Scilab Manual for Digital Signal Processing by Dr Prarthan Mehta Others Dharmsinh Desai University[1]

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November 25, 2026

[1]Funded by a grant from the National Mission on Education through ICT, http://spoken-tutorial.org/NMEICT-Intro. This Scilab Manual and Scilab codes written in it can be downloaded from the "Migrated Labs" section at the website http://scilab.in

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Experiment: 1

To generate basic discrete signal used in Digital Signal Processing

Scilab code Solution 1.01 Basic Discreate Signal Generation

```
1 // Exp-1 To generate basic discrete signal used in
     Digital Signal Processing
2
3 // Version : Scilab 5.4.1
4 // Operating Syatem : Window-xp, Window-7
5
6 clc;
7 clear;
8 xdel(winsid());
9 t=0:0.1:20;
10 f=0.2;
11 pi=3.14;
12
13
14 ////////////////////////    SINEWAVE
     ////////////////
15 x1=sin(2*pi*f*t);
```

```
16 //scf();
17 subplot(231);
18 plot(t,x1,'cya+','marker','d','markerfac','green','
      markeredg','red');
19 title('Sinewave','color','red','fontsize', 4);
20 //xtitle( 'Sinewave', 'Index', 'Amplitude') ;
21 xlabel("Index", "fontsize", 2,"color", "blue");
22 ylabel("Amplitude", "fontsize", 2, "color", "blue");
23
24
25 ////////////////////////    Cosine Wave
      ////////////////
26 x2=cos(2*pi*f*t);
27 //scf();
28 subplot(232);
29 plot(t,x2,'cya+','marker','d','markerfac','red','
      markeredg','yel');
30 title('Cosinewave','color','red','fontsize', 4);
31 xlabel("Index", "fontsize", 2,"color", "blue");
32 ylabel("Amplitude", "fontsize", 2, "color", "blue");
33
34
35 ////////////////////////    Impulse Wave
      ////////////////
36 t1=-10:10;
37 x3=[zeros(1,10) 1 zeros(1,10)];
38 //scf();
39 subplot(233);
40 plot(t1,x3,'cya+','marker','d','markerfac','green','
      markeredg','red');
41 title('Impulse','color','red','fontsize', 4);
42 xlabel("Index", "fontsize", 2,"color", "blue");
43 ylabel("Amplitude", "fontsize", 2, "color", "blue");
44
45
46 ////////////////////////    Ramp Wave
      ////////////////
47 t4=0:10;
```

```
48 x4=t4;
49 //scf();
50 subplot(234);
51 plot(t4,x4,'cya+','marker','d','markerfac','green','
      markeredg','red');
52 title('Ramp Wave','color','red','fontsize', 4);
53 xlabel("Index", "fontsize", 2,"color", "blue");
54 ylabel("Amplitude", "fontsize", 2, "color", "blue");
55
56
57 ////////////////////////    Exponetial Wave
      ////////////////
58 t5=0:10;
59 x5=exp(t5);
60 //scf();
61 subplot(235);
62 plot(t5,x5,'cya+','marker','d','markerfac','green','
      markeredg','red');
63 title('Exponetial Wave','color','red','fontsize', 4)
      ;
64 xlabel("Index", "fontsize", 2,"color", "blue");
65 ylabel("Amplitude", "fontsize", 2, "color", "blue");
66
67
68 ////////////////////////    Random Wave
      ////////////////
69
70 x6=rand(1,100);
71 //scf();
72 subplot(236);
73 plot(1:length(x6),x6,'cya+','marker','d','markerfac'
      ,'green','markeredg','red');
74 title('Random Wave','color','red','fontsize', 4);
75 xlabel("Index", "fontsize", 2,"color", "blue");
76 ylabel("Amplitude", "fontsize", 2, "color", "blue");
77
78
79
```

```
80 //////////////Impulse Sequence  ////////////////
81 n1=1,n0=50,n2=100;
82 if((n0<n1)|(n0>n2)|(n1>n2))
83     error('arugument incorrect');
84 end
85 n=[n1:n2];
86 x7=[(n-n0)==0,1];
87 scf()
88 subplot(121);
89 plot(n,x7(n1:n2),'cya+','marker','d','markerfac','
      green','markeredg','red');
90 title('Impulse Sequence','color','red','fontsize',
      4);
91 xlabel("Index", "fontsize", 2,"color", "blue");
92 ylabel("Amplitude", "fontsize", 2, "color", "blue");
93
94
95 ////////////////// Step Sequence  ///////////////
96 n1=1,n0=50,n2=100;
97 if((n0<n1)|(n0>n2)|(n1>n2))
98     error('arugument incorrect');
99 end
100 n=[n1:n2];
101 x8=[(n-n0)>=0,1];
102 subplot(122);
103 plot(n,x8(n1:n2),'cya+','marker','d','markerfac','
      green','markeredg','red');
104 title('Step Sequence','color','red','fontsize', 4);
105 xlabel("Index", "fontsize", 2,"color", "blue");
106 ylabel("Amplitude", "fontsize", 2, "color", "blue");
```

Experiment: 2

To perform basic signal operation (addition, multiplication, shifting, folding) on the discrete sequences.

