Scilab Manual for
Signals and Systems
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Contents

List of Experiments

List of Figures

Experiment: 1

Generation of unit step and unit ramp signals in Scilab

Scilab code Solution 1.1 Exp1

```
1  //Experiment-1
2  // windows - 10 - 64-Bit
3  //Scilab - 5.4.1
4
5
6  //AIM: Generation of Unit step and Unit ramp signals
       in SCILAB.
7
8
9  //Unit Step Signal
10
11 clear; clc;
12 t=-6:0.01:6;
13 u=ones(t).*(t>=0);
14 subplot(2,1,1);                //plotting multiple
       graph in one window
15 plot(t,u);
16 xgrid(4,1,7);                  // xgrid([color] [,
       thickness] [, style])
```

```scilab
17  xlabel("t","fontsize",4);                    // Label of
        X-Axis
18  ylabel("u(t)","fontsize",4);                 // Label of
        Y-Axis
19  title("Unit step","fontsize",4);             // Title of
        graph
20
21  set(gca(),"data_bounds",matrix([-6,6,-0.1,1.1],2,-1)
        );   // Range of axis
22
23  //Ramp Signal
24  r=t.*(t>=0);
25  subplot(2,1,2);
26  plot(t,r);
27  xgrid(4,1,7);
28  xlabel("t","fontsize",4);
29  ylabel("r(t)","fontsize",4);
30  title("Ramp","fontsize",4);
31  set(gca(),"data_bounds",matrix([-6,6,-0.1,7],2,-1));
            // Range of axis
```
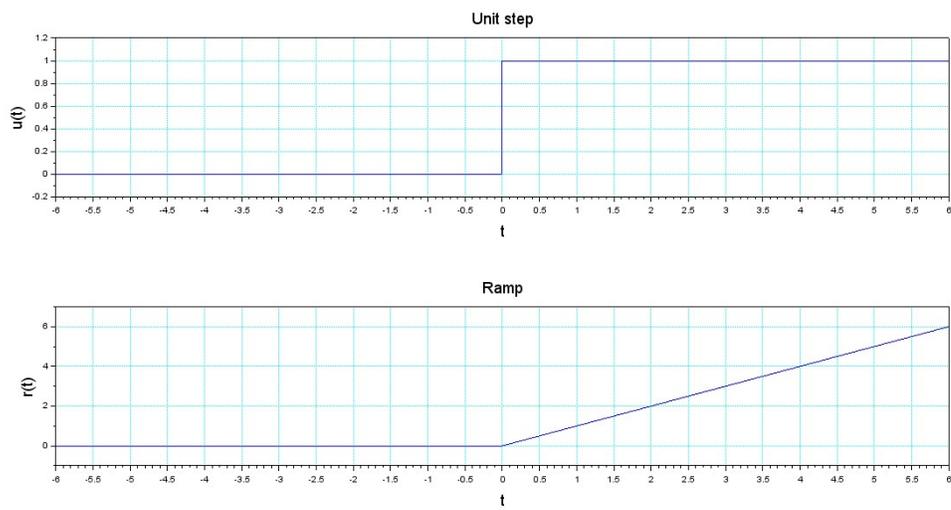
Figure 1.1: Exp1

