Scilab Manual for Signals and Systems by Prof Ishit Shah Electrical Engineering Venus International College of Technology, GTU[1]

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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])
```

```
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
```

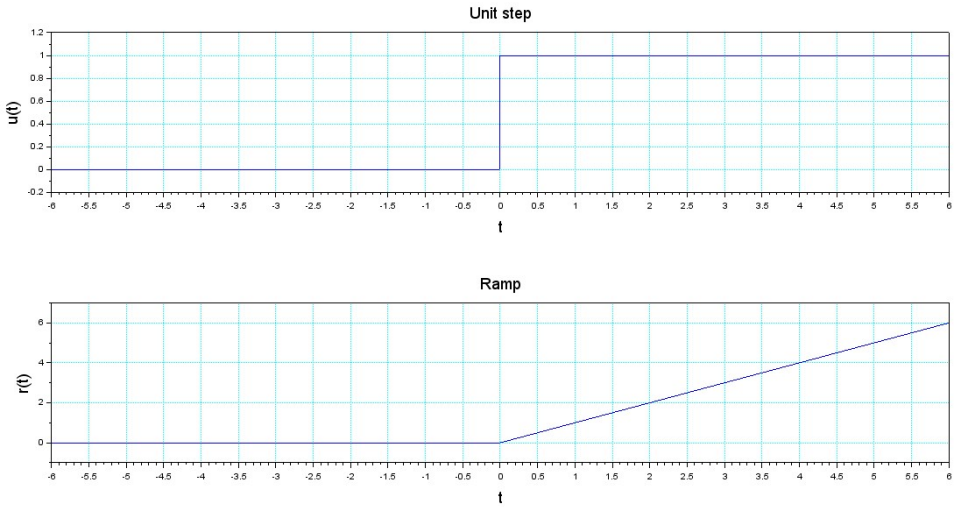


Figure 1.1: Exp1

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));
```

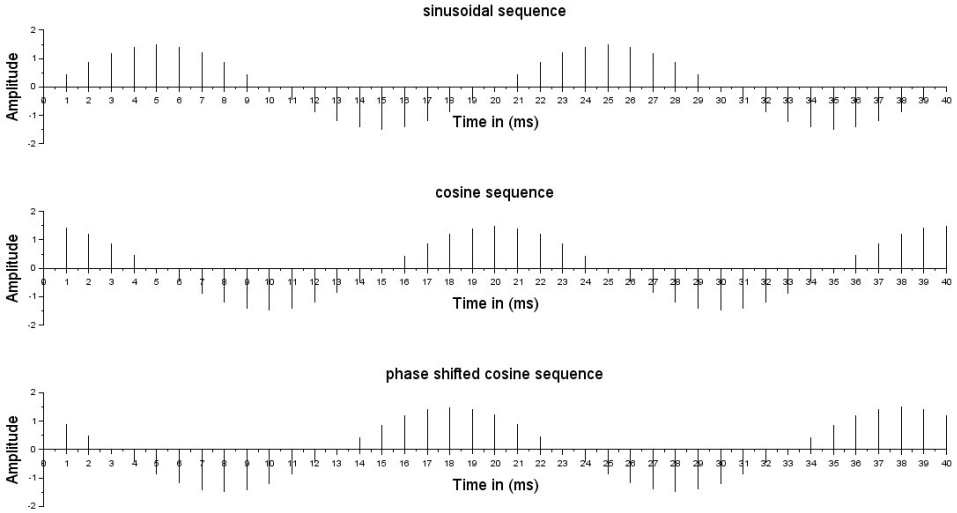


Figure 2.1: Exp2

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
```

```
clear; clc;
n=0:20;
w=%pi/6;
x=exp(%i*w*n);
f4=scf(2);
figure(2)
subplot(2,1,1);
plot2d3('gnn',n,real(x));
a = gca();                                          //
   get the current axes
a.x_location = "origin";                            //
   To Change reference axis
a.y_location = "origin";
xlabel("Time in (sec.)","fontsize",4)
ylabel("Amplitude","fontsize",4)
title("Real Part","fontsize",4);
subplot(2,1,2);
plot2d3('gnn',n,imag(x));
a = gca();                                          //
   get the current axes
a.x_location = "origin";                            //
   To Change reference axis
a.y_location = "origin";
xlabel("Time in (sec.)","fontsize",4)
ylabel("Amplitude","fontsize",4)
title("Imaginary Part","fontsize",4)


// Generation of comlex exponential sequence

clear; clc;
a=input("Type in real exponent = ");
b=input("Type in imaginary exponent = ");
c= a+b*%i;                                          //a+j*b
   for imaginary value
K=input("Type in the gain constant = ");
N=input("Type in length of sequence = ");
n=1:N;
```