Scilab code Solution 2.01 Signal Addition and Multiplication

```
1 // Exp-2 Addition & Multiplication Operation on two
     Discrete Sequences
2
3 // Version : Scilab 5.4.1
4 // Operating Syatem : Window-xp, Window-7
5
6 clc;
7 clear;
8 xdel(winsid());
9
10 x1=[1 6 7 4 5 2 3 7 8 9];
11 n1=[-3 -2 -1 0 1 2 3 4 5 6];
12 x2=[5 8 6 9 4 2 3 7 5 6 2 8 7];
13 n2=[4 5 6 7 8 9 10 11 12 13 14 15 16] ;
14 n=min(min(n1),min(n2)):max(max(n1),max(n2));
```

```
15 y1=zeros(1,length(n));
16 y2=y1;
17 y1(find((n>=min(n1))&(n<=max(n1))))=x1;
18 y2(find((n>=min(n2))&(n<=max(n2))))=x2;
19 y=y1+y2;
20 x=y1.*y2;
21 // Addition of Two Sequences //
22 scf();
23 subplot(311);
24 bar(n,y1,0.1,'red');
25 title('Sequence_1','color','red','fontsize', 4);
26 xlabel("Index", "fontsize", 2,"color", "blue",'
      position',[0.3 0.3]);
27 ylabel("Amplitude", "fontsize", 2, "color", "blue");
28 subplot(312);
29 bar(n,y2,0.1,'yellow');
30 title('Sequence_2','color','red','fontsize', 4);
31 xlabel("Index", "fontsize", 2,"color", "blue",'
      position',[0.3 0.3]);
32 ylabel("Amplitude", "fontsize", 2, "color", "blue");
33 subplot(313)
34 bar(n,y,0.1,'Green');
35 //plot(n,y,'cya+','marker','d','markerfac','red','
      markeredg','yel');
36 title('Addition of Sequences','color','red','
      fontsize', 4);
37 xlabel("Index", "fontsize", 2,"color", "blue",'
      position',[0.3 0.3]);
38 ylabel("Amplitude", "fontsize", 2, "color", "blue");
39
40 // Multiplication of Two Sequences //
41 scf();
42 subplot(311);
43 bar(n,y1,0.1,'red');
44 title('Sequence_1','color','red','fontsize', 4);
45 xlabel("Index", "fontsize", 2,"color", "blue",'
      position',[0.3 0.3]);
46 ylabel("Amplitude", "fontsize", 2, "color", "blue");
```

```
47 subplot(312);
48 bar(n,y2,0.1,'yellow');
49 title('Sequence_2','color','red','fontsize', 4);
50 xlabel("Index", "fontsize", 2,"color", "blue",'
   position',[0.3 0.3]);
51 ylabel("Amplitude", "fontsize", 2, "color", "blue");
52 subplot(313)
53 bar(n,x,0.1,'Green');
54 //plot(n,y,'cya+','marker','d','markerfac','red','
   markeredg','yel');
55 title('Multiplication of Sequences','color','red','
   fontsize', 4);
56 xlabel("Index", "fontsize", 2,"color", "blue",'
   position',[0.3 0.3]);
57 ylabel("Amplitude", "fontsize", 2, "color", "blue");
```

Scilab code Solution 2.02 Signal Shifting Operation

```
1 // Exp-3 Perform Shifting Operation on Discrete
   Sequences
2
3 // Version : Scilab 5.4.1
4 // Operating Syatem : Window-xp, Window-7
5
6 clc;
7 clear;
8 xdel(winsid());
9
10 x2=input("Enter the Sequence :");     //  [2 3 5 6 4
   8 6];
11 factor=input("Enter the Shifting Factor :"); //
   Example : -2 or 2
12
13
14 a=[];
```

```
t=[];
for i=1:length(x2)
        t=[t (i-factor)];
    a=[a x2(i)];
end
temp=[];
if(factor>0)
    a=[a zeros(1,factor)];
    for j=1:factor
    temp=[temp t(length(t))+j];
    end
    t=[t temp];
end
if(factor<0)
    a=[zeros(1,-factor) a];
    for j=1:-factor
    temp=[temp j];
    end
    t=[temp t];
end


scf();
subplot(2,1,1);
bar(x2,0.1,'red');
title('Original Sequence','color','red','fontsize',
   4);
xlabel("Index", "fontsize", 2,"color", "blue",'
   position',[0.3 0.3]);
ylabel("Amplitude", "fontsize", 2, "color", "blue");

title('Original Sequence');
subplot(2,1,2);
bar(t,a,0.1,'green');
title('Shfted Sequence','color','red','fontsize', 4)
   ;
xlabel("Index", "fontsize", 2,"color", "blue",'
   position',[0.3 0.3]);
```

```
49 ylabel("Amplitude", "fontsize", 2, "color", "blue");
```

Scilab code Solution 2.03 Signal Folding Operation

```
1  // Exp-4 Perform Signal Folding Operation on
      Discrete Sequences
2
3  // Version : Scilab 5.4.1
4  // Operating Syatem : Window-xp, Window-7
5
6  clc;
7  clear;
8  xdel(winsid());
9
10 x2=input("Enter the Sequence :");    //  [2 3 5 6 4
      8 6];
11 x3=mtlb_fliplr(x2);
12 n3=1:length(x2);
13 n3=-mtlb_fliplr(n3);
14 scf();
15 subplot(2,1,1);
16 bar(x2,0.1,'red');
17 title('Original Sequence','color','red','fontsize',
      4);
18 xlabel("Index", "fontsize", 2,"color", "blue",'
      position',[0.3 0.3]);
19 ylabel("Amplitude", "fontsize", 2, "color", "blue");
20
21 subplot(2,1,2);
22 bar(n3,x3,0.1,'green');
23 title('Folded Sequence','color','green','fontsize',
      4);
24 xlabel("Index", "fontsize", 2,"color", "blue",'
      position',[0.3 0.3]);
25 ylabel("Amplitude", "fontsize", 2, "color", "blue");
```

Experiment: 3

To perform Convolution & Correlation Operation on Two Discrete Sequences

Scilab code Solution 3.01 Convolution Operation

```
1  // Exp-5 Perform Convolution Operation on Two
       Discrete Sequences
2
3  // Version : Scilab 5.4.1
4  // Operating Syatem : Window-xp, Window-7
5
6
7  clc;
8  clear;
9  xdel(winsid());
10
11 x1=input("Enter the Sequence_1 :");     //  [1 2 3 4
       5];
12 x2=input("Enter the Sequence_2 :");     //  [5 4 8];
13 n = length(x1);
14 m = length(x2);
15 for k = 1:(m+n-1)
```

```
16      w(k) = 0;
17          for j =max(1,k+1-m) : min(k,n)
18              w(k)= w(k)+(x1(j)*x2(k+1-j));
19          end
20  end
21
22  scf();
23  subplot(3,1,1);
24  bar(x1,0.1,'red');
25  title('Sequence_1','color','red','fontsize', 4);
26  xlabel("Index", "fontsize", 2,"color", "blue",'
       position',[0.6 0.3]);
27  ylabel("Amplitude", "fontsize", 2, "color", "blue");
28
29  subplot(3,1,2);
30  bar(x2,0.1,'yellow');
31  title('Sequence_2','color','red','fontsize', 4);
32  xlabel("Index", "fontsize", 2,"color", "blue",'
       position',[0.6 0.3]);
33  ylabel("Amplitude", "fontsize", 2, "color", "blue");
34
35  subplot(3,1,3);
36  bar(w,0.1,'green');
37  title('Convoled Sequence','color','green','fontsize'
       , 4);
38  xlabel("Index", "fontsize", 2,"color", "blue",'
       position',[0.3 0.3]);
39  ylabel("Amplitude", "fontsize", 2, "color", "blue");
```