Experiment: 2

Generation of the sinusoidal wave in discrete time mode through Scilab code

Scilab code Solution 2.2 Exp2

```
1  //Experiment-2
2  // windows - 10 - 64-Bit
3  //Scilab - 5.4.1
4
5
6  //AIM: Generation of the Sinusoidal wave in Discrete
        time mode through SCILAB code
7
8
9  //Generation of a sinusoidal sequence
10 clear; clc;
11 n=0:40; //Length of sequence
12 f=0.05; // Frequency
13 phase=0;
14 A=1.5;//Amplitude
15 x1=A*sin(2*%pi*f*n-phase);
16 subplot(3,1,1);
```

```
17  plot2d3('gnn',n,x1);                                    //
        plot2d3('gnn',n,x1) in discrete form
18  a = gca();                                              //
        get the current axes
19  a.x_location = "origin";                                //
        To Change reference axis
20  a.y_location = "origin";
21  title("sinusoidal sequence","fontsize",4)
22  xlabel("Time in (ms)","fontsize",4)
23  ylabel("Amplitude","fontsize",4)
24  set(gca(),"data_bounds",matrix([0,40,-2,2],2,-1));
        // Range of Axis
25
26  x2=A*cos(2*%pi*f*n-phase);
27  subplot(3,1,2);
28  plot2d3('gnn',n,x2);
29  a = gca();                                              //
        get the current axes
30  a.x_location = "origin";                                //
        To Change reference axis
31  a.y_location = "origin";
32  title("cosine sequence","fontsize",4)
33  xlabel("Time in (ms)","fontsize",4)
34  ylabel("Amplitude","fontsize",4)
35  set(gca(),"data_bounds",matrix([0,40,-2,2],2,-1));
36
37  x3=A*cos(2*%pi*f*n+120);
38  subplot(3,1,3);
39  plot2d3('gnn',n,x3);
40  a = gca();                                              //
        get the current axes
41  a.x_location = "origin";                                //
        To Change reference axis
42  a.y_location = "origin";
43  title("phase shifted cosine sequence","fontsize",4)
44  xlabel("Time in (ms)","fontsize",4)
45  ylabel("Amplitude","fontsize",4)
46  set(gca(),"data_bounds",matrix([0,40,-2,2],2,-1));
```
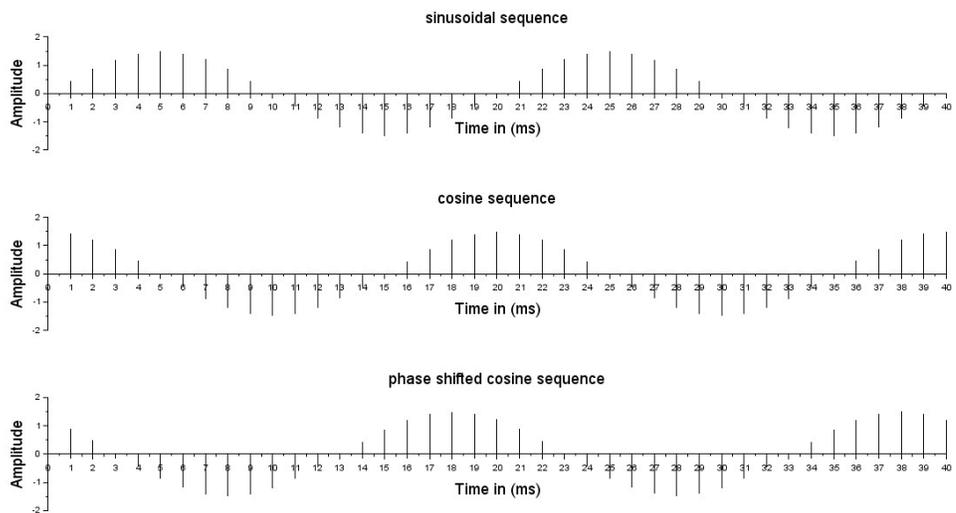
Figure 2.1: Exp2

