' h ( t ) '
          );
20      xs2jpg(0, 'problem38-plot-a.jpg');
21   // figure
22   f=scf(1);
23    plot2d (t,x)
24    xtitle ( ' Input Re spons e ' , ' t' , ' x ( t ) '
          );
25      xs2jpg(1, 'problem38-plot-b.jpg');
26    //figure
27    f=scf(2);
28    a= gca ();
29    t1 =-2:1:8;
30    plot2d (t1 ,y)
31    xtitle ( ' Output Re spons e ' , ' t ' , ' y ( t) '
          );
32      xs2jpg(2, 'problem38-plot-c.jpg');
```

Scilab code Exa 3.15 Determine the convolution sum of two sequences

```
1 //Example 3.15
2 //Determine the convolution sum of two sequences.
3 clc;
4 x=[1 4 3 2];
5 h=[1 3 2 1];
6 y=convol(x,h);
7 disp(y,'Convolution sum of the above two sequences
      is:");
```

Scilab code Exa 3.16 Determine the output response

```
1 //Example 3.16
2 //Determine the output response.
3 clc;
4 x=[1 2 3 2];
5 h=[1 2 2];
6 y=convol(x,h);
7 disp(y,'convolution of the above two sequences is:')
    ;
```

Scilab code Exa 3.17 Find the convolution of the sequences

```
1 //Example 3.17
2 //Find the convolution of the sequences.
3 x1=[1 -1 2 3];
4 x2=[1 -2 3 -1];
5 y=convol(x1,x2);
6 disp(y,'The convolution of the above sequences is:')
    ;
```

Scilab code Exa 3.18 Find the convolution

```
1 //Example 3.18
2 //Find the convolution.
3 clc;
4 x1=[1 -2 3 1];
5 x2=[2 -3 -2];
6 y=convol(x1,x2);
```

```
7  disp (y , ' The  convolution  of  the  above  two  sequences
       is : ' ) ;
```

Scilab code Exa 3.19 Find the convolution of the following sequence

```
1  // Example  3.19
2  // Find  the  convolution  of  the  following  sequence .
3  x =[2  -1  1  3];
4  h =[3  4  2];
5  y = convol ( x , h ) ;
6  disp (y , ' the  convolution  of  the  above  sequence  is : ' ) ;
```

Scilab code Exa 3.20 Find the convolution

```
1  // Example  3.20
2  // Find  the  convolution  of  h ( n )=a ^ n * u ( n )  and  x ( n )=b ^ n
       * u ( n )
3  clear ;
4  clc ;
5  close ;
6  n = -10:1/100:10;
7  a =5;
8  b =3;
9  for  i  =1: length ( n )
10      if  n ( i ) <0  then
11          h ( i ) =0;
12          x ( i ) =0;
13      else
14          h ( i ) = a ^ n ( i ) ;
15          x ( i ) = b ^ n ( i ) ;
16      end ;
17      end ;
18      y = convol ( h , x ) ;
```

36

```
19  //     figure
20      f=scf(0);
21      plot(n,h,'black');
22      xtitle('input response1','n','h(n)');
23      xs2jpg(0, 'problem29-plot-a.jpg');
24  //     figure
25      f=scf(1);
26      plot(n,x,'red');
27      xtitle('input response2','n','x(n)');
28      xs2jpg(1, 'problem29-plot-b.jpg');
29      n1=-20:1/100:20;
30  //     figure
31      f=scf(2);
32      plot(n1,y,'green');
33      xtitle('output response','n1','y(n)');
34      xs2jpg(2, 'problem29-plot-c.jpg');
```

Scilab code Exa 3.21 Determine the response of the below relaxed system

```
1  //Example 3.21
2  //Determine the response of the below relaxed system
        .
3  clc;
4  close;
5   n=-10:.01:10;
6   for i=1:length(n)
7       if n(i)<0 then
8           h(i)=0;x(i)=0;
9       else
10          h(i)=(1/3)^n(i);
11          x(i)=2^n(i);
12      end
13  end
14  y=convol(h,x);
15  //figure
```

```
16    f = scf (0) ;
17     plot (n ,h , ' black ') ;
18     xtitle ( ' input response1 ' , 'n ' , 'h(n) ') ;
19     xs2jpg (0 ,  ' problem29 − plot −a . jpg ') ;
20   // figure
21   f = scf (1) ;
22     plot (n ,x , ' red ') ;
23     xtitle ( ' input response2 ' , 'n ' , 'x(n) ') ;
24     xs2jpg (1 ,  ' problem29 − plot −b . jpg ') ;
25   // figure
26   f = scf (2) ;
27     n1 = -20:.01:20;
28     plot (n1 ,y , ' green ') ;
29     xtitle ( ' output response ' , 'n ' , 'y(n) ') ;
30     xs2jpg (2 ,  ' problem29 − plot −c . jpg ') ;
```

Scilab code Exa 3.22 Find the response

```
1  // Example 3.22
2  clear ;
3    close ;
4    clc ;
5    t = -5:1/100:5;
6    for i =1: length (t)
7    if t(i) <0 then
8    h(i)=0;
9    x(i)=0;
10   else
11   h(i)=1;
12   x(i)=1;
13   end
14   end
15   y = convol (x,h) ;
16   // figure
17   f = scf (0) ;
```

```
18    plot2d (t,h)
19    xtitle ( ' Input Re spons e ' , ' t ' , ' h ( t ) '
          ) ;
20    xs2jpg(0, 'problem31-plot-a.jpg');
21    //figure
22    f=scf(1);
23    plot2d (t,x)
24    xtitle ( ' Input Re spons e ' , ' t ' , ' x ( t ) '
          ) ;
25    xs2jpg(0, 'problem31-plot-b.jpg');
26    //figure
27    f=scf(2);
28    a= gca ();
29    t1 = -10:1/100:10;
30    plot2d (t1 ,y)
31    xtitle ( ' Output Re spons e ' , ' t ' , ' y ( t )
          ' ) ;
32    xs2jpg(0, 'problem31-plot-c.jpg');
```

Scilab code Exa 3.23 Find the convolution of the following sequences

```
1    //example 3.23<i>
2    //Find the convolution sum
3    clear ;
4     close ;
5     clc ;
6     t= -5:1/100:5;
7     for i =1: length (t)
8     if t(i) <0 then
9     h(i)=0;
10    x(i)=0;
11    else
12    h(i)=2^t(i);
13    x(i)=1;
14    end
```

39

```
15   end
16   y = convol (x,h) ;
17   //figure
18   f=scf(0);
19   plot2d (t,h)
20   xtitle ( ' Input Re spons e ' , ' t ' , ' h ( t ) '
         );
21   xs2jpg(0, 'problem32-plot-a.jpg');
22   //figure
23   f=scf(1);
24   plot2d (t,x)
25   xtitle ( ' Input Re spons e ' , ' t' , ' x ( t ) '
         );
26   xs2jpg(1, 'problem32-plot-b.jpg');
27   //figure
28   f=scf(2);
29   a= gca ();
30   t1 = -10:1/100:10;
31   plot2d (t1 ,y)
32   xtitle ( ' Output Re spons e ' , ' t ' , ' y ( t) '
         );
33   xs2jpg(2, 'problem32-plot-c.jpg');
34   //example 3.23<ii>
35   //Find the response using convolution sum
36   clear ;
37   clc;
38    close ;
39    t = -5:1/100:5;
40    for i =1: length (t)
41    if t(i) <0 then
42    h(i)=0;
43    x(i)=0;
44    elseif t(i)<3 then
45    h(i)=0;
46    x(i)=1;
47    else h(i)=1;x(i)=1;
48    end
49    end
```

```
50  y = convol (x,h) ;
51  //figure
52  f=scf(0);
53  plot2d (t,h)
54  xtitle ( ' Input Re spons e ' , ' t ' , ' h ( t ) '
        );
55  xs2jpg(0, 'problem33−plot−a.jpg');
56  //figure
57 f=scf(1);
58  plot2d (t,x)
59  xtitle ( ' Input Re spons e ' , ' t ' , ' x ( t ) '
        );
60  xs2jpg(1, 'problem33−plot−b.jpg');
61  //figure
62  f=scf(2);
63  a= gca ();
64  t1 = -10:1/100:10;
65  plot2d (t1 ,y)
66  xtitle ( ' Output Re spons e ' , ' t ' , ' y ( t )
        ' );
67  xs2jpg(2, 'problem33−plot−c.jpg');
68 //example 3.23<iii>
69 //Find the response using convolution sum
70 clear ;
71  close ;
72  clc ;
73  t = -5:1/100:5;
74  for i =1: length (t)
75  if t(i) <0 then
76  h(i)=0;
77  x(i)=0;
78  elseif t(i)<1 then
79  h(i)=0;
80  x(i)=1;
81 elseif t(i)<=4 then h(i)=1;x(i)=1;
82 elseif t(i)<=7 then
83     h(i)=0;
84     x(i)=1;
```