Scilab code Solution 3.02 Correlation Operation

```
1  // Exp-6 Perform Correlation Operation on Two
       Discrete Sequences
2
3  // Version : Scilab 5.4.1
```

```
4  // Operating Syatem : Window-xp, Window-7
5
6  clc;
7  clear;
8  xdel(winsid());
9  x=[2 4 5 6];
10 y=[2 4 5];
11
12 m=length(x);
13 n=length(y);
14
15 for k=1:m+n-1
16             w(k)=0;
17          for j=max(1,k+1-n):min(k,m)
18                  w(k)=w(k)+(x(j)*y(n-k+j));
19          end
20 end
21
22
23 scf();
24 subplot(3,1,1);
25 bar(x,0.1,'red');
26 title('Sequence_1','color','red','fontsize', 4);
27 xlabel("Index", "fontsize", 2,"color", "blue",'
      position',[0.6 0.3]);
28 ylabel("Amplitude", "fontsize", 2, "color", "blue");
29
30 subplot(3,1,2);
31 bar(y,0.1,'yellow');
32 title('Sequence_2','color','red','fontsize', 4);
33 xlabel("Index", "fontsize", 2,"color", "blue",'
      position',[0.6 0.3]);
34 ylabel("Amplitude", "fontsize", 2, "color", "blue");
35
36 subplot(3,1,3);
37 bar(w,0.1,'green');
38 title('Correlation of Sequences','color','green','
      fontsize', 4);
```

```
39 xlabel("Index", "fontsize", 2,"color", "blue",'
      position',[0.3 0.3]);
40 ylabel("Amplitude", "fontsize", 2, "color", "blue");
```

Experiment: 4

To perform Circular Shifting Operation on Discrete Sequence and prove phase reversal property of DFT.

Scilab code Solution 4.01 Circular Shifting Operation and Phase reversal Property

```
1 // Exp-7 Perform Circular Shifting Operation on
    Discrete Sequence and prove
2
3 // Version : Scilab 5.4.1
4 // Operating Syatem : Window-xp, Window-7
5
6 clc;
7 clear;
8 xdel(winsid());
9
10 n=0:10;  // Index
11 x=10*(0.8).^n;  // Input Sequence
12 y=x(pmodulo(-n,length(n))+1);   // y is circular
    shifted sequence of x
```

```
13
14 scf();
15 subplot(2,1,1);
16 bar(x,0.1,'Green');
17 title('Original Sequence','color','red','fontsize',
     4);
18 xlabel("Index", "fontsize", 2,"color", "blue");
19 ylabel("Amplitude", "fontsize", 2, "color", "blue");
20
21 subplot(2,1,2);
22 bar(y,0.1,'yellow');
23 title('Circular Shifted Sequence','color','red','
     fontsize', 4);
24 xlabel("Index", "fontsize", 2,"color", "blue");
25 ylabel("Amplitude", "fontsize", 2, "color", "blue");
26
27
28 X=fft(x,-1); // Discrete Fourier Transform of
     Original Sequence
29 Y= fft(y,-1); // Discrete Fourier Transform of
     Circular Shifted Sequence
30
31 scf();
32 subplot(2,2,1);
33 bar(n,real(X),0.1,'Green');
34 title('Real{DFT[x(n)]}','color','red','fontsize', 4)
     ;
35 xlabel("Index", "fontsize", 2,"color", "blue");
36 ylabel("Amplitude", "fontsize", 2, "color", "blue");
37
38
39 subplot(2,2,2);
40 bar(n,imag(X),0.1,'Green');
41 title('Imag{DFT[x(n)]}','color','red','fontsize', 4)
     ;
42 xlabel("Index", "fontsize", 2,"color", "blue");
43 ylabel("Amplitude", "fontsize", 2, "color", "blue");
44
```

```
45 subplot(2,2,3);
46 bar(n,real(Y),0.1,'Green');
47 title('Real{DFT[x((-n))]}','color','red','fontsize',
       4);
48 xlabel("Index", "fontsize", 2,"color", "blue");
49 ylabel("Amplitude", "fontsize", 2, "color", "blue");
50
51 subplot(2,2,4);
52 bar(n,imag(Y),0.1,'Green');
53 title('Imag{DFT[x((-n))]}','color','red','fontsize',
       4);
54 xlabel("Index", "fontsize", 2,"color", "blue");
55 ylabel("Amplitude", "fontsize", 2, "color", "blue");
```

Experiment: 5

Applications of Correlation

Scilab code Solution 5.01 Radar Signal Processing

```
1 // Exp-8 Application of Correlation in RADAR Signal
    Processing to detect Object and it's Distance.
2
3 // Objective : Correlation finds application in
    RADAR Signal Processing, in which the objective
    is to find whether the object is presence or
    Absence. it also required to find the distance
    between object and radar.
4
5 // R[n]=Alpha*X[n-D]+Noise     where Alpha=
    Attenution Factor = 1 and D= Delay factor by
    which transmitted signal is received back to
    receiver(RADAR)
6
7 // Observation : In the presence of object the
    received signal is reflected signal fron the
    object which can be given by R(n) = X(n-D)+Noise.
     if we find the correlation between received
    signal and transmitted signal, than the
    correlation value is higher at the delay index.
8
```

```
9  // Observation :In the Absence of object the
       received signal is only the Noise, which can be
       given by R(n) = Noise. if we find the correlation
        between received signal and transmitted signal,
       than the correlation value is not higher at the
       delay index what we have get in the presence of
       object.
10
11 // Version : Scilab 5.4.1
12 // Operating Syatem : Window-xp, Window-7
13
14 clc;
15 clear;
16 xdel(winsid());
17
18 x=[0 1 2 3 2 1 0];           //Triangle pulse
       transmitted by radar
19 n=[-3 -2 -1 0 1 2 3];       // Index of Triangular
       Pulse
20 D=10;                       // Delay amount
21 nd=n+D;                     // Index of Delayed
       Signal
22 y=x;                        // Delayed Signal
23
24 scf();
25 subplot(2,1,1);
26 bar(n,x,0.1,'red');
27 title('Original Transmitted Signal','color','red','
       fontsize', 4);
28 xlabel("Index", "fontsize", 2,"color", "blue");
29 ylabel("Amplitude", "fontsize", 2, "color", "blue");
30
31 subplot(2,1,2);
32 bar(nd,y,0.1,'yellow');
33 title('Delayed Signal','color','red','fontsize', 4);
34 xlabel("Index", "fontsize", 2,"color", "blue");
35 ylabel("Amplitude", "fontsize", 2, "color", "blue");
36
```

```
37 w=rand(1,length(x));       // Noise Generation
38 nw=nd;
39 scf();
40 bar(nw,w,0.1,'red');
41 title('Noisy Signal','color','red','fontsize', 4);
42 xlabel("Index", "fontsize", 2,"color", "blue");
43 ylabel("Amplitude", "fontsize", 2, "color", "blue");
44
45 // If object is present we receive the signal R(n) =
       x(n-D) + Noise
46 R=y+w;        // Original Signal+Noise
47 nr=nw;        // Index of received signal at RADAR
48
49 nr_fold=mtlb_fliplr(nr);
50 R_fold=mtlb_fliplr(R);
51 nmin=min(n)+min(nr_fold);        // Lowest index of y
      (n)
52 nmax=max(n)+max(nr_fold);        // Highest index of
      y(n)
53 n_received=nmin:nmax;
54 Received_Presence=conv(x,R_fold); // Convolution of
      Original signal and Received Signal in the
      Presence of Object (Equvalent to Correlation)//
55
56 scf();
57 subplot(2,1,1);
58 bar(n_received,Received_Presence,0.1,'red');
59 title('Correlation in the Presence of Object','color
      ','red','fontsize', 4);
60 xlabel("Index", "fontsize", 2,"color", "blue");
61 ylabel("Correlation Value", "fontsize", 2, "color",
      "blue");
62
63 // If object is not present we receive the signal R(
      n) = Noise
64 R=w;                                 // only Noise
      Signal
65 nr=nw;
```

```
66 nr_fold=mtlb_fliplr(nr);
67 R_fold=mtlb_fliplr(R);
68 nmin=min(n)+min(nr_fold);        // Lowest index of y
      (n)
69 nmax=max(n)+max(nr_fold);        // Highest index of
      y(n)
70 n_received=nmin:nmax;
71 Received_Absence=conv(x,R_fold); // Convolution of
      Original transmitted signal and Received Signal
      in the Absence of Object  (Equvalent to
      Correlation)//
72
73 subplot(2,1,2);
74 bar(n_received,Received_Absence,0.1,'Green');
75 title('Correlation in the Absence of Object','color'
      ,'red','fontsize', 4);
76 xlabel("Index", "fontsize", 2,"color", "blue");
77 ylabel("Correlation Value", "fontsize", 2, "color",
      "blue");
78
79
80 // INPUT Parameters
81 //D=10;                          // Delay amount
82 //x=[0 1 2 3 2 1 0];             //Triangle pulse
      transmitted by radar
83 //n=[-3 -2 -1 0 1 2 3];          // Index of Triangular
       Pulse
84
85 // OUT PUT Parameter
86 //R=[0.2113249    0.7560439    0.0002211
      0.3303271    0.6653811 0.6283918    0.8497452 ]
87 //Received_Presence=[0.    0.8497452    3.3278823
       8.4714004    15.245755    20.763547 22.706621
       19.050111    13.021551    6.1462834
      2.1786936 0.2113249    0]
88 //Received_Absence=[0.    0.8497452    2.3278823
      4.4714004    5.2457551    4.7635474 3.7066214
      3.0501113    3.0215507    2.1462834    1.1786936
```

```
   0.2113249    0]
```