Experiment: 3

Plotting of exponential sequence and complex exponential sequence

Scilab code Solution 3.3 Exp3

```
1  //Experiment-3
2  // windows - 10 - 64-Bit
3  //Scilab - 5.4.1
4
5
6  //Plotting of exponential sequence and complex
       exponential sequence
7
8  // Generation of exponential sequence
9  clear; clc;
10 n=0:20;
11 a1=2;
12 k=0.5;
13 x1=k*a1.^n;
14 f4=scf(1);
15 figure(1)
16 subplot(2,2,1)
```

```
17  plot2d3('gnn',n,x1);              // graph in discrete
        form
18  xlabel("Time in (sec.)","fontsize",4);
19  ylabel("Amplitude","fontsize",4);
20  a2=0.9;
21  x2=k*a2.^n;
22  subplot(2,2,2)
23  plot2d3('gnn',n,x2);
24  xlabel("Time in (sec.)","fontsize",4);
25  ylabel("Amplitude","fontsize",4);
26  a3=-2;
27  x3=k*a3.^n;
28  subplot(2,2,3)
29  plot2d3('gnn',n,x3);
30  a = gca();                                        //
        get the current axes
31  a.x_location = "origin";                          //
        To Change reference axis
32  a.y_location = "origin";
33  xlabel("Time in (sec.)","fontsize",4);
34  ylabel("Amplitude","fontsize",4);
35  a4=-0.9;
36  x4=k*a4.^n;
37  subplot(2,2,4)
38  plot2d3('gnn',n,x4);
39  a = gca();                                        //
        get the current axes
40  a.x_location = "origin";                          //
        To Change reference axis
41  a.y_location = "origin";
42  xlabel("Time in (sec.)","fontsize",4);
43  ylabel("Amplitude","fontsize",4);
44
45
46
47
48  //Generatioin of a complex exponential sequence
49
```

```scilab
50  clear; clc;
51  n=0:20;
52  w=%pi/6;
53  x=exp(%i*w*n);
54  f4=scf(2);
55  figure(2)
56  subplot(2,1,1);
57  plot2d3('gnn',n,real(x));
58  a = gca();                                    //
        get the current axes
59  a.x_location = "origin";                      //
        To Change reference axis
60  a.y_location = "origin";
61  xlabel("Time in (sec.)","fontsize",4)
62  ylabel("Amplitude","fontsize",4)
63  title("Real Part","fontsize",4);
64  subplot(2,1,2);
65  plot2d3('gnn',n,imag(x));
66  a = gca();                                    //
        get the current axes
67  a.x_location = "origin";                      //
        To Change reference axis
68  a.y_location = "origin";
69  xlabel("Time in (sec.)","fontsize",4)
70  ylabel("Amplitude","fontsize",4)
71  title("Imaginary Part","fontsize",4)
72
73
74  // Generation of comlex exponential sequence
75
76  clear; clc;
77  a=input("Type in real exponent = ");
78  b=input("Type in imaginary exponent = ");
79  c= a+b*%i;                                    //a+j*b
        for imaginary value
80  K=input("Type in the gain constant = ");
81  N=input("Type in length of sequence = ");
82  n=1:N;
```

```scilab
83  x=K*exp(c*n); //generate the sequence
84  f4=scf(3);
85  figure(3)
86  subplot(2,1,1);
87  plot2d3('gnn',n,real(x));                            //
        real(x) = gives real component
88  a = gca();                                           //
        get the current axes
89  a.x_location = "origin";                             //
        To Change reference axis
90  a.y_location = "origin";
91  xlabel("Time in (sec.)","fontsize",4)
92  ylabel("Amplitude","fontsize",4)
93  title("Real Part","fontsize",4);
94  subplot(2,1,2)
95  plot2d3('gnn',n,imag(x));                            //
        imag(x) = gives imaginary component
96  a = gca();                                           //
        get the current axes
97  a.x_location = "origin";                             //
        To Change reference axis
98  a.y_location = "origin";
99  xlabel("Time in (sec.)","fontsize",4)
100 ylabel("Amplitude","fontsize",4)
101 title("Imaginary Part","fontsize",4)
102
103 //For Example
104
105 // Type in real exponent = -0.0833
106 // Type in imaginary exponent = 0.5236
107 // Type in the gain constant = 1.5
108 // Type in length of sequence = 40
```
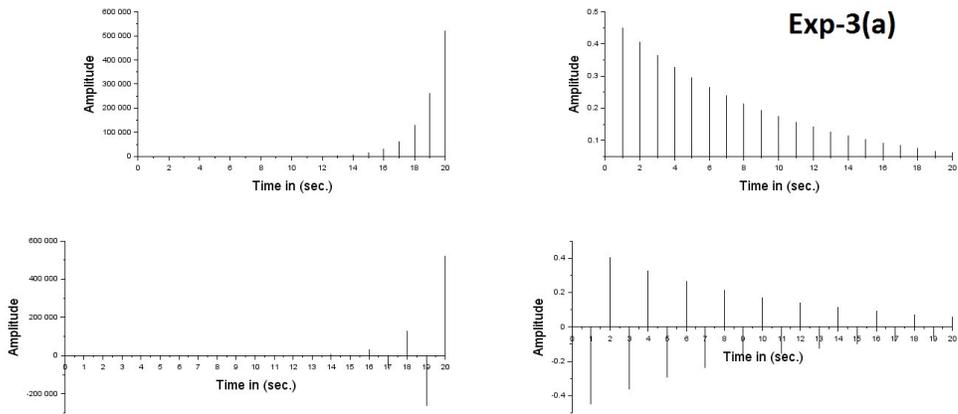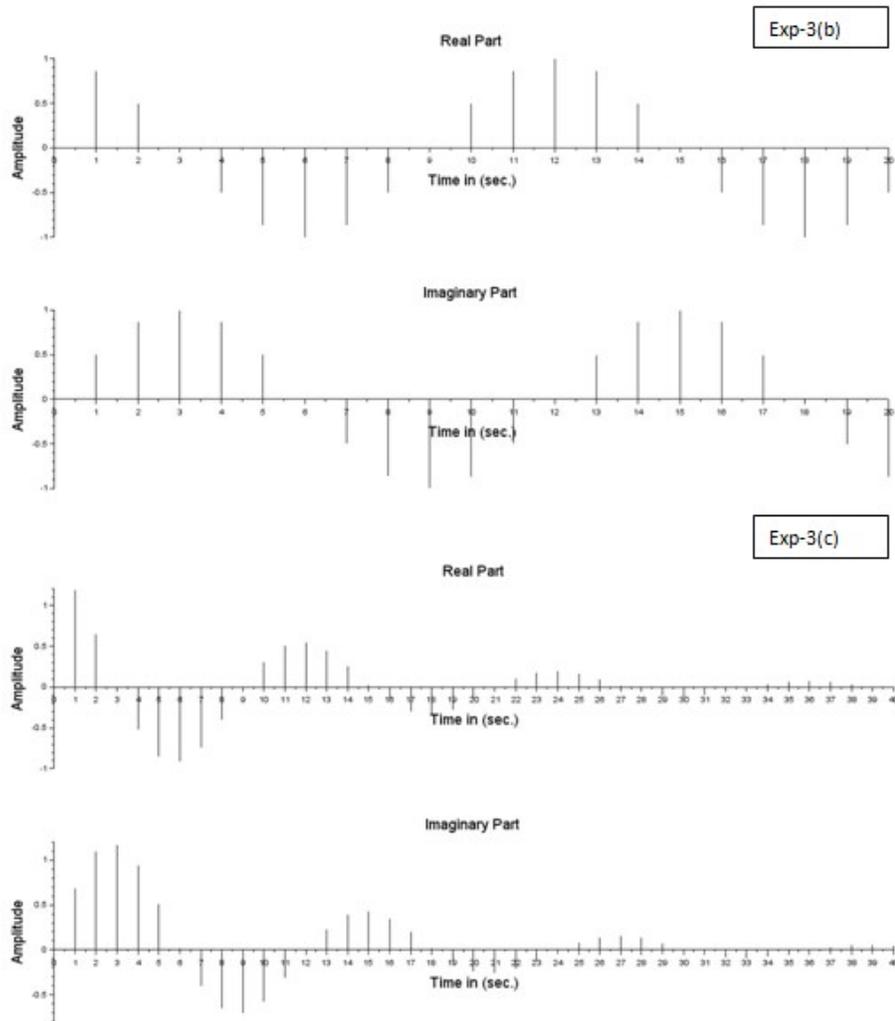
Figure 3.1: Exp3