```
85   end
86   end
87   y = convol (x,h) ;
88   // figure
89    f = scf (0);
90   plot2d (t,h)
91   xtitle ( ' Input Re spons e ' , ' t ' , ' h ( t ) '
         );
92   xs2jpg(0, 'problem34-plot-a.jpg');
93   // figure
94   f = scf (1);
95   plot2d (t,x)
96   xtitle ( ' Input Re spons e ' , ' t ' , ' x ( t ) '
         );
97   xs2jpg(1, 'problem34-plot-b.jpg');
98   // figure
99    f = scf (2);
100  t1 = -10:1/100:10;
101  plot2d (t1 ,y)
102  xtitle ( ' Output Re spons e ' , ' t ' , ' y ( t )
         ' );
103  xs2jpg(2, 'problem34-plot-c.jpg');
```

Scilab code Exa 3.25 Find whether the systems are causal and stable

```
1  // Example 3.25<i>
2  // Find whether the system is causal and stable .
3  clear all;
4   clc ;
5   n = -5:5;
6   for i =1: length (n)
7   if(n(i) <=0)
8   h(i)=  2^n(i);
9   else
10  h(i)=0;
```

```scilab
11    end
12    end
13    causal =%t ;
14    for i =1: length (n)
15    if n(i) <0 & h(i) ~=0 then
16    causal =%f ;
17    end
18    end
19    disp (causal ,'The statement that the system is
         causal is :');
20     n =0:100000;
21    for i =1: length (n)
22    if(n(i) <=0)
23    h(i)=  2^n(i);
24    else
25    h(i)=0;
26    end
27    end
28    bibo =sum(h);
29    if (bibo < %inf ) then
30    disp (" system is bibo stable ");
31    else
32    disp (" systes not stable ");
33    end
34    //Example 3.25<ii>
35    //Find whether the system is causal and stable.
36    clear all;
37     clc ;
38     n =  -5:5;
39    for i =1: length (n)
40    if(n(i) >=1)
41    h(i)=  exp(2*n(i));
42    else
43    h(i)=0;
44    end
45    end
46    causal =%t ;
47    for i =1: length (n)
```

```
48   if  n ( i )  <0  &  h ( i )  ~=0  then
49   causal =%f ;
50   end
51   end
52   disp  ( causal , ' The  statement  that  the  system  is
         causal  is : ' ) ;
53    n  =0 : 1 0 0 0 0 0 ;
54   for  i  =1:  length  ( n )
55   if ( n ( i )  >=1)
56   h ( i )=   exp (2* n ( i ) ) ;
57   else
58   h ( i )=0 ;
59   end
60   end
61   bibo  = sum ( h ) ;
62   if  ( bibo  <  %inf  )  then
63   disp  ( ”  system  is  bibo  stable  ” ) ;
64   else
65   disp  ( ”  system  not  stable  ” ) ;
66   end
67   // Example  3.25 < i i i >
68   // Find  whether  the  system  is  causal  and  stable .
69   clear  all ;
70    clc  ;
71    n  =  -5 : 5 ;
72    for  i  =1:  length  ( n )
73    if ( n ( i )  <=3)
74    h ( i )=   (5* n ( i ) ) ;
75    else
76    h ( i )=0 ;
77    end
78    end
79    causal =%t ;
80    for  i  =1:  length  ( n )
81    if  n ( i )  <0  &  h ( i )  ~=0  then
82    causal =%f ;
83    end
84    end
```

```
85   disp ( causal , 'The statement that the system is
         causal is : ');
86    n =0:100000;
87   for i =1: length (n)
88   if ( n ( i ) <=1)
89   h ( i )=  (5* n ( i ) );
90   else
91   h ( i )=0;
92   end
93   end
94   bibo =sum ( h );
95   if ( bibo < %inf ) then
96   disp (" system is bibo stable ");
97   else
98   disp (" system not stable ");
99   end
100  //Example 3.2 <iv>
101  //Find whether the system is causal and stable .
102  clear all ;
103   clc ;
104  n = -5:5;
105   for i =1: length (n)
106   h ( i )=  exp ( -6* abs ( n ( i ) ) );
107   end
108   causal =%t ;
109   for i =1: length (n)
110   if n ( i ) <0 & h ( i ) ~=0 then
111   causal =%f ;
112   end
113   end
114   disp ( causal , 'The statement that the system is
         causal is : ');
115    n =0:100000;
116   for i =1: length (n)
117   h ( i )= exp ( -6* abs ( n ( i ) ) );
118   end
119   bibo =sum ( h );
120   if ( bibo < %inf ) then
```

```
121    disp (" system is bibo stable ");
122    else
123    disp (" system not stable ");
124    end
```

Scilab code Exa 3.26 Find the step response

```
1  //Find the step response.
2  //Example 3.26<i>
3  clear;
4  close;
5  clc;
6  n=-5:.01:5;
7  for i=1:length(n)
8      if n(i)==2 then
9          del1(i)=1;
10         del2(i)=0;
11     elseif n(i)==3 then
12         del1(i)=0;del2(i)=1;
13     else
14         del1(i)=0;del2(i)=0;
15     end
16     x1(i)=del1(i)+del2(i);
17     if n(i)<0 then
18         x2(i)=0;
19     else
20         x2(i)=1;
21     end
22 end
23 y=convol(x1,x2);
24 //figure
25 f=scf(0);
26 plot(n,x1,'black');
27 xtitle('Delta function as input');
28  xs2jpg(0, 'problem39-plot-a.jpg');
```

46

```scilab
29  //figure
30  f=scf(1);
31  plot(n,x2,'red');
32  xtitle('Unit function as input');
33   xs2jpg(1, 'problem39-plot-b.jpg');
34  //figure
35  f=scf(2);
36  n1=-10:.01:10;
37  plot(n1,y,'green');
38  xtitle('Step function as output');
39   xs2jpg(2, 'problem39-plot-c.jpg');
40  //Example 3.26 <ii>
41  //Find the step response.
42  clc;
43  clear;
44  close;
45  n=-5:.01:5;
46  a=6;
47  for i=1:length(n)
48      if n(i)<0 then
49          h(i)=0;x(i)=0;
50      else
51          h(i)=(-a)^n(i);
52          x(i)=1;
53      end
54  end
55  s=convol(h,x);
56  //figure
57  f=scf(0);
58  plot(n,h,'red');
59  xtitle('h(n)');
60   xs2jpg(0, 'problem40-plot-a.jpg');
61  //figure
62  f=scf(1);
63  plot(n,x,'green');
64  xtitle('x(n)');
65   xs2jpg(1, 'problem40-plot-b.jpg');
66  //figure
```

```
67  f=scf(2);
68  n1=-10:.01:10;
69  plot(n1,s,'blue');
70  xtitle('s(n)');
71   xs2jpg(2, 'problem40-plot-c.jpg');
72  //Example 3.26<iii>
73  //Find the step response of the system.
74  clc;
75  clear;
76  close;
77  n=-5:.01:5;
78  for i=1:length(n)
79      if n(i)<0 then
80          h(i)=0;x(i)=0;
81      else
82          h(i)=1;
83          x(i)=1;
84      end
85  end
86  s=convol(h,x);
87  //figure
88  f=scf(0);
89  plot(n,h,'black');
90  xtitle('h[n]');
91  xs2jpg(0, 'problem41-plot-a.jpg');
92  //figure
93  f=scf(1);
94  plot(n,x,'red');
95  xtitle('x[n]');
96  xs2jpg(1, 'problem41-plot-b.jpg');
97  //figure
98  f=scf(2);
99  n1=-10:.01:10;
100  plot(n1,s,'green');
101  xtitle('s[n]');
102  xs2jpg(2, 'problem41-plot-c.jpg');
103  //Example 3.26 <iv>
104  //Find the step response.
```

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```
105 clc;
106 clear;
107 close;
108 n=-5:.01:5;
109 for i=1:length(n)
110     if n(i)<0 then
111         h(i)=0;x(i)=0;
112     else
113         h(i)=((1/2)^n(i))+((-(1/3))^n(i));
114         x(i)=1;
115     end
116 end
117 s=convol(h,x);
118 //figure
119 f=scf(0);
120 plot(n,h,'red');
121 xtitle('h(n)');
122 xs2jpg(0, 'problem42-plot-a.jpg');
123 //figure
124 f=scf(1);
125 plot(n,x,'green');
126 xtitle('x(n)');
127 xs2jpg(1, 'problem42-plot-b.jpg');
128 //figure
129 f=scf(2);
130 n1=-10:.01:10;
131 plot(n1,s,'blue');
132 xtitle('s(n)');
133 xs2jpg(2, 'problem42-plot-c.jpg');
```