Scilab code Solution 5.02 Binary Sequence Detection at Receiver

```
1  // Exp-9 : Application of Correlation to detect
       binary sequence at receiver.
2
3  // Objective : To transmite a Binary Signal "0" and
       "1", we used sin(n*pi/8) and sin(n*pi/4)
       respectively. while transmition noise has been
       added with these signals. this information will
       be available to both receiver and transmitter. by
        finding correlation value between received
       signal with noise and the two corresponding
       signals used to represent binary signal "0" or
       "1", at the receiver side we can detect whether
       tranmitted signal is binary "0" or "1"
4
5  // Version : Scilab 5.4.1
6  // Operating Syatem : Window-xp, Window-7
7
8
9  clc;
10 clear;
11 xdel(winsid());
12 N=30;                          // Length of the signal
13 n=0:N-1;
14 pi=3.14;
15 x0=sin(n*pi/8);               // For '0' transmission
16 x1=sin(n*pi/4);               // For '1' transmission
17
18 scf();
19 subplot(2,1,1);
20 bar(n,x0,0.1,'red');
21 title('Sin(n*pi/8) to Represent Binary 0','color','
```

```
    red','fontsize', 4);
22 xlabel("Index", "fontsize", 2,"color", "blue");
23 ylabel("Amplitude", "fontsize", 2, "color", "blue");
24
25 subplot(2,1,2);
26 bar(n,x1,0.1,'yellow');
27 title('Sin(n*pi/4) to Represent Binary 1','color','
    red','fontsize', 4);
28 xlabel("Index", "fontsize", 2,"color", "blue");
29 ylabel("Amplitude", "fontsize", 2, "color", "blue");
30
31 w=rand(1,N);  // Noise Signal
32 y0=x0+w;      // Original Signal + Noise Signal
33 y1=x1+w;      // Original Signal + Noise Signal
34
35 // If received signal is y0(n)
36 rx0y0=xcorr(x0,y0);        // crosscorrelation
    between x0(n) and y0(n)
37 rx1y0=xcorr(x1,y0);        // crosscorrelation
    between x1(n) and y0(n)
38
39 scf();
40 subplot(2,1,1);
41 bar(rx0y0,0.1,'red');
42 title('Correlation between x0 and y0','color','red',
    'fontsize', 4);
43 xlabel("Index", "fontsize", 2,"color", "blue");
44 ylabel("Amplitude", "fontsize", 2, "color", "blue");
45
46 subplot(2,1,2);
47 bar(rx1y0,0.1,'green');
48 title('Correlation between x1 and y0','color','red',
    'fontsize', 4);
49 xlabel("Index", "fontsize", 2,"color", "blue");
50 ylabel("Amplitude", "fontsize", 2, "color", "blue");
51
52
53 // If received signal is y1(n)
```

```
54 rx0y1=xcorr(x0,y1);        // crosscorrelation
      between x0(n) and y1(n)
55 rx1y1=xcorr(x1,y1);        // crosscorrelation
      between x1(n) and y1(n)
56
57 scf();
58 subplot(2,1,1);
59 bar(rx0y1,0.1,'red');
60 title('Correlation between x0 and y1','color','red',
      'fontsize', 4);
61 xlabel("Index", "fontsize", 2,"color", "blue");
62 ylabel("Amplitude", "fontsize", 2, "color", "blue");
63
64 subplot(2,1,2);
65 bar(rx1y1,0.1,'green');
66 title('Correlation between x1 and y1','color','red',
      'fontsize', 4);
67 xlabel("Index", "fontsize", 2,"color", "blue");
68 ylabel("Amplitude", "fontsize", 2, "color", "blue");
```

Experiment: 6

Musical Tone Generation [sa re ga ma pa dh ni sa] with each Tone has time duration 0.5 sec.