Figure 3.2: Exp3

16

Experiment: 4

Performing cross correlation operation using SCILAB code

Scilab code Solution 4.4 Exp4

```
1  // Experiment-4
2  //  windows - 10 - 64-Bit
3  // Scilab - 5.4.1
4
5
6  // AIM : Performing Cross Correlation Operation
       using SCILAB code
7
8  clear; clc;
9
10  n1 =[-1,0,1]
11  x1 =[1,2,3]
12  f4=scf(1);
13  figure(1)
14  subplot(2,2,1)
15  plot2d3('gnn',n1,x1);
16  a = gca();                              //
        get the current axes
17  a.x_location = "origin";                //
```

```scilab
        To Change reference axis
18  a.y_location = "origin";
19  xlabel("Reference Axis","fontsize",3);
20  ylabel("Amplitude","fontsize",3);
21  title("Sequence-1","fontsize",3);
22  n2=[-1,0,1]
23  x2=[4,5,6]
24  subplot(2,2,2)
25  plot2d3('gnn',n2,x2);
26  a = gca();                                    //
        get the current axes
27  a.x_location = "origin";                      //
        To Change reference axis
28  a.y_location = "origin";
29  xlabel("Reference Axis","fontsize",3);
30  ylabel("Amplitude","fontsize",3);
31  title("Sequence-2","fontsize",3);
32  [c, ind]=xcorr(x1,x2)              // function of cross
        correlation
33  [ind',c']
34  subplot(2,2,3)
35  plot2d3('gnn',c)
36  a = gca();                                    //
        get the current axes
37  a.x_location = "origin";                      //
        To Change reference axis
38  a.y_location = "origin";
39  xlabel("Reference Axis","fontsize",3);
40  ylabel("Amplitude","fontsize",3);
41  title("Cross- Correlation Sequence","fontsize",3);
42
43
44  clear; clc;
45
46  x=input ("Type in the refrence sequence = ");
47  y=input ("Type in the second sequence = ");
48
49  //compute the correlation sequence
```

```
50
51  n1=length(y)-1;
52  n2=length(x)-1;
53  r=conv(x,y);
54  k=(-n1):n2;
55  f4=scf(2);
56  figure(2)
57  plot2d3('gnn',k,r);
58  a = gca();                                        //
        get the current axes
59  a.x_location = "origin";                          //
        To Change reference axis
60  a.y_location = "origin";
61  xlabel("Lag index","fontsize",4);
62  ylabel("Amplitude","fontsize",4);
63
64
65
66  //For Example
67
68  //Type in the refrence sequence =
        [2,-1,3,7,1,2,-3,0]
69  //Type in the second sequence = [1,-1,2,-2,4,1,-2,5]
```
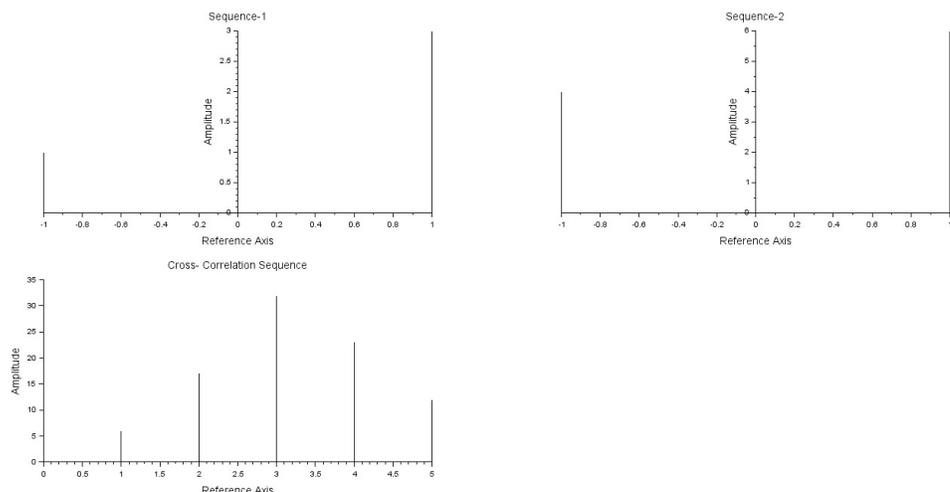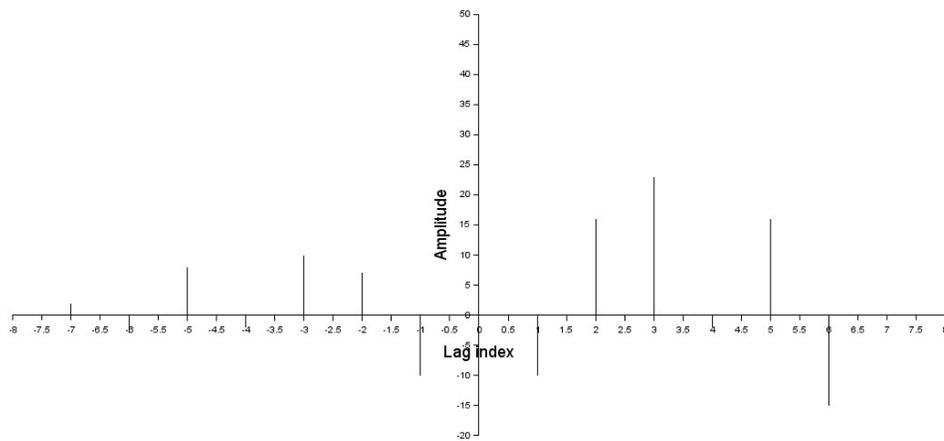
Figure 4.1: Exp4