Scilab code Exa 3.27 Find the convolution of the following sequences

```
1 //example 3.27<i>
2 //Find the convolution sum
3 clear ;
```

```scilab
4  clc ;
5   close ;
6   t= -10:1/100:10;
7   for i =1: length (t)
8   if t(i) <0 then
9   h(i)=0;
10  x(i)=0;
11  else
12  h(i)=(1/2)^t(i);
13  x(i)=cos(%pi*t(i));
14  end
15  end
16  y = convol (x,h) ;
17  // figure
18    f=scf(0);
19  plot2d (t,h)
20  xtitle ( ' Input Re spons e ' , ' t ' , ' h ( t ) '
        );
21  xs2jpg(0, 'EX3_27_1-plot-a.jpg');
22  // figure
23    f=scf(1);
24  plot2d (t,x)
25  xtitle ( ' Input Re spons e ' , ' t' , ' x ( t ) '
        );
26  xs2jpg(1, 'EX3_27_1-plot-b.jpg');
27  // figure
28    f=scf(2);
29  t1 = -20:1/100:20;
30  plot2d (t1 ,y)
31  xtitle ( ' Output Re spons e ' , ' t ' , ' y ( t) '
        );
32  xs2jpg(2, 'EX3_27_1-plot-c.jpg');
33  //example 3.27< ii >
34  //Find the response using convolution sum
35  clear ;
36   close ;
37   clc ;
38   t = -10:1/100:10;
```

```
39   for i =1: length (t)
40   if t(i) <0 then
41   h(i)=0;
42   x(i)=(1/3)^(-t(i));
43   elseif t(i)==0 then
44   h(i)=0;
45   x(i)=0;
46   else h(i)=1;x(i)=0;
47   end
48   end
49   y = convol (x,h) ;
50   //figure
51   f=scf(0);
52   plot2d (t,h)
53   xtitle ( ' Input Re spons e ' , ' t ' , ' h ( t ) '
         );
54    xs2jpg(0, 'EX3_27_2−plot−a.jpg');
55   //figure
56   f=scf(1);
57   plot2d (t,x)
58   xtitle ( ' Input Re spons e ' , ' t ' , ' x ( t ) '
         );
59    xs2jpg(1, 'EX3_27_2−plot−b.jpg');
60   //figure
61   f=scf(2);
62   a= gca ();
63   t1 = -20:1/100:20;
64   plot2d (t1 ,y)
65   xtitle ( ' Output Re spons e ' , ' t ' , ' y ( t )
         ' );
66    xs2jpg(2, 'EX3_27_2−plot−c.jpg');
67   //example 3.27< iii >
68   //Find the response using convolution sum
69   clear ;
70   close ;
71   clc ;
72   t = -5:1/100:5;
73   for i =1: length (t)
```

```scilab
74    if t(i) <0 then
75    h(i)=0;
76    x(i)=0;
77    elseif t(i)<=10 then
78    x(i)=(1/2)^t(i);
79    h(i)=1;
80  else
81        h(i)=0;
82        x(i)=(1/2)^t(i);
83    end
84    end
85    y = convol (x,h) ;
86    // figure
87    f=scf(0);
88    plot2d (t,h)
89    xtitle ( ' Input Re spons e ' , ' t ' , ' h ( t ) '
          );
90    xs2jpg(0, 'EX3_27_3-plot-a.jpg');
91  // figure
92  f=scf(1);
93    plot2d (t,x)
94    xtitle ( ' Input Re spons e ' , ' t ' , ' x ( t ) '
          );
95    xs2jpg(1, 'EX3_27_3-plot-b.jpg');
96    // figure
97    f=scf(2);
98    a= gca ();
99    t1 = -10:1/100:10;
100   plot2d (t1 ,y)
101   xtitle ( ' Output Re spons e ' , ' t ' , ' y ( t )
          ' );
102   xs2jpg(2, 'EX3_27_3-plot-c.jpg');
```

Scilab code Exa 3.28 Find the convolution

```scilab
1  //Example 3.28
2  //Find the convolution.
3  clc;
4  clear;
5  close;
6  n=-5:.01:5;
7  for i=1:length(n)
8      if n(i)<0 then
9          x1(i)=0;
10     else
11         x1(i)=1;
12     end
13     if n(i)<3 then
14         x2(i)=0;
15     else
16         x2(i)=2;
17     end
18     if n(i)<6 then
19         x3(i)=0;
20     else
21         x3(i)=1;
22     end
23     x(i)=x1(i)-x2(i)+x3(i);
24     if n(i)<-2 | n(i)>9 then
25         h(i)=0;
26     else
27         h(i)=1;
28     end
29  end
30  y=convol(x,h);
31  //figure
32  f=scf(0);
33  plot(n,h,'red');
34  xtitle('h[n]');
35  xs2jpg(0, 'problem43-plot-a.jpg');
36  //figure
37  f=scf(1);
38  plot(n,x,'blue');
```

```
39  xtitle('x[n]');
40  xs2jpg(1, 'problem43-plot-b.jpg');
41  //figure
42  f=scf(2);
43  n1=-10:.01:10;
44  plot(n1,y,'green');
45  xtitle('y[n]');
46  xs2jpg(2, 'problem43-plot-c.jpg');
```

Scilab code Exa 3.31 Find the cross correlation of two finite length sequences

```
1  //Example 3.31
2  //Find the cross correlation of two finite length
       sequences.
3  clc;
4  x=[1 2 1 1];
5  y=[1 2 1 1];
6  z=convol(x,y);
7  disp(z);
```

Scilab code Exa 3.32 Find the input signal

```
1  //Example 3.32
2  //Find the input signal
3  clc;t=1:7;
4  y=[1 5 10 11 8 4 1];
5  h=[1 2 1 0 0 0 0];
6  Y=fft(y,-1);//-1 is taken to obtain the fourier
       transform of y.
7  H=fft(h,-1);
8
9  X=Y./H;
```

```
10  x=fft(X,1);//1 is taken to obtain the inverse
        fourier transform of X.
11  s=round(x);
12  disp(s,'The deconvolution of the above two sequences
        is :');
```

Chapter 4

Time domain analysis of continuous time systems

Scilab code Exa 4.4.2 Find the step response of the following impulse response

```
1 //Example 4.4 <ii>
2 //Find the step response of the following impulse
      response.
3 clc;
4 t=-1:.01:1;
5 for i=1:length(t)
6     if t(i)==0 then
7         del1(i)=1;del2(i)=0;
8     elseif t(i)==1 then
9         del1(i)=0;del2(i)=1;
10    else
11        del1(i)=0;del2(i)=0;
12 end
13 h(i)=del1(i)-del2(i);
14 if t(i)<0 then
15     u(i)=0;
16 else
17     u(i)=1;
```

```
18  end
19  end
20  s=convol(h,u);
21  t1=-10:.05:10;
22  f=scf(0);
23  plot(t1,s,'red');
24  xtitle('s[t]');
25  xs2jpg(0,  'EX4_4_2-plot-a.jpg');
```

Scilab code Exa 4.6 Find the convolution of the following signals

```
1  //Find the covolution Of the following signals.
2  //Example 4.6<i>
3  clc;
4  clear;
5  close;
6  a=.5;
7  b=.6;
8  t=-4:.01:4;
9  for i=1:length(t)
10      if t(i)<0 then
11          x1(i)=0;x2(i)=0;
12      else
13          x1(i)=exp(-a.*t(i));
14          x2(i)=exp(-b.*t(i));
15      end
16  end
17  y=convol(x1,x2);
18  f=scf(0);
19  subplot(3,1,1);
20  plot(x1,t,'red');
21  xtitle('x1[t]');
22  subplot(3,1,2);
23  plot(x2,t,'blue');
24  xtitle('x2[t]');
```

```
25  subplot(3,1,3);
26  t1 =-8:.01:8;
27  plot(t1,y,'green');
28  xtitle('y[n]');
29  xs2jpg(0, 'EX4_6_1-plot-a.jpg');
30  //Find the covolution Of the following signals.
31  //Example 4.6<ii>
32  clc;
33  clear;
34  close;
35  t=-4:.01:4;
36  for i=1:length(t)
37      if t(i)<0 then
38          x1(i)=0;x2(i)=0;
39      else
40          x1(i)=1;
41          x2(i)=1;
42      end
43  end
44  y=convol(x1,x2);
45  f=scf(0);
46  subplot(3,1,1);
47  plot(x1,t,'red');
48  xtitle('x1[t]');
49  subplot(3,1,2);
50  plot(x2,t,'blue');
51  xtitle('x2[t]');
52  subplot(3,1,3);
53  t1 =-8:.01:8;
54  plot(t1,y,'green');
55  xtitle('y[n]');
56  xs2jpg(0, 'EX4_6_2-plot-a.jpg');
57  //Find the covolution Of the following signals.
58  //Example 4.6<iii>
59  clc;
60  clear;
61  close;
62  t=-4:.01:4;
```

```scilab
63  for i=1:length(t)
64      if t(i)<0 then
65          x1(i)=0;x2(i)=0;
66      else
67          x1(i)=t(i);
68          x2(i)=1;
69      end
70  end
71  y=convol(x1,x2);
72  f=scf(0);
73  subplot(3,1,1);
74  plot(x1,t,'red');
75  xtitle('x1[t]');
76  subplot(3,1,2);
77  plot(x2,t,'blue');
78  xtitle('x2[t]');
79  subplot(3,1,3);
80  t1=-8:.01:8;
81  plot(t1,y,'green');
82  xtitle('y[n]');
83  xs2jpg(0, 'EX4_6_3-plot-a.jpg');
84  //Find the covolution Of the following signals.
85  //Example 4.6<iv>
86  clc;
87  clear;
88  close;
89  t=-4:.01:4;
90  for i=1:length(t)
91      if t(i)<0 then
92          x1(i)=0;x2(i)=0;
93      else
94          x1(i)=sin(t(i));
95          x2(i)=1;
96      end
97  end
98  y=convol(x1,x2);
99  f=scf(0);
100 subplot(3,1,1);
```

```
101  plot(x1,t,'red');
102  xtitle('x1[t]');
103  subplot(3,1,2);
104  plot(x2,t,'blue');
105  xtitle('x2[t]');
106  subplot(3,1,3);
107  t1=-8:.01:8;
108  plot(t1,y,'green');
109  xtitle('y[n]');
110  xs2jpg(0,  'EX4_6_4-plot-a.jpg');
```