Scilab code Solution 6.01 Musical Tone Generation

```
1 // Exp-11 : Musical Tone Generation [sa re ga ma pa
    dh ni sa] with each Tone has time duration 0.5
    sec.
2
3 // Version : Scilab 5.4.1
4 // Operating Syatem : Window-xp, Window-7
5
6 clc;
7 close;
8 clear;
9 frequency=[240 254 302 320 358.5 380 451 470]; //
    Corresponding Frequency
10 fs=8000;                                        //
    Sampling Frequency
11 no=8;
12 N=1:4000;                                       // Total
    No. of Samples for Each tone
```

```
13
14 temp=[];
15 for i=1:no
16     y=sin(2*3.14*(frequency(i)/fs)*N);
17     temp=[temp y];
18 end
19 length(temp);
20 sound(temp,fs);
21
22 //savewave('D:\temp_Original.wav',temp,[8000]);
```

Experiment: 7

DTMF Signal Generation and Decoder according to the given Mobile Number.

Scilab code Solution 7.01 DTMF Signal Generation

```
1 // Exp-10 : DTMF Signal Generation for the given
    Mobile Number.
2
3 // Version : Scilab 5.4.1
4 // Operating Syatem : Window-xp, Window-7
5
6 ////////////////////// DTMF //////////////////////
7 row_f1=[700 770 850 941];                  // Row
    Frequency
8 colum_f1=[1220 1350 1490];                 // Column
    Frequency
9 fs=8000;                                   // Sampling
    Frequency
10 N=1:4000;                                 // Total No.
    of Sample
11 mobile=[9 9 7 8 3 7 4 2 5 3];             // Mobile
    Number
```

```
12 temp=[];                                  // Array that
      Contain total signal for each Digit
13
14 figure;
15
16 for i=1:length(mobile)
17     select mobile(i)
18     case 1
19         row_f=1;
20         colum_f=1;
21     case 2
22         row_f=1;
23         colum_f=2;
24     case 3
25         row_f=1;
26         colum_f=3;
27     case 4
28         row_f=2;
29         colum_f=1;
30     case 5
31         row_f=2;
32         colum_f=2;
33     case 6
34         row_f=2;
35         colum_f=3;
36      case 7
37         row_f=3;
38         colum_f=1;
39     case 8
40         row_f=3;
41         colum_f=2;
42     case 9
43         row_f=3;
44         colum_f=3;
45      case 0
46         row_f=4;
47         colum_f=2;
48     else
```

```
49          row_f=4;
50          colum_f=1;
51      end
52
53       y=sin(2*3.14*(row_f1(row_f)/fs)*N)+sin(2*3.14*(
            colum_f1(colum_f)/fs)*N);
54
55       temp=[temp y zeros(1,4000)]; // Append the
            Signal + zeros After each Number
56
57      end
58      plot(temp);
59      sound(temp,fs);
```

Scilab code Solution 7.02 DTMF Signal Generation and Decoder

```
1  // Exp-12 : DTMF Signal Generation and Decoder
      according to the given Mobile Number.
2
3  // Version : Scilab 5.4.1
4  // Operating Syatem : Window-xp, Window-7
5
6  ////////////////////////// DTMF ////////////////////////
7  clc;
8  close;
9  clear;
10 row_f1=[700 770 850 940];          // Row Frequency
11 colum_f1=[1220 1350 1490];         // Column Frequency
12 fs=8000;                           // Sampling Frequency
13 N=1:800;                           // Total No. of
      Samples for each Digit
14 mobile=[9 9 0 8 4 5 0 6 5 0];
15 total_signal=[];
16
17 figure;
```

```
18
19 for i=1:length(mobile)
20     select mobile(i)
21     case 1
22         row_f=1;
23         colum_f=1;
24     case 2
25         row_f=1;
26         colum_f=2;
27     case 3
28         row_f=1;
29         colum_f=3;
30     case 4
31         row_f=2;
32         colum_f=1;
33     case 5
34         row_f=2;
35         colum_f=2;
36     case 6
37         row_f=2;
38         colum_f=3;
39      case 7
40         row_f=3;
41         colum_f=1;
42     case 8
43         row_f=3;
44         colum_f=2;
45     case 9
46         row_f=3;
47         colum_f=3;
48      case 0
49         row_f=4;
50         colum_f=2;
51     else
52         row_f=4;
53         colum_f=1;
54     end
55      y=sin(2*3.14*(row_f1(row_f)/fs)*N)+sin(2*3.14*(
```

```
          colum_f1(colum_f)/fs)*N);  //Time Domain
          Signal Generation for each Digit
56       total_signal=[total_signal y zeros(1,8800)];
57       temp(:,:,i)=y(:,:);
58      end
59      plot(total_signal);
60      title('DTMF Signal','color','red','fontsize', 4)
          ;
61      xlabel("Samples", "fontsize", 2,"color", "blue")
          ;
62      ylabel("Amplitude", "fontsize", 2, "color", "
          blue");
63      sound(total_signal,fs);
64
65
66  row_f=[];
67  col_f=[];
68
69  for i=1:10
70      n=length(temp(:,:,i));
71      p=abs(fft(temp(:,:,i))); // FFT of Signal of
          respective Digit
72      f=(0:n-1)*fs/n;          // Total Frequency
          Range
73      //plot(f,p);
74      row=p(2:100);            // Row Frequency
          separation
75      col=p(101:200);          // Column Frequency
          separation
76      [r1 c1]=find(row==max(row));   // Finding the
          location of peak for Row Frequency
77      [r2 c2]=find(col==max(col));   // Finding the
          location of peak for Column Frequency
78      row_f=[row_f 10*c1];            // Array
          containing peak of Row Freqiency
79      col_f=[col_f (10*(c2+100))-10]; // Array
          containing peak of Column Freqiency
80  end
```

```
81
82 mobile_find=[];  // Blank Array to Store Mobile
      Number
83 for i=1:10      // Loop forFinding the Number form
      the Row and Column Frequency
84     if(row_f(i)==700 & col_f(i)==1220)
85         n0=1;
86         elseif(row_f(i)==700 & col_f(i)==1350)
87     n0=2;
88     elseif(row_f(i)==700 & col_f(i)==1490)
89     n0=3;
90     elseif(row_f(i)==770 & col_f(i)==1220)
91     n0=4;
92     elseif(row_f(i)==770 & col_f(i)==1350)
93     n0=5;
94     elseif(row_f(i)==770 & col_f(i)==1490)
95     n0=6;
96     elseif(row_f(i)==850 & col_f(i)==1220)
97     n0=7;
98     elseif(row_f(i)==850 & col_f(i)==1350)
99     n0=8;
100    elseif(row_f(i)==850 & col_f(i)==1490)
101    n0=9;
102    elseif(row_f(i)==940 & col_f(i)==1350)
103    n0=0;
104 end
105 mobile_find=[mobile_find n0];  // Array containing
      Decoded Digit of Mobile Number.
106 end
107
108 disp("Decoded Mobile Number :");
109 disp(mobile_find);
110
111
112 ////////////// Out Put Parameters
      ////////////////////
113 //row_f=[850.    850.    940.    850.    770.
      770.    940.    770.    770. 940.];
```

```
114 //col_f=[1490.    1490.    1350.    1350.    1220.
        1350.    1350.    1490.  1350.  1350.];
115 //mobile_find=[9.    9.    0.    8.    4.    5.
    0.    6.    5.    0.];
```

Experiment: 8

Design Low Pass Filter as per the given specification and plot the Frequency Response.