Figure 4.2: Exp4

Experiment: 5

Performing auto correlation operation using Scilab code

Scilab code Solution 5.3 Exp5

```
1  //Experiment-5
2  // windows - 10 - 64-Bit
3  //Scilab - 5.4.1
4
5  //5
6
7  //AIM: Performing Auto Correlation Operation using
       SCILAB code
8
9  clear; clc;
10 x=[2,-1,3,7,1,2,-3,0]
11 [c,ind]=xcorr(x)
12 [ind' c']
13 plot2d3("gnn",c)
14 a = gca();                                    //
       get the current axes
15 a.x_location = "origin";                      //
       To Change reference axis
16 a.y_location = "origin";
```
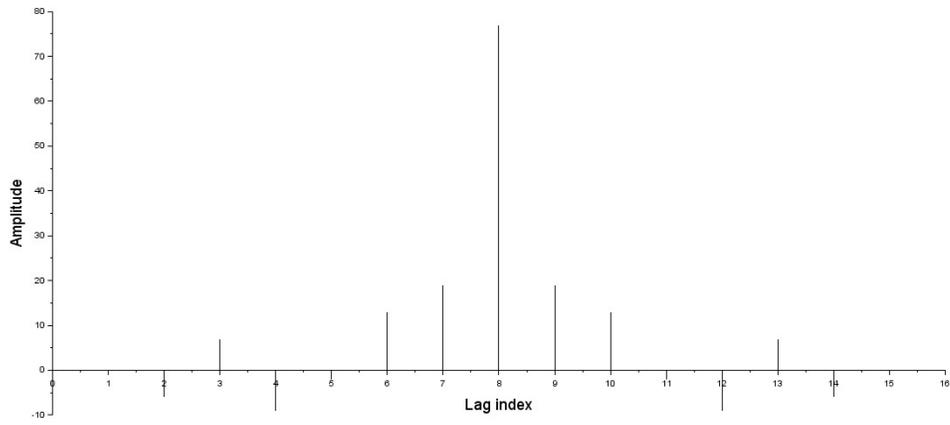
Figure 5.1: Exp5

```
17  xlabel("Lag index","fontsize",4);
18  ylabel("Amplitude","fontsize",4);
```