Scilab code Exa 4.7 Find the convolution of the following signals

```
 1  //Find the covolution Of the following signals.
 2  //Example 4.7<i>
 3  clc;
 4  clear;
 5  close;
 6  t=-4:.01:4;
 7  //Define signal h(t)=u(t+2)
 8  for i=1:length(t)
 9      if t(i)<-2 then
10          h(i)=0;
11      else
12          h(i)=1;
13      end
14      //Define signal x(t)=exp^(-2*t)*u(t)
15      if t(i)<0 then
16      x(i)=0;
17  else
18      x(i)=exp(-2.*t(i));
19  end
20  end
21  y=convol(h,x);//convolution is done
22  f=scf(0);
```

```scilab
23  subplot(3,1,1);
24  plot(h,t,'red');
25  xtitle('h[t]');
26  subplot(3,1,2);
27  plot(x,t,'blue');
28  xtitle('x[t]');
29  subplot(3,1,3);
30  t1=-8:.01:8;
31  plot(t1,y,'green');
32  xtitle('y[n]');
33  xs2jpg(0, 'problem52-plot.jpg');
34  //Find the covolution Of the following signals.
35  //Example 4.7<iii>
36  clc;
37  clear;
38  close;
39  t=-4:.01:4;
40  //Define signal h(t)=u(t-2)
41  for i=1:length(t)
42      if t(i)<-1 then
43          h(i)=0;
44      else
45          h(i)=1;
46      end
47      //Define signal x(t)=u(t+1)
48      if t(i)<2 then
49      x(i)=0;
50  else
51      x(i)=1;
52  end
53  end
54  y=convol(h,x);//The convolution is done here.
55  subplot(3,1,1);
56  plot(h,t,'red');
57  xtitle('input response 2','t','h[t]');
58  subplot(3,1,2);
59  plot(x,t,'blue');
60  xtitle('input response 2','t','x[t]');
```

```
61  subplot (3 ,1 ,3) ;
62  t1 = -8:.01:8;
63  plot (t1 ,y , 'green ') ;
64  xtitle ('output response ', 't ', 'y[t1] ') ;
65  //Find the covolution Of the following signals.
66  //Example 4.7<ii >
67  clc ;
68  clear ;
69  close ;
70  t = -4:.01:4;
71  for i=1: length (t)
72          x (i)=exp (-abs (t(i))) ;
73           if t(i)<-1   then
74         h(i)=0;
75          else
76           h(i)=exp (-2.*(t(i)+1))  ;
77          end
78      end
79  y=convol (h , x) ;//Here convolution of the above two
      signals is done
80  subplot (3 ,1 ,1) ;
81  plot (h ,t , 'red ') ;
82  xtitle ('input response 2 ', 't ', 'h[t] ') ;
83  subplot (3 ,1 ,2) ;
84  plot (x ,t , 'blue ') ;
85  xtitle ('input response 2 ', 't ', 'x[t] ') ;
86  subplot (3 ,1 ,3) ;
87  t1 = -8:.01:8;
88  plot (t1 ,y , 'green ') ;
89  xtitle ('output response ', 't ', 'y[t1] ') ;
```

Scilab code Exa 4.8 Find the covolution Of the following signals

```
1  //Find the covolution Of the following signals.
2  //Example 4.8
```

```scilab
3  clc ;
4  clear ;
5  close ;
6  t = -4:.01:4;
7  for i =1: length ( t )
8      if t ( i ) >=0 & t ( i ) <=2 then
9          x ( i ) =1;
10     else
11         x ( i ) =0;
12     end
13     if t ( i ) >=0 & t ( i ) <=3 then
14     h ( i ) =1;
15 else
16     h ( i ) =0;
17 end
18 end
19 y = convol ( h , x ) ;// Convolution of the above two signals
       is done .
20 subplot (3 ,1 ,1) ;
21 plot ( t , h , ' red ') ;
22 xtitle ( ' input response 2 ' , ' t ' , ' h [ t ] ') ;
23 subplot (3 ,1 ,2) ;
24 plot ( t , x , ' blue ') ;
25 xtitle ( ' input response 2 ' , ' t ' , ' x [ t ] ') ;
26 subplot (3 ,1 ,3) ;
27 t1 = -8:.01:8;
28 plot ( t1 , y , ' green ') ;
29 xtitle ( ' output response ' , ' t ' , ' y [ t1 ] ') ;
```

Scilab code Exa 4.9 Find the covolution Of the following signals

```scilab
1 // Find the covolution Of the following signals .
2 // Example 4.9
3 clc ;
4 clear ;
```

```
5  close;
6  t=-10:.01:10;
7  //input signal:x(t)=u(t-3)-u(t-5)
8  for i=1:length(t)
9      if t(i)<3 | t(i)>5 then
10         x(i)=0;
11     else
12         x(i)=1;
13     end
14     //h(t)=exp(-3*t)*u(t)
15     if t(i)>=0 then
16     h(i)=exp(-3.*t(i));
17 else
18     h(i)=0;
19 end
20 end
21 y=convol(h,x);//cconvolution of the above two
      signals
22 subplot(3,1,1);
23 plot(t,h,'red');
24 xtitle('input response 2','t','h[t]');
25 subplot(3,1,2);
26 plot(t,x,'blue');
27 xtitle('input response 2','t','x[t]');
28 subplot(3,1,3);
29 t1=-20:.01:20;
30 plot(t1,y,'green');
31 xtitle('output response','t','y[t1]');
```

Scilab code Exa 4.10 Find the covolution Of the following signal

```
1  //Find the covolution Of the following signals.
2  //Example 4.10
3  clc;
4  clear;
```

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```
 5  close ;
 6  t = -20:.01:20;
 7  for  i =1: length (t)
 8       if  t(i) <0  |  t(i) >2  then
 9            x ( i ) =0;
10       else
11            x ( i ) =1;
12       end
13       if  t(i) >=10  then
14       h ( i ) =1;
15  else
16       h ( i ) =0;
17  end
18  end
19  y = convol (h , x );
20  subplot (3 ,1 ,1);
21  plot (t ,h , ' red ');
22  xtitle ( ' input  response  2 ' , ' t ' , ' h [ t ] ' );
23  subplot (3 ,1 ,2);
24  plot (t ,x , ' blue ');
25  xtitle ( ' input  response  2 ' , ' t ' , ' x [ t ] ' );
26  subplot (3 ,1 ,3);
27  t1 = -40:.01:40;
28  plot (t1 ,y , ' green ');
29  xtitle ( ' output  response ' , ' t ' , ' y [ t1 ] ' );
```

Scilab code Exa 4.11 Find the covolution Of the following signals

```
1  // Find  the  covolution  Of  the  following  signals .
2  // Example  4.11
3  clc ;
4  clear ;
5  close ;
6  t = -5:.01:5;
7  for  i =1: length (t)
```

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```
 8       if t(i)<0 | t(i)>2 then
 9           x(i)=0;
10       else
11           x(i)=1;
12       end
13       if t(i)<-1 | t(i)>2 then
14       h(i)=0;
15 else
16       h(i)=2;
17 end
18 end
19 y=convol(h,x);
20 subplot(3,1,1);
21 plot(t,h,'red');
22 xtitle('input response 2','t','h[t]');
23 subplot(3,1,2);
24 plot(t,x,'blue');
25 xtitle('input response 2','t','x[t]');
26 subplot(3,1,3);
27 t1=-10:.01:10;
28 plot(t1,y,'green');
29 xtitle('output response','t','y[t1]');
```

Scilab code Exa 4.12 Find the convolution of the following signals

```
 1 //Find the covolution Of the following signals.
 2 //Example 4.12 <i>
 3 clc;
 4 clear;
 5 close;
 6 t=-5:.01:5;
 7 for i=1:length(t)
 8       if t(i)>=0 & t(i)<=2 then
 9       x(i)=sin(%pi*t(i));
10 else
```

```scilab
11        x(i)=0;
12        end
13 if t(i)<1 | t(i)>3 then
14      h(i)=0;
15 else
16      h(i)=1;
17 end
18 end
19 y=convol(h,x);//convolution of the above two signals
        is done here.
20 subplot(3,1,1);
21 plot(t,h,'red');
22 xtitle('input response 2','t','h[t]');
23 subplot(3,1,2);
24 plot(t,x,'blue');
25 xtitle('input response 2','t','x[t]');
26 subplot(3,1,3);
27 t1=-10:.01:10;
28 plot(t1,y,'green');
29 xtitle('output response','t','y[t1]');
30 //Find the covolution Of the following signals.
31 //Example 4.12 <ii>
32 clc;
33 clear;
34 close;
35 t=-5:.01:5;
36 for i=1:length(t)
37      if t(i)<0   then
38          x(i)=0;
39      elseif  t(i)<1 then
40          x(i)=1+t(i);
41      elseif t(i)<2 then
42      x(i)=1-t(i);
43 else
44      x(i)=0;
45 end
46 if t(i)<0 | t(i)>2 then
47      h(i)=0;
```

```
48  else
49      h(i)=1;
50  end
51  end
52  y=convol(h,x);
53  subplot(3,1,1);
54  plot(t,h,'red');
55  xtitle('input response 2','t','h[t]');
56  subplot(3,1,2);
57  plot(t,x,'blue');
58  xtitle('input response 2','t','x[t]');
59  subplot(3,1,3);
60  t1=-10:.01:10;
61  plot(t1,y,'green');
62  xtitle('output response','t','y[t1]');
```