Scilab code Solution 8.01 Low Pass Filter Design

```
1 // Exp-13 : Design Low Pass Filter as per the given
    specification and plot the Frequency Response.
2
3 // Version : Scilab 5.4.1
4 // Operating Syatem : Window-xp, Window-7
5
6 clc;
7 close;
8 clear;
9 delta1=0.1;      // Atennuation
10 delta2=0.1;
11 fl=400;          // Low Cut-Off Frequency
12 fh=500;          // High Cut-Off Frequency
13 fs=8000;         // Sampling Frequency
14 A=-20*log10(min(delta1:delta2));
15 w1=2*%pi*fl/fs;
16 w2=2*%pi*fh/fs;
```

```
17 temp=1+((A-8)/(2.285*((2*3.14*fh/fs)-(2*3.14*fl/fs))
     ));
18 N=ceil((temp-1)/2);
19 n=-N:N;
20 h=(((w2+w1)/2)*(sinc(((w2+w1)/2)*n)))/(3.14);   //
     Response
21 //plot(n,h);
22
23 [xm1,fr1]=frmag(h,8000);              // Frequency
     Response
24 figure;
25 plot(fr1,xm1);
26 title('Frequency Response','color','red','fontsize',
     4);
27 xlabel("Frequency (Normalized)", "fontsize", 2,"
     color", "blue");
28 ylabel("Magnitude", "fontsize", 2, "color", "blue");
```

Experiment: 9

Design High Pass Filter as per the given specification and plot the Frequency Response.

Scilab code Solution 9.01 High Pass Filter design

```
1 // Exp-14 : Design High Pass Filter as per the given
      specification and plot the Frequency Response.
2
3 // Version : Scilab 5.4.1
4 // Operating Syatem : Window-xp, Window-7
5
6 clc;
7 close;
8 clear;
9 delta1=0.1;
10 delta2=0.1;
11 fl=2;
12 fh=2.115;
13 fs=8;
14 A=-20*log10(min(delta1:delta2));
15 w1=2*3.14*fl/fs;
16 w2=2*3.14*fh/fs;
```

```
17 temp=1+((A-8)/(2.285*((2*3.14*fh/fs)-(2*3.14*fl/fs))
     ));
18 N=ceil((temp-1)/2);
19 n=-N:N;
20 del=[zeros(1:N) 1 zeros(N+1:2*N)];
21 h=del-(((w2+w1)/2)*(sinc(((w2+w1)/2)*n)))/(3.14);
     // High_Pass=1-Low_Pass
22 //h=[-h(1:30) 0 -h(32:61)];
23 //figure;
24 //plot(n,h);
25
26 [xmh,frh]=frmag(h,8000);
27 figure;
28 plot(frh,xmh);
29 title('Frequency Response','color','red','fontsize',
     4);
30 xlabel("Frequency (Normalized)", "fontsize", 2,"
     color", "blue");
31 ylabel("Magnitude", "fontsize", 2, "color", "blue");
```

Experiment: 10

Design Band Pass Filter as per the given specification and plot the Frequency Response.

Scilab code Solution 10.01 Band Pass Filter

```
1 // Exp-15 : Design Band Pass Filter as per the given
      specification and plot the Frequency Response.
2
3 // Version : Scilab 5.4.1
4 // Operating Syatem : Window-xp, Window-7
5
6 clc;
7 close;
8 clear;
9 delta1=0.1;
10 delta2=0.1;
11 fl2=600;
12 fh2=700;
13 fs=8000;
14 A=-20*log10(min(delta1:delta2));
15 w12=2*3.14*fl2/fs;
16 w22=2*3.14*fh2/fs;
```

```
17 temp2=1+((A-8)/(2.285*((2*3.14*fh2/fs)-(2*3.14*fl2/
      fs))));
18 N=ceil((temp2-1)/2);
19 n=-N:N;
20 h2=(((w22+w12)/2)*(sinc(((w22+w12)/2)*n)))/(3.14);
21
22 //[xm2,fr2]=frmag(h2,8000);
23 //figure;
24 //plot(fr2,xm2);
25
26 ////////////////////////////
27 delta1=0.1;
28 delta2=0.1;
29 fl1=200;
30 fh1=300;
31 fs=8000;
32 A=-20*log10(min(delta1:delta2));
33 w11=2*3.14*fl1/fs;
34 w21=2*3.14*fh1/fs;
35 temp1=1+((A-8)/(2.285*((2*3.14*fh1/fs)-(2*3.14*fl1/
      fs))));
36 N=ceil((temp1-1)/2);
37 n=-N:N;
38 h1=(((w21+w11)/2)*(sinc(((w21+w11)/2)*n)))/(3.14);
39
40 h=h2-h1;
41
42 [xmb,frb]=frmag(h,8000);
43
44 figure;
45 plot(frb,xmb);
46 title('Frequency Response','color','red','fontsize',
      4);
47 xlabel("Frequency", "fontsize", 2,"color", "blue");
48 ylabel("Gain", "fontsize", 2, "color", "blue");
```