```
x=K*exp(c*n); //generate the sequence
f4=scf(3);
figure(3)
subplot(2,1,1);
plot2d3('gnn',n,real(x));                                    //
   real(x) = gives real component
a = gca();                                                   //
   get the current axes
a.x_location = "origin";                                     //
   To Change reference axis
a.y_location = "origin";
xlabel("Time in (sec.)","fontsize",4)
ylabel("Amplitude","fontsize",4)
title("Real Part","fontsize",4);
subplot(2,1,2)
plot2d3('gnn',n,imag(x));                                    //
   imag(x) = gives imaginary component
a = gca();                                                   //
   get the current axes
a.x_location = "origin";                                     //
   To Change reference axis
a.y_location = "origin";
xlabel("Time in (sec.)","fontsize",4)
ylabel("Amplitude","fontsize",4)
title("Imaginary Part","fontsize",4)

//For Example

// Type in real exponent = -0.0833
// Type in imaginary exponent = 0.5236
// Type in the gain constant = 1.5
// Type in length of sequence = 40
```

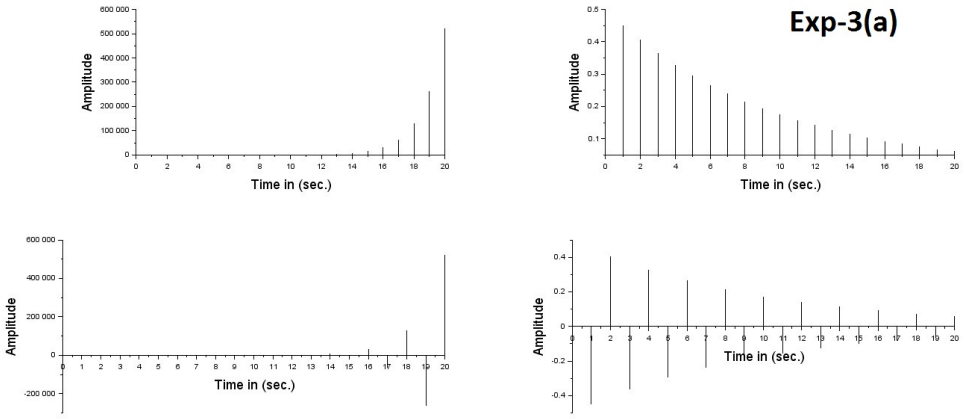


Figure 3.1: Exp3

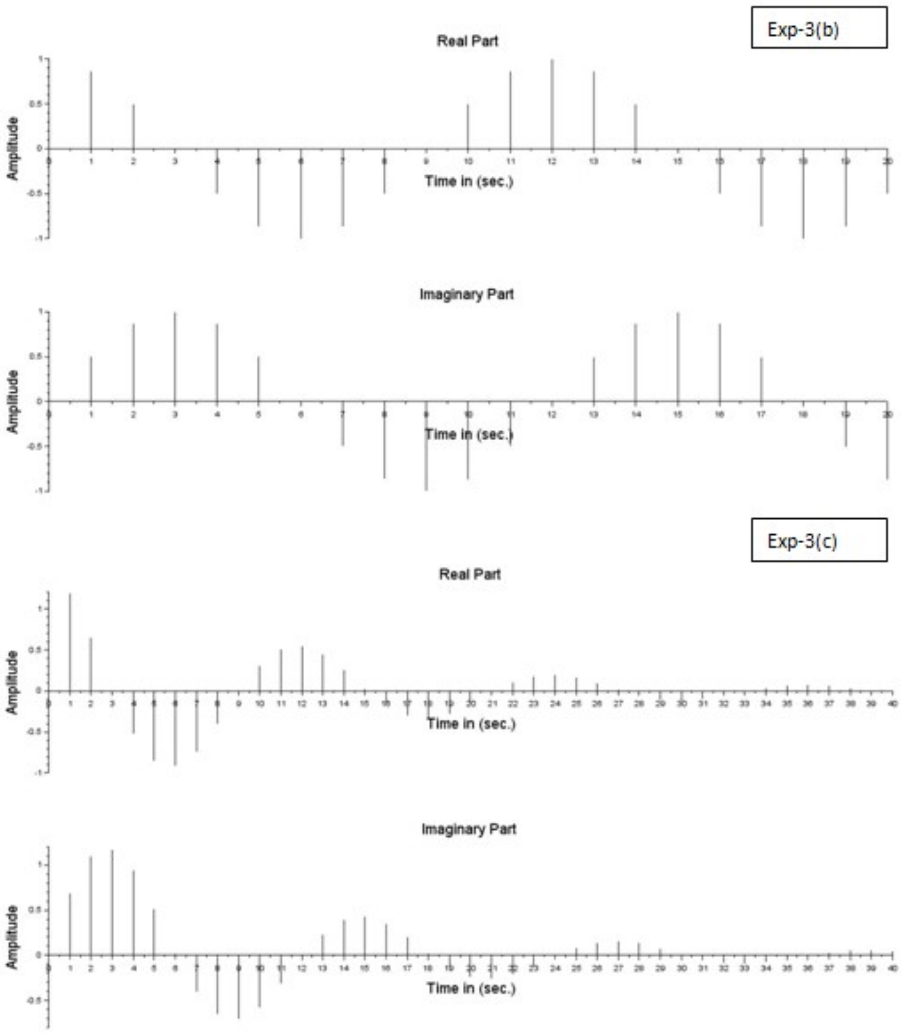


Figure 3.2: Exp3

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";                          //
```

```
    To Change reference axis
a.y_location = "origin";
xlabel("Reference Axis","fontsize",3);
ylabel("Amplitude","fontsize",3);
title("Sequence-1","fontsize",3);
n2=[-1,0,1]
x2=[4,5,6]
subplot(2,2,2)
plot2d3('gnn',n2,x2);
a = gca();                                          //
    get the current axes
a.x_location = "origin";                            //
    To Change reference axis
a.y_location = "origin";
xlabel("Reference Axis","fontsize",3);
ylabel("Amplitude","fontsize",3);
title("Sequence-2","fontsize",3);
[c, ind]=xcorr(x1,x2)              // function of cross
    correlation
[ind',c']
subplot(2,2,3)
plot2d3('gnn',c)
a = gca();                                          //
    get the current axes
a.x_location = "origin";                            //
    To Change reference axis
a.y_location = "origin";
xlabel("Reference Axis","fontsize",3);
ylabel("Amplitude","fontsize",3);
title("Cross- Correlation Sequence","fontsize",3);


clear; clc;

x=input ("Type in the refrence sequence = ");
y=input ("Type in the second sequence = ");

//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]
```