Chapter 7

Laplace Transform Analysis of Signals and Systems

Scilab code Exa 7.1.1 Find the laplace transform and Roc of the following signal

```
1  //Example  7.1.1
2  //Find  the  laplace  transform  and  Roc  of  the
       following  signal
3  clc ;
4  close ;
5  syms  t ;
6  a =5;
7   x=exp(-a*t);
8  b =6; c =7;
9  s=b+c*%i;
10 X=integrate((exp(-(a+s)*t)),'t',0,%inf);
11 disp(X);
12 disp(real(s));
13 disp('Since  real(s)>-a,so  the  integral  converges');
```

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Chapter 7

Laplace Transform Analysis of Signals and Systems

Scilab code Exa 7.1.1 Find the laplace transform and Roc of the following signal

```
1  //Example  7.1.1
2  //Find  the  laplace  transform  and  Roc  of  the
       following  signal
3  clc ;
4  close ;
5  syms  t ;
6  a =5;
7   x=exp(-a*t);
8  b =6; c =7;
9  s=b+c*%i;
10 X=integrate((exp(-(a+s)*t)),'t',0,%inf);
11 disp(X);
12 disp(real(s));
13 disp('Since  real(s)>-a,so  the  integral  converges');
```

Scilab code Exa 7.1.2 Find the laplace transform and Roc of the following signal

```
1  //Example 7_1_2
2  //Find the laplace transform and Roc of the
      following signal.
3  clc;
4  t=-10:.01:10;
5  a=4;
6  for i=1:length(t)
7       if t(i)>0 then
8            x(i)=0;
9       else
10           x(i)=-exp(-a*t(i));
11      end
12 end
13 s=%s;
14 numfs=1;
15 denfs=s+.04;
16 fs=syslin('c',numfs/denfs);
17 fs1=csim('impulse',t,fs);
18 f=scf(0);
19 subplot(2,1,1);
20 plot2d(t,x,2);
21 xtitle('Phrasing');
22 xgrid;
23 subplot(2,1,2);
24 plot2d(t,fs1,1);
25 xtitle('Solution');
26 xgrid;
27 disp(fs);
28 disp('As  real(s)<-a,so the integral converges for
      real(s)<-a');
29 xs2jpg(0, 'EX7_1_2-plot-a.jpg');
```

Scilab code Exa 7.2 Find the laplace transform and Roc of the following signal

```
1 //Example 7.2
2 //Find the laplace transform and Roc of the
     following signal
3 clc;
4 close;
5 syms t;
6  x=exp(-3*t)+exp(-2*t);
7 b=6;c=7;
8 s=b+c*%i;
9 X=integrate((exp(-(3+s)*t))+(exp(-(2+s)*t)),'t',0,
     %inf);
10 disp(X);
11 disp(real(s));
12 disp('Since real(s)>-2,so the integral converges');
```

Scilab code Exa 7.3 Find the laplace transform and Roc of the following signal

```
1 //Example 7.3
2 //Find the laplace transform and Roc of the
     following signal
3 clc;
4 close;
5 syms t;
6 a=3;b1=-8;
7  x1=exp(-a*t);
8 b=6;c=7;
9 s=b+c*%i;
10 X1=integrate((exp(-(a+s)*t)),'t',0,%inf);
11 x2=exp(-2*t);
12 X2=integrate((exp(-(b1+s)*t)),'t',-%inf,0);
13 disp(X1);
```

```
14  disp(X2);
15  X=X1+X2;disp(X);
16  disp(real(s));
17  disp('Since -a< real(s)>-b1,so the integral
        converges');
```

Scilab code Exa 7.4 Find the laplace transform

```
1  //Example 7.4
2  //Find the laplace transform
3  clc;
4  close;
5  syms t;
6  b=4;
7    a=2;c=1;
8  s=a+c*%i;
9  X1=integrate((exp(-(b+s)*t)),'t',0,%inf);
10  X2=integrate((exp(-(s-b)*t)),'t',-%inf,0);
11  disp(X1);
12   disp(X2);
13  X=X1+X2;disp(X)
14  disp(real(s));
15  disp('Since -b< real(s)<b,so the integral  converges'
        );
```

Scilab code Exa 7.5 Find the laplace transform of the following signal

```
1  //Example 7.5.2
2  //Find the laplace transform of the following signal
        .
3  clc;
4  close;
5  t=-10:.01:10;
```

```
6  for i =1: length (t)
7      if t(i) >=0 then
8          x(i) =1;
9      else
10         x(i) =0;
11     end
12 end
13 s =%s;
14 numfs =1;
15 denfs =s;
16 fs = syslin ('c',numfs/denfs);
17 fs1 = csim ('impulse ',t,fs);
18 disp (fs);
19 f= scf (0);
20 subplot (2 ,1 ,1);
21 plot2d (t,x ,2);
22 xtitle ('Phrasing ');
23 xgrid;
24 subplot (2 ,1 ,2);
25 plot2d (t,fs1 ,1);
26 xtitle ('solution ');
27 xgrid;
28 xs2jpg (0, 'EX7_5−plot −a.jpg ');
```

Scilab code Exa 7.6 Find the laplace transform

```
1  //Example 7.6
2  //Find the laplace transform
3  clc;
4  t = -5:.05:5;
5  w =2* %pi;
6  x= cos (w*t);
7  s =%s;
8  numfs =s;
9  denfs =s^2+w^2;
```

```
10 fs=syslin('c',numfs/denfs);
11 disp(fs);
12 fs1=csim('impulse',t,fs);
13 f=scf(0);
14 subplot(2,1,1);
15 plot2d(t,x,2);
16 xtitle('Phrasing');
17 xgrid;
18 subplot(2,1,2);
19 plot2d(t,fs1,1);
20 xtitle('Solution');
21 xgrid;
22 xs2jpg(0, 'EX7_6-plot-a.jpg');
```

Scilab code Exa 7.7 Find the laplace transform of the following signal

```
1 //Example 7.7.1
2 //Find the laplace transform of the following.
3 clc;
4 close;
5 syms t,;
6  x=1;
7  a=2;c=1;
8  s=a+c*%i;
9 X=integrate((exp(-s*t)),'t',2,%inf);
10  disp(X);
11 //Example 7.7.2
12 //Find the laplace transform .
13 clc;
14 t=-10:.01:10;
15 for i=1:length(t)
16     if t(i)>=0 then
17         x(i)=(t(i)^2)*exp(-2*t(i));
18     else
19         x(i)=0;
```

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```
20      end
21  end
22  s =%s;
23  numfs =2;
24  denfs =( s+2) ^3;
25  fs = syslin ( 'c ', numfs / denfs );
26  fs1 = csim ( 'impulse ', t , fs );
27  disp ( fs );
28  f = scf (0);
29  subplot (2 ,1 ,1);
30  plot2d ( t , x ,2);
31  xtitle ( 'Phrasing ');
32  xgrid ;
33  subplot (2 ,1 ,2);
34  plot2d ( t , fs1 ,1);
35  xtitle ( 'Solution ');
36  xgrid ;
37  xs2jpg (0 ,  'EX7_7_2 - plot -a . jpg ');
```

Scilab code Exa 7.8 Find the laplace transform

```
1  // Example7 .8
2  // Find  the  laplace  transform  .
3  clc ;
4  s =%s; t = -10:10;
5  numfs =2* s ;
6  denfs = s ^2 -8;
7  fs = syslin ( 'c ', numfs / denfs );
8  fs1 = csim ( 'impulse ', t , fs );
9  f = scf (0);
10  plot2d ( t , fs1 ,1);
11  xtitle ( 'Solution ');
12  xgrid ;
13  xs2jpg (0 ,  'problem110 - plot -a . jpg ')
14  disp ( fs , 'fs= ');
```

Scilab code Exa 7.11 find the laplace transform