Experiment: 11

Design Equillizer (LOW + HIGH + BANDPASS) as per the given specification

Scilab code Solution 11.01 Equilizer Design

```
1 // Exp-16 : Design Equillizer (LOW + HIGH + BANDPASS
    ) as per the given specification
2
3 // Version : Scilab 5.4.1
4 // Operating Syatem : Window-xp, Window-7
5
6 clc;
7 close;
8 clear;
9
10 function [xm1,fr1]=low(fl,fh)
11
12 delta1=0.1;
13 delta2=0.1;
14 //fl=200;
15 //fh=300;
16 fs=8000;
```

```
17 A=-20*log10(min(delta1:delta2));
18 w1=2*3.14*fl/fs;
19 w2=2*3.14*fh/fs;
20 temp=1+((A-8)/(2.285*((2*3.14*fh/fs)-(2*3.14*fl/fs))
      ));
21 N=ceil((temp-1)/2);
22 n=-N:N;
23 h=(((w2+w1)/2)*(sinc(((w2+w1)/2)*n)))/(3.14);
24 //plot(n,h);
25
26 [xm1,fr1]=frmag(h,8000);
27 //figure;
28 //plot(fr1,xm1);
29
30 endfunction
31
32 ////////////////////////////
33 function [xmh,frh]=highpass(fl,fh)
34
35
36
37 delta1=0.1;
38 delta2=0.1;
39 //fl=400;
40 //fh=500;
41 fs=8000;
42 A=-20*log10(min(delta1:delta2));
43 w1=2*3.14*fl/fs;
44 w2=2*3.14*fh/fs;
45 temp=1+((A-8)/(2.285*((2*3.14*fh/fs)-(2*3.14*fl/fs))
      ));
46 N=ceil((temp-1)/2);
47 n=-N:N;
48 del=[zeros(1:N) 1 zeros(N+1:2*N)];
49 h=del-(((w2+w1)/2)*(sinc(((w2+w1)/2)*n)))/(3.14);
50 //h=[-h(1:30) 0 -h(32:61)];
51 //figure;
52 //plot(n,h);
```

```
53
54 [xmh,frh]=frmag(h,8000);
55 //figure;
56 //plot(frh,xmh);
57 endfunction
58
59
60 ////////////////////////////////////////
61 function [xmb,frb]=bandpass(fl1,fh1,fl2,fh2)
62
63 delta1=0.1;
64 delta2=0.1;
65 //fl2=350;
66 //fh2=450;
67 fs=8000;
68 A=-20*log10(min(delta1:delta2));
69 w12=2*3.14*fl2/fs;
70 w22=2*3.14*fh2/fs;
71 temp2=1+((A-8)/(2.285*((2*3.14*fh2/fs)-(2*3.14*fl2/
      fs))));
72 N=ceil((temp2-1)/2);
73 n=-N:N;
74 h2=(((w22+w12)/2)*(sinc(((w22+w12)/2)*n)))/(3.14);
75
76
77 //[xm2,fr2]=frmag(h2,8000);
78
79 ////////////////////////////
80 delta1=0.1;
81 delta2=0.1;
82 //fl1=250;
83 //fh1=350;
84 fs=8000;
85 A=-20*log10(min(delta1:delta2));
86 w11=2*3.14*fl1/fs;
87 w21=2*3.14*fh1/fs;
88 temp1=1+((A-8)/(2.285*((2*3.14*fh1/fs)-(2*3.14*fl1/
      fs))));
```

```
89  N=ceil((temp1-1)/2);
90  n=-N:N;
91  h1=(((w21+w11)/2)*(sinc(((w21+w11)/2)*n)))/(3.14);
92
93  h=h2-h1;
94
95  [xmb,frb]=frmag(h,8000);
96
97
98  //figure;
99  //plot(frb,xmb);
100 endfunction
101
102 ////////////////////Main Programm ////////////
103
104 [y,fs]=wavread('original.wav');  // User can read
      any .wav file
105
106 ////////////    LOW PASS    ///////////////////////
107 fl=200;                  // Lower Cut-Off Frequency
108 fh=300;                  // Higher Cut-Off Frequency
109 [xm1,fr1]=low(fl,fh);    // Function for Low Pass
      Filter
110 /////////////////   HIGH PASS   /////////////////
111 fl=400;                  // Lower Cut-Off Frequency
112 fh=500;                  // Higher Cut-Off Frequency
113 [xmh,frh]=highpass(fl,fh);   // Function for high
      Pass Filter
114 ////////////////////  BAND PASS
      ////////////////////
115 fl1=250;                // Lower Cut-Off Frequency1
116 fh1=350;                // Higher Cut-Off Frequency1
117 fl2=350;                // Lower Cut-Off Frequency2
118 fh2=450;                // Higher Cut-Off Frequency2
119 [xmb,frb]=bandpass(fl1,fh1,fl2,fh2);  // Function
      for Band Pass Filter
120 //
      ////////////////////////////////////////////////////
```

```
121
122 gain_L=2;          // Gain for Low Pass Frequency
123 gain_B=5;          // Gain for band Pass Frequency
124 gain_H=2;          // Gain for High Pass Frequency
125 sig_L=conv(y*gain_L,xm1);
126 sig_B=conv(y*gain_B,xmb);
127 sig_H=conv(y*gain_H,xmh);
128 sig_T=sig_L+sig_H+sig_B;
129 figure;
130 plot(y);
131 title('Original Signal (DTMF)','color','red','
      fontsize', 4);
132 xlabel("Time Index (Samples)", "fontsize", 2,"color"
      , "blue");
133 ylabel("Amplitude", "fontsize", 2, "color", "blue");
134
135 figure;
136 plot(sig_T);
137 title('Filtered Signal (DTMF)','color','red','
      fontsize', 4);
138 xlabel("Time Index (Samples)", "fontsize", 2,"color"
      , "blue");
139 ylabel("Amplitude", "fontsize", 2, "color", "blue");
140
141 sound(sig_T,fs);
142
143 //sound(y,fs);
```

Experiment: 12

To Generation of ECG signals used in Medical Processing

Scilab code Solution 12.01 ECG Wave Generation

```
1  // Exp-18 : To Generation of ECG signals used in
       Medical Processing
2
3  // Version : Scilab 5.4.1
4  // Operating Syatem : Window-xp, Window-7
5
6  clc;
7  clear;
8  close;
9  cycle=zeros(1,500);
10 y=[01 2 3 4 5 6 7 8 9 10 9 8 7 6 5 4 3 2 1 0]/4;
       // Triangle pulse segment
11 t=[0:1:40];
       // Local time axis
12 a=(.05*(t-20).*(t-20)-20)/50;
       // Parabolic recovery segment
13 cycle(1:61)=2*[y a];
       // Place pulse in 1sec. cycle
14 cyc=filter([1 1 1 1 1], [1], cycle);
```

```
    // Smooth the corners
15 x=[cyc cyc cyc cyc cyc];                          //
    Repetition used for 5 cycle of trace
16 [idum, nsize]=size(x);
17 t=[0:1:nsize-1]/500;
    // Sampling frequency 500Hz
18 plot(t,x);
19 title('ECG Signal','color','red','fontsize', 4);
20 xlabel("Time Index", "fontsize", 2,"color", "blue");
21 ylabel("Amplitude", "fontsize", 2, "color", "blue");
```

Experiment: 13

Design the following Low Pass analog filters with the given specification. (1) Butter Worth (2) Chebyshev-I (3) Chebyshev-II