Experiment: 6

A Scilab program to perform addition of sequences

Scilab code Solution 6.6 Exp6

```
1  //Experiment-6
2  // windows - 10 - 64-Bit
3  //Scilab - 5.4.1
4
5  //A SCILAB program to perform Addition of sequences
6  clc;
7  clear;
8  i=1:20;
9  n1=[ones(1,10),zeros(1,10)];            //Discrete
       Signal
10 n2=[zeros(1,6),ones(1,6),zeros(1,8)];   //Discrete
       Signal
11 n3=n1+n2;                               //Addition
       of two discrete Signals
12 //n4=n1-n2;                             //
       Subtraction of two discrete Signals
13 subplot(2,2,1);
14 plot2d3(i,n1);
15 xlabel('Reference Axis',"fontsize",4);
```

```
16  ylabel('Amplitude',"fontsize",4);
17  title('1st Signal',"fontsize",4);
18  subplot(2,2,2);
19  plot2d3 (i,n2);                          //plot2d3('
       gnn',n,x1) in discrete form
20  xlabel('Reference Axis',"fontsize",4);
21  ylabel('Amplitude',"fontsize",4);
22  title('2nd Signal',"fontsize",4);
23  subplot(2,2,3);
24  plot2d3(i,n3);
25  xlabel('Reference Axis',"fontsize",4);
26  ylabel('Amplitude',"fontsize",4);
27  title('Addition of two discrete Signals',"fontsize"
       ,4);
28  subplot(2,2,4);
29  plot(i,n3);                              // Plot
       Continuous Signal
30  xlabel('Reference Axis',"fontsize",4);
31  ylabel('Amplitude',"fontsize",4);
32  title('Addition of two continuous Signals',"fontsize
       ",4);
33  set(gca(),"data_bounds",matrix([0,20,0,2.5],2,-1));
        // Range of axis
34  //subplot(2,3,5);
35  //plot2d3(i,n4);
36  //a = gca();                                      //
       get the current axes
37  //a.x_location = "origin";                         //
       To Change reference axis
38  //a.y_location = "origin";
39  //xlabel('time');
40  //ylabel('amplitude');
41  //title('Subtraction of two discrete Signals');
42  //subplot(2,3,6);
43  //plot(i,n4);
44  //xlabel('time');
45  //ylabel('amplitude');
46  //title('Subtraction of two continuous Signals');
```
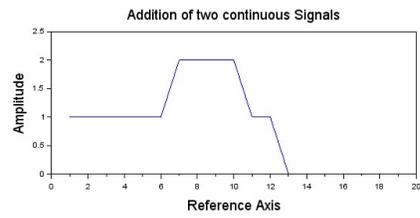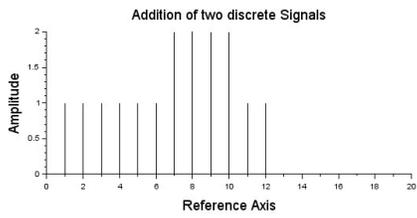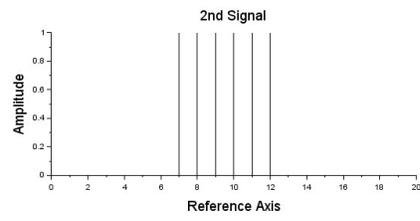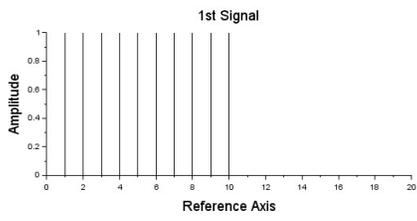
24