```
1  //Example  7.11
2  //Find  the  laplace  transform  .
3  clc;
4  t = -10:.01:10;
5  for  i =1: length (t)
6      if  t(i) >=0  then
7          x(i) = exp ( -2.* t(i)) * sin (2* t(i));
8      else
9          x(i) =0;
10     end
11 end
12 s =% s;
13 numfs =2;
14 denfs =(s +2) ^2+4;
15 fs = syslin ('c ', numfs / denfs );
16 fs1 = csim ('impulse ',t ,fs );
17 disp (fs );
18 f = scf (0);
19 subplot (2 ,1 ,1);
20 plot2d (t ,x ,2);
21 xtitle ('Phrasing ');
22 xgrid ;
23 subplot (2 ,1 ,2);
24 plot2d (t ,fs1 ,1);
25 xtitle ('Solution ');
26 xgrid ;
27 xs2jpg (0,  'problem109 −plot −a. jpg ');
```

Scilab code Exa 7.16 Find the laplace transform of the following signals

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```scilab
1  //Example7.16.1
2  //Find the laplace transform .
3  clc;
4  s=%s;t=-5:5;
5  numfs=s^2+4*s+3;
6  denfs=(s^2+4*s+5)^2;
7  fs=syslin('c',numfs/denfs);
8  fs1=csim('impulse',t,fs);
9  plot2d(t,fs1,1);
10 xtitle('Solution');
11 xgrid;
12 disp(fs);
13 //Example7.16.2
14 //Find the laplace transform .
15 clc;
16 s=%s;t=-5:5;
17 numfs=s+3;
18 denfs=(s^2+6*s+10);
19 fs=syslin('c',numfs/denfs);
20 fs1=csim('impulse',t,fs);
21 f=scf(0);
22 plot2d(t,fs1,1);
23 xtitle('Solution');
24 xgrid;
25 xs2jpg(0, 'EX7_16_2-plot-a.jpg');
26 disp(fs);
27 //Example7.16.3
28 //Find the laplace transform .
29 clc;
30 s=%s;t=-5:5;
31 numfs=(s+2)^2;
32 denfs=(s^2+4*s+5)^2;
33 fs=syslin('c',numfs/denfs);
34 fs1=csim('impulse',t,fs);
35 plot2d(t,fs1,1);
36 xtitle('Solution');
37 xgrid;
38 disp(fs);
```

Scilab code Exa 7.22 Find the laplace transform

```
1  //Example 7.22
2  //Find the laplace transform .
3  clc;
4  t=-10:.01:10;
5  for i=1:length(t)
6      y(i)=exp(-t(i))-2*exp(-2*t(i))+exp(-3*t(i));
7      x(i)=exp(-0.5*t(i));
8  end
9  s=%s;
10 numfs1=1;
11 denfs1=s+0.5;
12 fs=syslin('c',numfs1/denfs1);
13 numfs2=2;
14 denfs2=(s+1)*(s+2)*(s+3);
15 fs1=syslin('c',numfs2/denfs2);
16 hs=fs1/fs;
17 hs1=csim('impulse',t,hs);
18 subplot(3,1,1);
19 plot2d(t,x,2);
20 xtitle('Phrasing');
21 xgrid;
22 subplot(3,1,2);
23 plot2d(t,y,3);
24 xtitle('Phrasing');
25 xgrid;
26 subplot(3,1,3);
27 plot2d(t,hs1,1);
28 xtitle('Solution');
29 xgrid;
30 disp(fs,'fs=:');
31 disp(fs1,'fs1=:');
32 disp(hs,'hs=:');
```

Chapter 8

Fourier analysis of discrete time signals

Scilab code Exa 8.14 Find the convolution of the signals given below using fourier transform

```
1
2  //Example 8.14
3  //Find the convolution of the signals given below
        using fourier transform
4  clc;
5  clear all;
6  n=-10:10;
7  for i=1:length(n)
8      if n(i)>=0 then
9          x1(i)=(1/2)^n(i);
10         x2(i)=(1/3)^n(i);
11     else
12         x1(i)=0;
13         x2(i)=0;
14     end
15 end
16 subplot(3,2,1)
17 plot(x1,n);
```

```
18  xtitle('(a) x1(n)');
19  subplot(3,2,2)
20  plot(x2,n);
21  xtitle('(b) x2(n)');
22  X1=fft(x1,-1);
23  X2=fft(x2,-1);
24  subplot(3,2,3)
25  plot(X1,n);
26  xtitle('(c) X1(n)');
27  subplot(3,2,4)
28  plot(X2,n);
29  xtitle('(d) X2(n)');
30  X3=X2.*X1;
31  subplot(3,2,5)
32  plot(X3,n);
33  xtitle('(e) X3(n)');
34  x3=fft(X3,1);
35  disp(x3,'The result of convolution is:');
36  subplot(3,2,6)
37  plot(x3,n);
38  xtitle('(f) x3(n)');
```

Scilab code Exa 8.19 Use fourier transform to determine the response of the following signal

```
1
2  //Example 8.19.1
3  //Use fourier transform to determine the response of
        the following signal
4  clc;
5  clear all;
6  n=-10:10
7  for i=1:length(n)
8      if n(i)>=1 then
9          x(i)=(3/4)^n(i);
```

```
10              h(i)=(1/2)^n(i);
11       else
12              x(i)=0;
13              h(i)=0;
14       end
15  end
16  subplot(3,2,1)
17  plot(x,n);
18  xtitle('(a)x(n)');
19  subplot(3,2,2)
20  plot(h,n);
21  xtitle('(b)h(n)');
22  X=fft(x,-1);
23  H=fft(h,-1);
24  subplot(3,2,3)
25  plot(X,n);
26  xtitle('(c)X(n)');
27  subplot(3,2,4)
28  plot(H,n);
29  xtitle('(d)H(n)');
30  Y=H.*X;
31  subplot(3,2,5)
32  plot(Y,n);
33  xtitle('(e)Y(n)');
34  y=fft(Y,1);
35  disp(y,'The output response is:');
36  subplot(3,2,6)
37  plot(y,n);
38  xtitle('(f)y(n)');
39
40
41  clf()
42
43  //Example 8.19.2
44  //Use fourier transform to determine the response of
         the following signal
45  clc;
46  clear;
```

```
47  n = -10:10
48  for i =1: length (n)
49       if n(i) >=1 then
50            x(i) =(-1)^n(i);
51            h(i) =(1/2)^n(i);
52       else
53            x(i) =0;
54            h(i) =0;
55       end
56  end
57  subplot (3,2,1)
58  plot (x,n);
59  xtitle ('x(n)');
60  subplot (3,2,2)
61  plot (h,n);
62  xtitle ('h(n)');
63  X= fft (x,-1);
64  H= fft (h,-1);
65  subplot (3,2,3)
66  plot (X,n);
67  xtitle ('X(n)');
68  subplot (3,2,4)
69  plot (H,n);
70  xtitle ('H(n)');
71  Y=H.*X;
72  subplot (3,2,5)
73  plot (Y,n);
74  xtitle ('Y(n)');
75  y= fft (Y,1);
76  disp (y,'The output response is:');
77  subplot (3,2,6)
78  plot (y,n);
79  xtitle ('y(n)');
```

Scilab code Exa 8.25 Find IDFT of the following signals

```
1  //Example 8.25.1
2  //Find idft of the following
3  clc;
4  X=[1 1-%i*2 -1 1+%i*2];
5  x=fft(X,1);
6  disp(x);
7  //Example 8.25.2
8  //Find idft of the following
9  clc;
10 X=[1 0 1 0];
11 x=fft(X,1);
12 disp(x);
```

Scilab code Exa 8.26 Find the circular convolution of two sequences

```
1
2  //Example 8.26
3  //Find the circular convolution of two sequences
4  clc;
5  clear all;
6  x1=[1 2 3 4];
7  x2=[1 -1 2 1];
8  X1=fft(x1,-1);
9  X2=fft(x2,-1);
10 X3=X1.*X2;
11 x3=fft(X3,1);
12 disp(x3,'The circular convolution is:');
```

Scilab code Exa 8.27 Find the circular convolution of the following sequences

```
1
2  //Example 8.27
```

```
3 //Find the circular convolution of the following
     sequences
4 clc;
5 clear all;
6 x1=[1 -1 2 3];
7 x2=[0 1 2 3];
8 X1=fft(x1,-1);//To obtain fourier transform of x1,
     -1 is taken.
9 X2=fft(x2,-1);
10 X3=X1.*X2;
11 x3=fft(X3,1);//+1 to obtain inverse fourier
     transform.
12 disp(x3,'Circular convolution of the above two
     sequences is:');
```

Scilab code Exa 8.28 Find the linear and circular convolution

```
1
2 //Example 8.28
3 //Find the linear and circular convolution
4 clc;
5 clear all;
6 x1=[1 2 3 4];
7 x2=[2 3 4 1];
8 //Linear convolution
9 z=convol(x1,x2);
10 disp(z,'The linear convolution is:');
11 //To obtain circular convolution
12 X1=fft(x1,-1);
13 X2=fft(x2,-1);
14 X3=X1.*X2;
15 x3=fft(X3,1);
16 disp(x3,'The circular convolution is:');
```

Scilab code Exa 8.29 Find DFT of the following sequences

```
1  //Find dft of the following sequence
2  //Example 8.29.1
3  clc;
4  n=-10:10;
5  for i=1:length(n)
6      if n(i)==0 then
7          x(i)=1;
8      else
9          x(i)=0;
10     end
11 end
12 y=fft(x,-1);
13 disp(y,'The dft of the sequence is:');
14 //Find dft of the following sequence
15 //Example 8.29.2
16 clc;
17 n=-10:10;n0=2;
18 for i=1:length(n)
19     if n(i)==n0 then
20         x(i)=1;
21     else
22         x(i)=0;
23     end
24 end
25 y=fft(x,-1);
26 disp(y,'The dft of the sequence is:');
27 //Find dft of the following sequence
28 //Example 8.29.3
29 clc;
30 n=-10:10;a=2;
31 for i=1:length(n)
32     x(i)=a^n(i);
```

```
33  end
34  y=fft(x,-1);
35  disp(y,'The dft of the sequence is:');
```