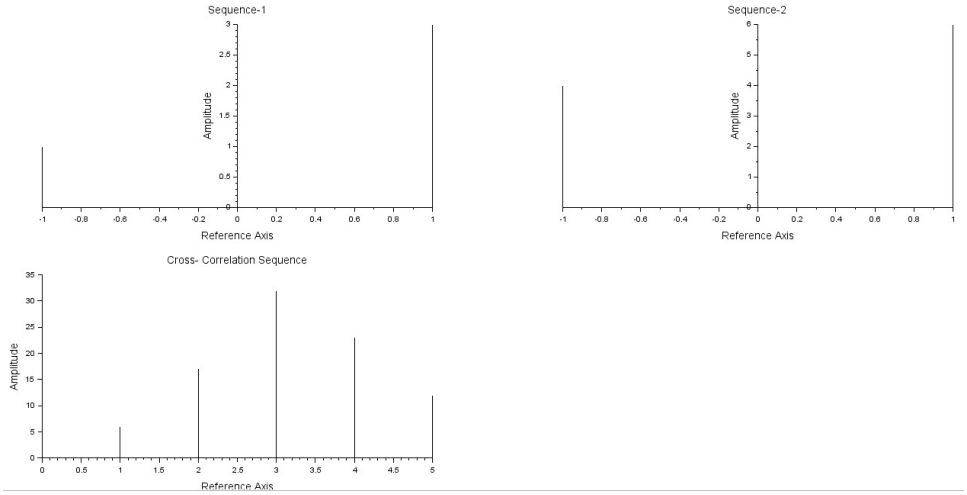


Figure 4.1: Exp4

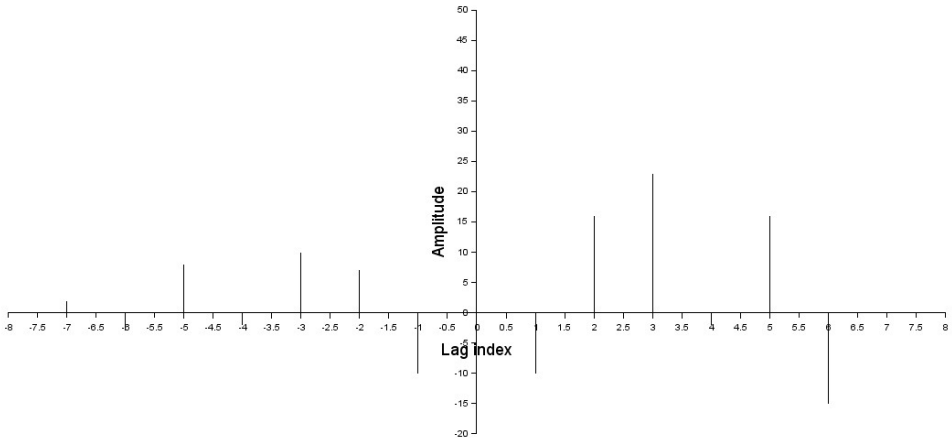


Figure 4.2: Exp4

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";
```

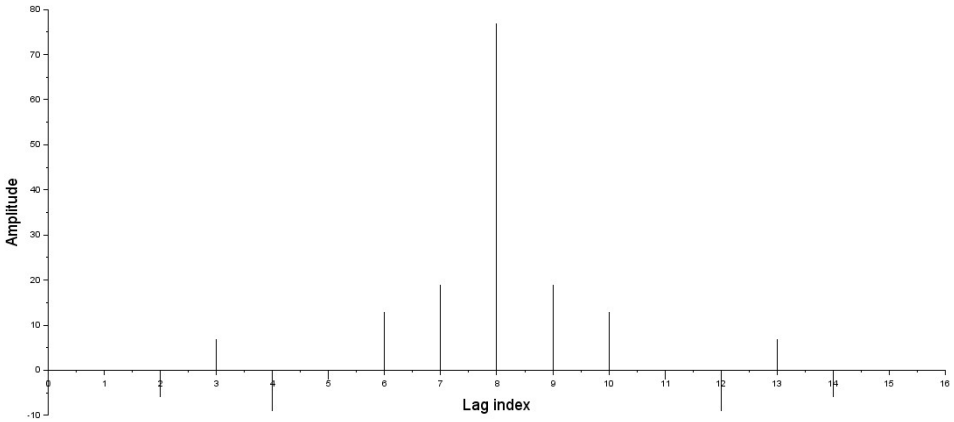


Figure 5.1: Exp5

```
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');
```

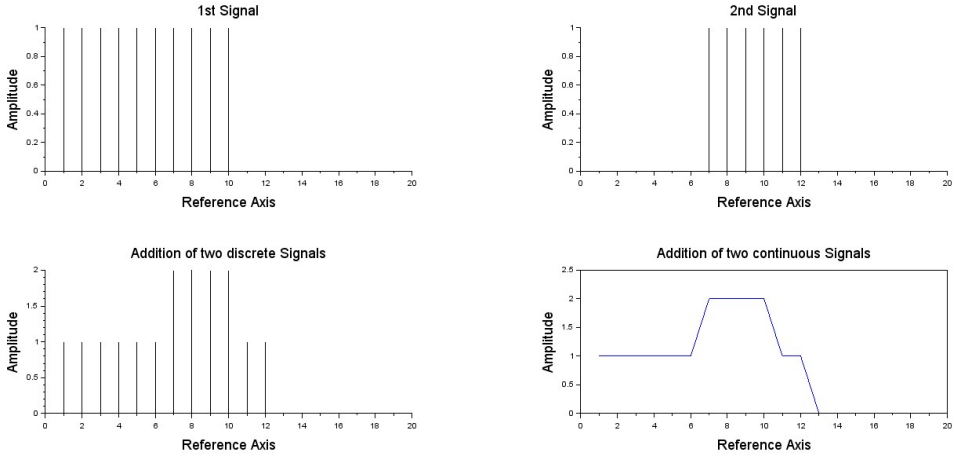


Figure 6.1: Exp6

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";                           //
```