Figure 6.1: Exp6

47 //

Experiment: 7

A Scilab program to perform multiplication and folding of sequences

Scilab code Solution 7.7 Exp7

```
1  //Experiment−7
2  //  windows − 10 − 64−Bit
3  //Scilab − 5.4.1
4
5  //A SCILAB program to perform Multiplication and
       Folding of sequences
6
7  clc;
8  clear;
9  i=0:6;
10 n1=[zeros(1,3),ones(1,4)];
11 n2=i-2;                         //Advancing Shifting
       Signal
12 n3=i+2;                         //Delay Shifting
       Signal
13 n4=i;                           //Folded Signal
14 //n5=n1+n2;                       //Addition of
```

```
        Signals
15  n6=n3.*n4;                               //Multiplication of
        Signals
16  subplot(3,1,1);
17  plot2d3(i,n1);
18  xlabel('Reference Axis',"fontsize",4);
19  ylabel('Amplitude',"fontsize",4);
20  title('Sample Signal',"fontsize",4);
21  //subplot(3,2,2);
22  //plot2d3(i,n2);
23  //a = gca();                             //
        get the current axes
24  //a.x_location = "origin";               //
        To Change reference axis
25  //a.y_location = "origin";
26  //xlabel('time');
27  //ylabel('amplitude');
28  //title('Advancing Shifting Signal');
29  //subplot(3,2,3);
30  //plot2d3(i,n3);
31  //a = gca();                             //
        get the current axes
32  //a.x_location = "origin";               //
        To Change reference axis
33  //a.y_location = "origin";
34  //xlabel('time');
35  //ylabel('amplitude');
36  //title('Delay Shifting Signal');
37  subplot(3,1,2);
38  plot2d3(i,n4);
39  xlabel('Reference Axis',"fontsize",4);
40  ylabel('Amplitude',"fontsize",4);
41  title('Folded Signal',"fontsize",4);
42  //subplot(3,2,5);
43  //plot2d3(i,n5);
44  //a = gca();                             //
        get the current axes
45  //a.x_location = "origin";               //
```
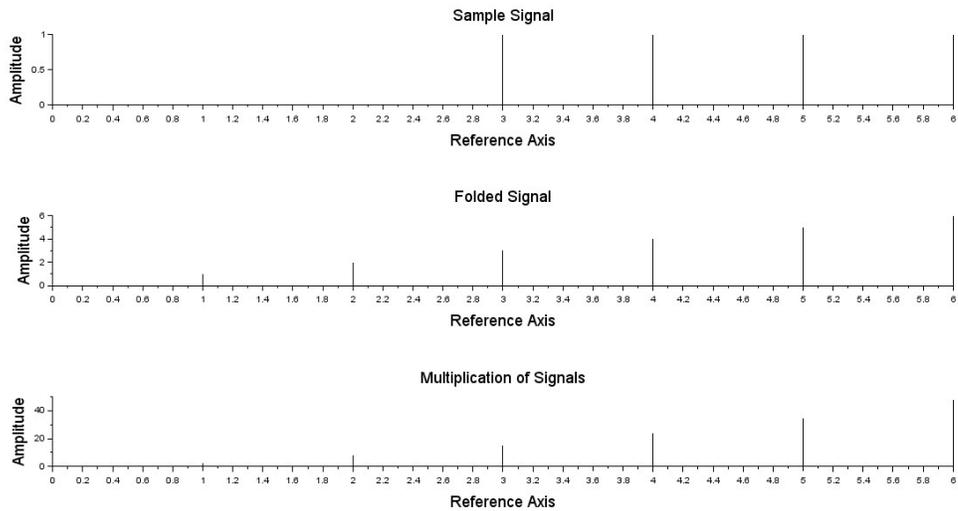
Figure 7.1: Exp7

```
        To Change reference axis
46  //a.y_location = "origin";
47  //xlabel('time');
48  //ylabel('amplitude');
49  //title('Addition of Signals');
50  subplot(3,1,3);
51  plot2d3(i,n6);
52  xlabel('Reference Axis',"fontsize",4);
53  ylabel('Amplitude',"fontsize",4);
54  title('Multiplication of Signals',"fontsize",4);
```

Experiment: 8

Scilab code to demonstrate amplitude Modulation concept

Scilab code Solution 8.8 Exp8

```
1  //Experiment-8
2  //  windows - 10 - 64-Bit
3  //Scilab - 5.4.1
4
5
6  //SCILAB code to demonstrate Amplitude Modulation
      concept
7
8  clear; clc;
9  t=0:0.001:1;
10 Am=5;//Amplitude of signal
11 Ac=5;
12 fm=input("Message frequency=");//Accepting input
      value
13 fc=input("Carrier frequency=");//Accepting input
      value (fc>fa)
14 mi=input("Modulation Index=");//Modulation Index
15 Sm=Am*sin(2*%pi*fm*t);//Message Signal
16 subplot(3,1,1);
```

```
17  plot(t,Sm);
18  xlabel("Time in (sec.)","fontsize",4);
19  ylabel("Amplitude","fontsize",4);
20  title("Message Signal","fontsize",4);
21  Sc=Ac*sin(2*%pi*fc*t);//Carrier Signal
22  subplot(3,1,2);
23  plot(t,Sc);
24  xlabel("Time in (sec.)","fontsize",4);
25  ylabel("Amplitude","fontsize",4);
26  title("Carrier Signal","fontsize",4);
27  Sam=(Ac+mi*Sm).*sin(2*%pi*fc*t);//AM Signal
28  subplot(3,1,3);
29  plot(t,Sam);
30  xlabel("Time in (sec.)","fontsize",4);
31  ylabel("Amplitude","fontsize",4);
32  title("AM Signal","fontsize",4);
33
34
35  //For Example
36  //fm = 3
37  //fc = 50
38  //mi = 1
```
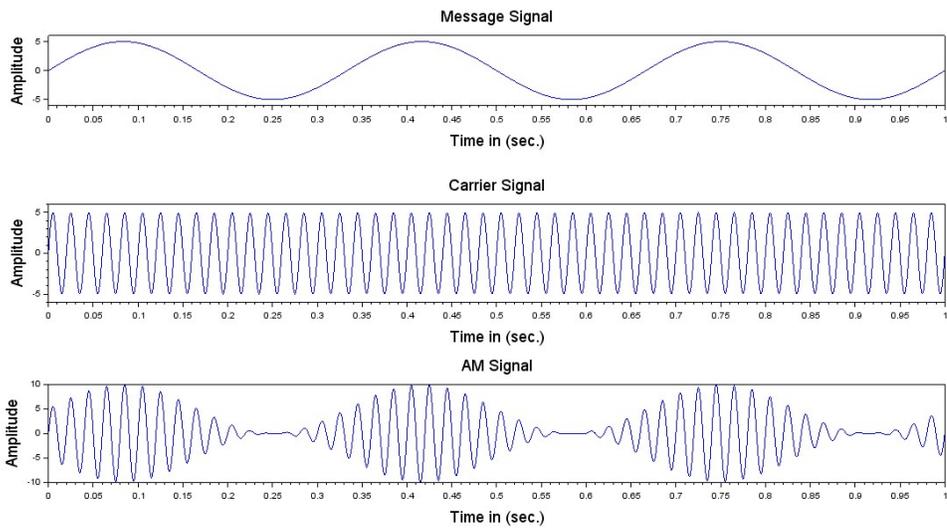
Figure 8.1: Exp8