Chapter 12

Random processes

Scilab code Exa 12.1 Show whether independent or not

```
1 //Example 12.1
2 //Show whether independent or not
3 disp('Two events are independent if P(A and B)=P(A)P
     (B)')
4 disp(0.28,'P(A and B)=')
5 disp(0.8*0.35,'P(A)*P(B)=')
6 disp('Hence A and B are independent')
```

Scilab code Exa 12.2 Find the probability of the problem

```
1 //Example 12.2
2 //Find the probability of the problem.
3 disp('The sample space in this case is:-');
4 disp('(1,1) (1,2) (1,3) (1,4) (1,5) (1,6)');
5 disp('(2,1) (2,2) (3,3) (4,4) (5,5) (6,6)');
6 disp('(3,1) (2,2) (3,3) (4,4) (5,5) (6,6)');
7 disp('(4,1) (2,2) (3,3) (4,4) (5,5) (6,6)');
8 disp('(5,1) (2,2) (3,3) (4,4) (5,5) (6,6)');
```

```matlab
 9  disp('(6,1) (2,2) (3,3) (4,4) (5,5) (6,6)');
10  disp('Implies that N=36');
11  disp('Let A be the event of sum 7' );
12  disp('A={1,6} (2,5) (3,4) (4,3) (5,2) (6,1)} i.e n(A
        )=6' );
13  p_a=6/36;
14  disp(p_a,'Hence the probability of getting a sum 7
        is p(A)=6/36=' );
15  disp('Let B be the event of sum 11' );
16  disp('A={5,6} (6,5) } i.e n(B)=2' );
17  p_b=2/36;
18  disp(p_b,'Hence the probability of getting a sum 2
        is P(B)=2/36=' );
19  disp('Let C be the event of sum 7 or 11' );
20  disp('Probabilty of getting a sum of 7 or 11 ,P(C)=P
        (A)+P(B)' );
21  p_c=p_a+p_b;
22  disp(p_c,'Hence the probability of getting a sum 7
        or 11 is P(C)=' );
23  disp('Let D be the event of sum 3' );
24  disp('A={1,2} (2,1)} i.e n(A)=2' );
25  p_d=2/36;
26  disp(p_d,'Hence the probability of getting a sum 3
        is P(D)=2/36=' );
27  disp('Let E be the event of sum 2 or 12' );
28  disp('Probabilty of getting a sum of 2 or 12 ,P(E)=P
        (sum of 2)+P(sum of 12)' );
29  disp('P(sum of 2)=1/36  P(sum of 12)=1/36')
30  p_e=2/36;
31  disp(p_e,'Hence the probability of getting a sum of
        2 or 12 is P(E)=' );
32  disp('Let F be the event of sum 2 or 3 0r 12' );
33  disp('Probabilty of getting a sum of 2 or 3 or 12 ,P
        (F)=P(D)+P(E)' );
34  p_f=p_d+p_e;
35  disp(p_f,'Hence the probability of getting a sum 2
        or 3 or 12 is P(F)=' );
```

Scilab code Exa 12.3 Find the probability that tails shows up at least once

```
1 //Example12.3
2 //Find the probability that tails shows up at least
      once.
3 disp('Let A be the event that tail shows atleast
      once');
4 disp('Eac toss has two possible outcmes H ,T');
5 disp(2^3,'Hence the total no of outcomes is 2^3=');
6 disp(1-(1/2^3),'P(A)=1-Probability of getting all
      head i.e 1/8=');
```

Scilab code Exa 12.4 Probability to find the required sample size

```
1 //Example 12.4
2 //Probability to find the required sample size.
3 disp('Let A be the event of choosing a sample size
      of 6 containing two red, one green , two blue and
       one white blue ball.');
4 funcprot(0)
5 function c = combination ( n , r )
6 c = prod ( n : -1 : n-r+1 )/ prod (1:r)
7 endfunction
8 disp('The number of combination of choosing 6 balls
      from 14 balls is 14 C 6 ways')
9 disp('The number of combination of choosing 2 red
      balls from 4 balls is 4 C 2 ways')
10 disp('The number of combination of choosing 1 from 3
       green balls is 3 C 1 ways')
11 disp('The number of combination of choosing 2 from 5
       green balls is 5 C 2 ways')
```

```
12  disp('The number of combination of choosing 1 from 2
         white balls is 2 C 1 ways')
13  disp('P(A)={(4 C 2)*(3 C 1)*(5 C 2)*(2 C 1)}/(14 C
       6)=')
14  p=(combination(4,2)*combination(3,1)*combination
       (5,2)*combination(2,1))/combination(14,6);
15  disp(p);
```

Scilab code Exa 12.5 Probability to find the first white ball on the 3rd draw

```
1  //Example 12.5
2  //Probability to find the first white ball on the 3
      rd draw.
3  disp('Let A be the event of drawing the first white
         ball at the third draw from 15 balls ')
4  disp('Let W be the event of drawing a 10 white balls
        ')
5  disp('Let B be the event of drawing a 5 black balls '
      )
6  disp('Hence we have 1st draw :B  2nd Draw :B  3rd
       Draw :W');
7  funcprot(0)
8  function c = combination ( n , r )
9  c = prod ( n : -1 : n-r+1 )/ prod (1:r)
10 endfunction
11 disp('P(A)={(5 C 1)*(5 C 1)*(10 C 1)}/{(15 C 1)*(15
      C 1)*(15 C 1)}=')
12 p=(combination(5,1)*combination(5,1)*combination
      (10,1))/(combination(15,1)*combination(15,1)*
      combination(15,1))
13 disp(p)
```

Scilab code Exa 12.6 To find the required probabilities

```
1 //Example 12.6
2 //To find the required probabilities.
3 disp(100/500, 'P(1 kilo-ohms)=100/500=');
4 disp(140/500, 'P(20%)=140/500=');
5 disp((125/500)/(260/500), 'P(10%/10 kilo-ohms)={P(10%
     )&P(10 kilo-ohms)}/{P(10 kilo-ohms)}=(125/500)
     /(260/500)');
```

Scilab code Exa 12.7 find the required probabilities

```
1 //Example 12.7
2 //find the required probabilities.
3 disp(((1/2)*(1/2))+((2/3)*(1/2)), 'P(PMOS is chosen)
     =(P{PMOS/4}/P{4})+(P{PMOS/3}/P{3})=((1/2)*(1/2))
     +((2/3)*(1/2))=');
4 disp('Using Bayes Rule:')
5 disp('P{4/NMOS}=P(NMOS/4)*P(4)/P(NMOS)=')
6 disp('(1/2)*(1/2)/(1-(7/12))=')
7 disp((1/2)*(1/2)/(1-(7/12)))
```

Scilab code Exa 12.8 Find the given probabillities

```
1 //Example 12.8
2 //Find the given probabillities.
3 disp('P{R1/So}=0.15 and P{Ro/S}=0.75');
4 disp((1-0.15), 'P{Ro/So}1-P{R1/So}');
5 disp((1-0.075), 'P{R1/S1}1-P{Ro/S1}');
6 disp('P{R1}=P{R1/So}P(So)+P{R1/S1}P{S1}=');
7 disp(((0.15)*(0.85)+(0.925)*(1-0.85)), '(0.15)(0.85)
     +(0.925)(1-0.85)=');
8 disp('Using Bayes Rule:')
```

```
9  disp('P{S1/R1}=(P{R1/S1}P{S0})/P{R0}=');
10 p=(0.925*0.15/0.266)
11 disp(p,'(0.925)(1-0.85)/0.266=');
12 disp('P{Ro/So}P{So}/P{Ro}');
13 disp('P{Ro/So}P{So}/(P{Ro/So}P{So}+P{Ro/S1}P{S1}=');
14 p=(0.85)*(0.85)/((0.85)*(0.85)+(0.075)*(0.15))
15 disp(p,'(0.85)(0.85)/((0.85)(0.85)+(0.075)(0.15))=')
      ;
```

Scilab code Exa 12.9 Find the required probabilities

```
1  //Example  12.9
2  //Find the  required  probabilities.
3  disp('Let H be the  event that  Husband  is  alive')
4  disp('Let W be the  event that  wife is  alive')
5  disp('P(H)=0.85    P(W)=0.9')
6  disp(0.85*0.9,'P(both alive)=P(H)P(W)=')
7  disp(0.15*0.1,'P(neither alive)=(1-P(H))(1-P(W))=')
8  disp(0.85+0.9-0.765,'P(Atleast one is  alive)=P(H)+P(
      W)-P(both are  alive)=')
9  disp('P(only one is  alive)=P(Husband is  alive and
      wife is  dead)OR P(Husband is  dead and  wife is
      alive)')
10 disp('P(H)(1-P(W))+(1-P(H))P(W)=')
11 disp((0.85)*(1-0.9)+(1-0.85)*(0.9),'(0.85)(1-0.9)
      +(1-0.85)(0.9)=')
```