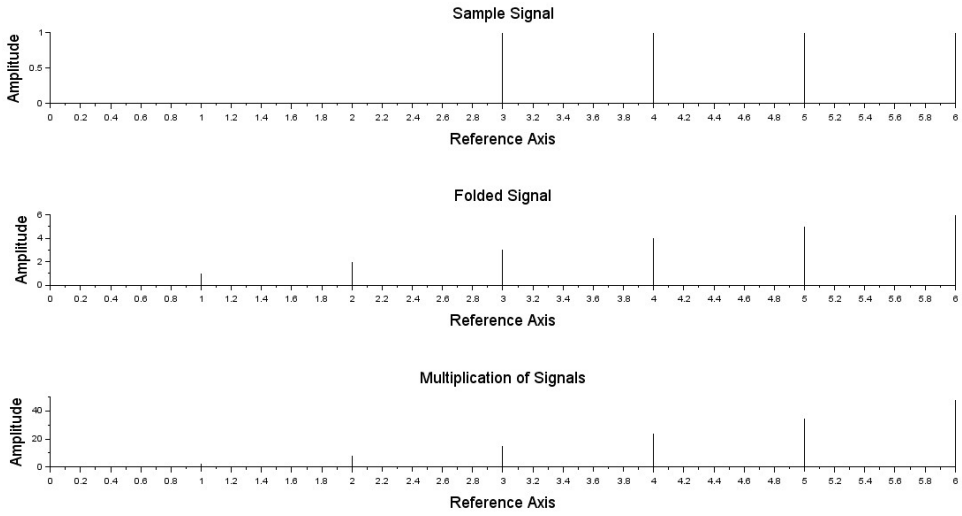


Figure 7.1: Exp7

```
    To Change reference axis
//a.y_location = "origin";
//xlabel('time');
//ylabel('amplitude');
//title('Addition of Signals');
subplot(3,1,3);
plot2d3(i,n6);
xlabel('Reference Axis',"fontsize",4);
ylabel('Amplitude',"fontsize",4);
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
```

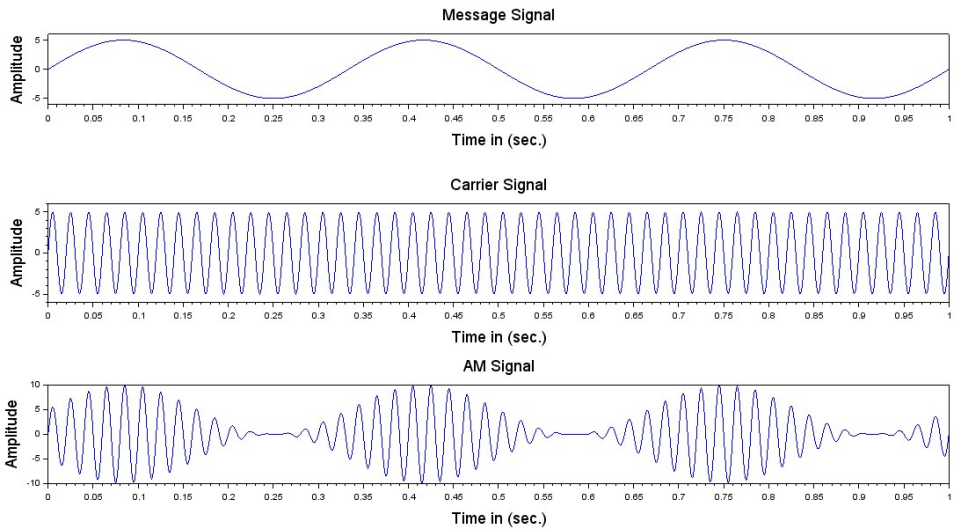


Figure 8.1: Exp8

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);
```

```
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
```

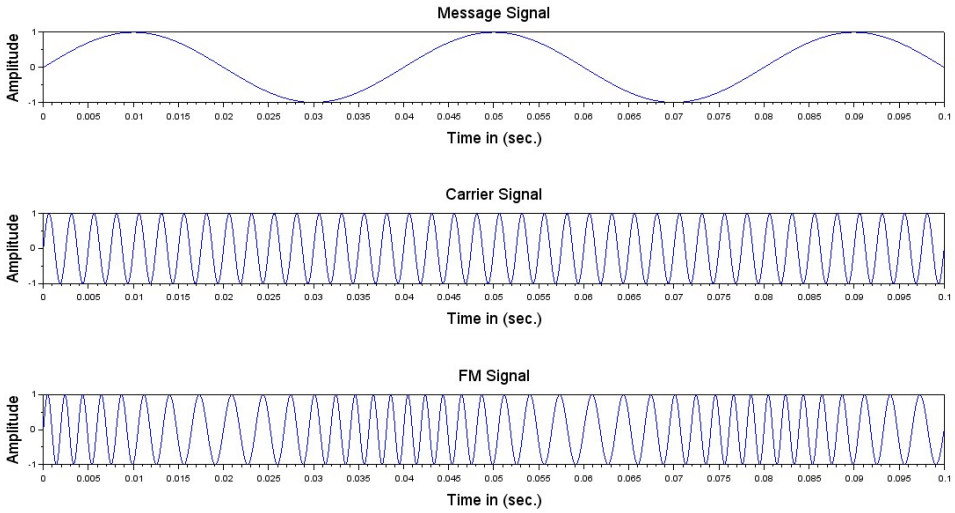


Figure 9.1: Exp9