Experiment: 9

Scilab code to demonstrate frequency Modulation concept

Scilab code Solution 9.9 Exp9

```
1  //Experiment-9
2  // windows - 10 - 64-Bit
3  //Scilab - 5.4.1
4
5
6  //SCILAB code to demonstrate Frequency Modulation
      concept
7
8  clear; clc;
9  fm=input(" Message frequency=");//Accepting input
      value
10 fc=input(" Carrier frequency=");//Accepting input
      value (fc>fa)
11 mi=input(" Modulation Index=");//Modulation Index
12 t=0:0.0001:0.1;
13 Sm=sin(2*%pi*fm*t);
14 subplot(3,1,1);
15 plot(t,Sm);
16 xlabel("Time in (sec.)","fontsize",4);
```

```scilab
17  ylabel("Amplitude","fontsize",4);
18  title("Message Signal","fontsize",4);
19  Sc=sin(2*%pi*fc*t);
20  subplot(3,1,2);
21  plot(t,Sc);
22  xlabel("Time in (sec.)","fontsize",4);
23  ylabel("Amplitude","fontsize",4);
24  title("Carrier Signal","fontsize",4);
25  Sfm=sin(2*%pi*fc*t+(mi.*sin(2*%pi*fm*t))); //
        Frequency changing w.r.t Message
26  subplot(3,1,3);
27  plot(t,Sfm);
28  xlabel("Time in (sec.)","fontsize",4);
29  ylabel("Amplitude","fontsize",4);
30  title("FM Signal","fontsize",4);
31
32
33  //For Example
34
35  //Message frequency=25
36  //Carrier frequency=400
37  //Modulation Index=5
```
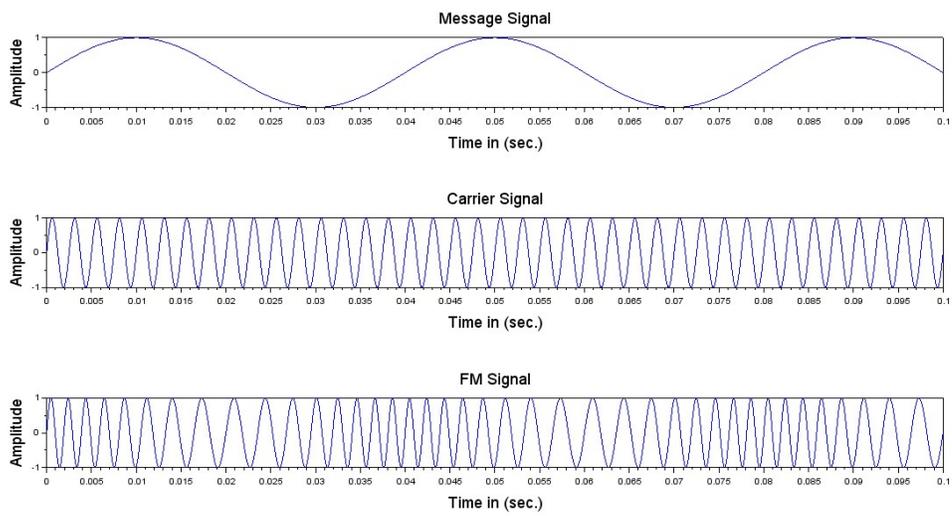
Figure 9.1: Exp9