Scilab code Exa 12.10 find the required probabilities

```
1  //Example  12.10
2  //find the  required  probabilities.
3  disp('P(Plant  shut down)=P(S1&S2&S3 is  offline)or P(
      S1&S2 is  offline)or  P(S1&S3 are  offline)=')
```

```
4  p=(0.01)*(0.03)*(0.05)+(0.01)*(0.03)*(1-0.05)+(0.01)
       *(1-0.03)*(0.05)
5  disp('(0.01)*(0.03)*(0.05)+(0.01)*(0.03)*(1-0.05)
       +(0.01)*(1-0.03)*(0.05)=')
6  disp(p)
7  disp(1-p,'P(Plant on line)=1-P(Plant shut down)=')
8  disp('P(plant is online/S1 failed)=')
9  disp((0.01)*(1-0.03)*(1-0.05)/0.01,'P(plant is
       online and S1 failed)/P(S1 failed)=(0.01)
       *(1-0.03)*(1-0.05)/0.01')
```

Scilab code Exa 12.11 Find the required probabilities

```
1  //Exampple 12.11
2  //Find the required probabilities.
3  disp(0.45,'Let SS be the event that Ramesh pass in
       Signal and systems, P(SS)=')
4  disp(0.32,'Let RP be the event that Ramesh pass in
       Random process P(RP)=')
5  disp(0.15,'P(passed in both)=')
6  disp('P(passed in either one subject)=P(SS U RP)')
7  disp(0.45+0.32-0.15,'P(SS)+P(RP)-P(passed in both)
       =0.45+0.32-0.15=')
8  disp(1-0.62,'P(passed in neither of the subjects)=1*
       P(passed in either subjects)=1-0.62=')
9  disp('P( passed in one subject)=');
10 disp(0.45*0.68+0.55*0.32,'P(SS)*P(failed in RP)+P(
       failed in SS)*P(RP)=(0.45)*(1-0.32)+(1-0.45)
       *(0.32)=')
11 disp(1-0.45,'P(failed in SS)=1-P(SS)=1-0.45')
```

Scilab code Exa 12.12 Find the required probabilities

```
1  //Example 12.12
2  //Find the required probabilities.
3  disp('P(A occurs exactly k times in N trials)=(n C K
       )[P(A)]^k[1-P(A)]^(N-k)')
4  disp('P(A)=1/6  P(~A)=5/6')
5  funcprot(0)
6  function c = combination ( n , r )
7  c = prod ( n : -1 : n-r+1 )/ prod (1:r)
8  endfunction
9  disp('P( 3 shows up exactly twice in 6 trials)=(6 c
       2)*(1/6)^2*(5/6)^4=')
10 p=combination(6,2)*(1/6)^2*(5/6)^4;
11 disp(p);
12 disp('P(4 shows up atleast twice)=1-P(4 does not
       shows up)-P(4 shows up once)')
13 disp('P(4 does not show up)=(6 c 0)*(1/6)^0*(5/6)^6=
       ')
14 p=combination(6,0)*(1/6)^0*(5/6)^6;
15 disp(p);
16 disp('P(4 shows up once)=(6 c 1)*(1/6)^1*(5/6)^5=')
17 p=combination(6,1)*(1/6)^1*(5/6)^5;
18 disp(p);
19 disp('P(4 shows up atleast twice)=1-(5/6)^6-(5/6)^5=
       ')
20 p=1-(5/6)^6-(5/6)^5;
21 disp(p);
```

Scilab code Exa 12.13 Find the required probabilities

```
1  //Example 12.13
2  //Find the required probabilities.
3  disp('P(X>0.6)=1-F(0.6)=')
4  disp(%e^(-1.2),'1-(1-e^(-1.2))=e^(-1.2)=')
5  disp(1-%e^(-0.5),'P(X<=0.25)=(1-e^(2*(-1.2)))=1-e
       ^(-0.5)=')
```

```
6  disp ( 'P(0.4 <X<=0.8)=F(0.8)−F(0.4)=')
7  disp ((1-%e^(-1.6))-(1-%e^(-0.8)), '(1−e^(−1.6))−(1−e
       ^(−0.8))=')
```

Scilab code Exa 12.14 Find the mean value of the current under following conditions

```
1  //Example  12.14
2  //Find  the  mean  value  of  the  current  under  following
        conditions.
3  disp ( 'I=Io [ e^(nV)−1] ')
4  disp ( 'E[ I]=E[ Io [ e^(nV) −1]]: ')
5  Xo =0;  X1 =2;
6  X = integrate ( '%e^(10*X)−1', 'X', Xo , X1 );
7  disp (10^(-9)*X/2, 'Hence  E[ I]= ')
```

Scilab code Exa 12.16 Find the following

```
1   //Example  12.16
2   //Find  the  following.
3   Xo =0; X1 =1
4   X = integrate ( '2*X*((1−X)^2)', 'X', Xo , X1 )
5   disp (X, 'E[X]= ')
6   Xo =0; X1 =1
7   X2 = integrate ( '2*X^2*((1−X)^2)', 'X', Xo , X1 )
8   disp (X2, 'E[X^2]= ')
9   disp (6*X+3*(X2), 'E[6X+3X^2]=6E[X]+3E[X^2]= ')
10  disp (2*X+3, 'E[2*X+3]=2E[X]+3= ')
11  x1 =2*X+3
12  disp (4*X2+9+12*X, 'E[(2*X+3)^2]=E[4*X^2+9+12*X]= ')
13  x2 =4*X2+9+12*X
14  disp (x2-x1^2, 'Variance  of  (2*X+3)=E[(2*x+3)^2]−{E[2*
        X+3]}^2= ')
```

Scilab code Exa 12.17 Probablity that R lies between 110 and 120 ohm

```
1  //Example 12.17
2  //Probablity that R lies between 110 and 120 ohm
3  clc;
4  X0=110;
5  X1=120;
6  X=integrate('1/(130-100)','X',X0,X1);
7  disp(X,'The probability that R lies between 110 and
        120 is :');
```

Scilab code Exa 12.18 Find the mean and variance if they exist

```
1  //Example 12.18
2  //Find the mean and variance,if they exist.
3  Xo=0;X1=1
4  X=integrate('X*(X^3/12)','X',Xo,X1)
5  disp(X,'E[X]=')
6  Xo=0;X1=1
7  X2=integrate('X^2*(X^3/12)','X',Xo,X1)
8  disp(X2,'E[X^2]=')
9  disp(X2-X^2,'Variance =E[X^2]-E[X]^2=')
10 x=1:1:5;
11 y=sum(x^2)/15;
12 disp(y,'E[X]=sum(x*f(x))=sum(x^2)/15')
13 y1=sum(x^3)/15;
14 disp(y1,'E[X]=sum(x^2*f(x))=sum(x^3)/15')
15 disp(y1-y^2,'Variance =E[X^2]-E[X]^2=')
```

Scilab code Exa 12.19 Find the required values

```
1  //Example 12.19
2  //Find the required values.
3  x=[0,0;8,8;8,0]
4  y=[0,0;3,3;0,3]
5  deff('z=f(x,y)','z=x/6')
6  I=int2d(x,y,f)
7  disp(I,'E[X]=')
8  deff('z=f(x,y)','z=y/6')
9  I=int2d(x,y,f)
10 disp(I,'E[Y]=')
11 deff('z=f(x,y)','z=x*y/6')
12 I=int2d(x,y,f)
13 disp(I,'E[XY]=')
```

Scilab code Exa 12.20 Find the correlation

```
1  Xo=0;X1=1
2  X=integrate('X*(X+0.5)','X',Xo,X1)
3  disp(X,'E[X]=')
4  Yo=0;Y1=1
5  Y=integrate('Y*(Y+0.5)','Y',Yo,Y1)
6  disp(Y,'E[Y]=')
7  x=[0,0;1,1;1,0]
8  y=[0,0;1,1;0,1]
9  deff('z=f(x,y)','z=x*y*(x+y)')
10 I=int2d(x,y,f)
11 disp(I,'E[XY]=')
12 disp(I-X*Y,'cov(X,Y)=E[XY]-E[X]E[Y]=');
13 cov=I-X*Y
14 Xo=0;X1=1
15 X2=integrate('X^2*(X+0.5)','X',Xo,X1)
16 disp(X2,'E[X^2]=')
17 Yo=0;Y1=1
```

```
18  Y2 = integrate ( 'Y ^ 2*( Y +0.5) ' , 'Y ' , Yo , Y1 )
19  disp ( Y2 , 'E[ Y^2]= ')
20  disp ( X2 - X ^2 , 'Variance of X=E[X^2]−E[X] ^2)= ')
21  v1 = X2 - X ^2
22  disp ( Y2 - Y ^2 , 'Variance of Y=E[Y^2]−E[Y] ^2)= ')
23  v2 = Y2 - Y ^2
24  disp ( cov / sqrt ( v1 * v2 ) , 'Correlation coefficient of X
        and Y=cov (X,Y)/( s.d of X∗s.d of Y)= ')
```

Scilab code Exa 12.52 Find the average power

```
1  //Example 12.52
2  //Find the average power .
3  Xo = -(4* % pi ) ; X1 =4* % pi
4  X = integrate ( '(1−(X/(4∗%pi)))' , 'X ' , Xo , X1 )
5  disp ( X /(4* % pi ) , 'Average Power= ')
```