Scilab code Solution 13.01 Low Pass Filter Design

```
1 // Exp-19 : Design the following Low Pass analog
    filters with the given specification.
2 //          (1) Butter Worth  (2) Chebyshev-I  (3)
    Chebyshev-II  (4) Elliptical
3
4
5 //Evaluate magnitude response of the filter
6
7 // Version : Scilab 5.4.1
8 // Operating Syatem : Window-xp, Window-7
9
10 clc;
11 close;
```

```
12 clear;
13
14 fcut=5; //hz
15 n=5;//filter order
16 hc1=analpf(n,'cheb1',[0.1 0],fcut*2*%pi);
17 hc2=analpf(n,'cheb2',[0 0.1],fcut*2*%pi);
18 he=analpf(n,'ellip',[0.1 0.1],fcut*2*%pi);
19 hb=analpf(n,'butt',[0 0],fcut*2*%pi);
20 //hc1.dt='c';hc2.dt='c';he.dt='c';hb.dt='c';
21 clf();
22 [fr, hf]=repfreq(hc1,0,15);
23 plot(fr,abs(hf),'b')
24 [fr, hf]=repfreq(hc2,0,15);
25 plot(fr,abs(hf),'y')
26 [fr, hf]=repfreq(he,0,15);
27 plot(fr,abs(hf),'r')
28 [fr, hf]=repfreq(hb,0,15);
29 plot(fr,abs(hf),'c')
30
31 xgrid();
32 legend(["Chebyshev I","Chebyshev II","Elliptic","
      Butterworth"]);
33 xlabel("Frequency (Hz)");
34 ylabel("Gain");
35 title("Analog filters of order 5");
```

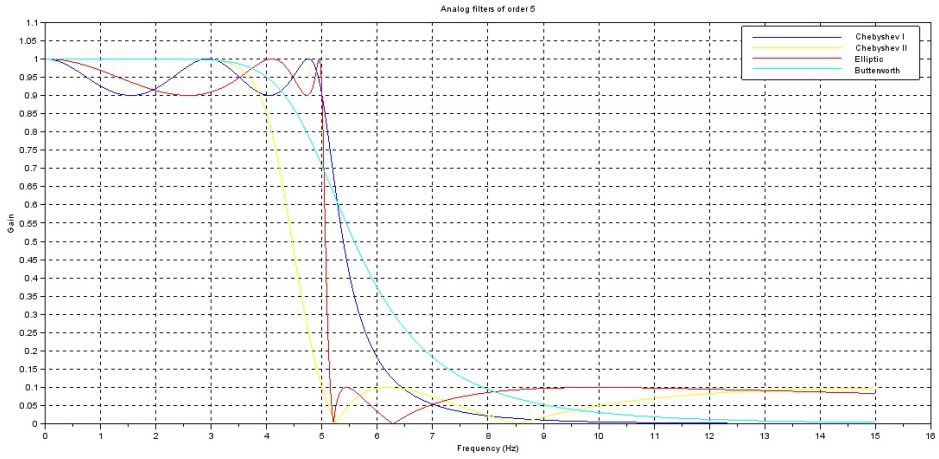


Figure 13.1: Low Pass Filter Design

Experiment: 14

Design the following IIR filters with the given specification. (1) Butter Worth (2) Chebyshev-I (3) Chebyshev-II (4) Elliptic

Scilab code Solution 14.01 IIR filter Design

```
1 // Exp-20 : Design the following IIR filters with
    the given specification.
2 //           (1) Butter Worth  (2) Chebyshev-I  (3)
    Chebyshev-II  (4) Elliptical
3
4 //
    ////////////////////////////////////////////////////////////
5 //     Example:
6 //                  filter type ('lp','hp','sb','bp')
7 //                  design approximation ('butt','
    cheb1','cheb2','ellip')
8 //                  om=[om1,om2,om3,om4], 0 <= om1 <=
     om2 <= om3 <= om4 <= pi .When ftype='lp' or 'hp
    ', om3 and om4 are not used and may be set to 0.
```

```
9  //                    0<= deltap <=1
10 //                    0<= deltas <=1
11 //
   ////////////////////////////////////////////////////////////////////////

12
13 //Evaluate magnitude response of the filter
14
15 // Version : Scilab 5.4.1
16 // Operating Syatem : Window-xp, Window-7
17
18 clc;
19 close;
20 clear;
21 //ftype=input('Enter the Filter Type:','s');
22 //approx=input('Enter the Filter Name:','s');
23 //om=input('Enter Cut-Off Frequency Vector:');
24 //deltap=input('Enter Ripple in the Passband:');
25 //deltas=input('Enter ripple in the Stopband:');
26
27
28 ftype='lp';
29 approx='cheb2';
30 om=[0.3 0.5];
31 deltap=0.1;
32 deltas=0.4;
33
34
35 [cells,fact,zzeros,zpoles]=eqiir(ftype,approx,om,
      deltap,deltas);
36 h=fact*poly(zzeros,'z')/poly(zpoles,'z');
37
38 pole_real=[];
39 pole_imag=[];
40 for i=1:length(zpoles)
41     pole_real=[pole_real real(zpoles(i))];
42     pole_imag=[pole_imag imag(zpoles(i))];
43 end
```

```
44
45
46 mtlb_axis([-1 1 -1 1]);
47 xgrid();
48 plot(pole_real,pole_imag,'cya+','marker','d','
      markerfac','red','markeredg','red');
49
50 title('Pole Location','color','red','fontsize', 4);
51 xlabel("Real Axis", "fontsize", 2,"color", "blue");
52 ylabel("Imaginary Axis", "fontsize", 2, "color", "
      blue");
```

Experiment: 15

Design the following FIR filters with the given specification. (1) Low Pass (2) High Pass (3) Band Pass (4) Band Stop

Scilab code Solution 15.01 FIR Filter

```
1 // Exp-21 : Design the following FIR filters with
    the given specification.
2 //
3
4 //
    ////////////////////////////////////////////////////////////
5 //    Example:
6 //                  filter type ('lp','hp','sb','bp')
7 //                  Filter order (pos integer)(odd
    for ftype='hp' or 'sb')
8 //                  cfreq=2-vector of cutoff
    frequencies (0<cfreq(1),cfreq(2)<.5) only cfreq
    (1) is used when ftype='lp' or 'hp'
9 //                  wtype= Window type ('re','tr','hm
```

```
    ','hn','kr','ch')
10 //                  fpar=2-vector of window
    parameters. Kaiser window fpar(1)>0 fpar(2)=0.
    Chebyshev window fpar(1)>0, fpar(2)<0 or fpar(1)
    <0, 0<fpar(2)<.5
11 //                  wft=time domain filter
    coefficients
12 //                  wfm=frequency domain filter
    response on the grid fr
13 //                  fr=Frequency grid
14 //
    ////////////////////////////////////////////////////////////////

15
16 //Evaluate magnitude response of the filter
17
18 // Version : Scilab 5.4.1
19 // Operating Syatem : Window-xp, Window-7
20
21 clc;
22 close;
23 clear;
24
25 //ftype=input('Enter the Filter Type:','s');
26 //forder=input('Enter Order of Filter:');
27 //cfreq=input('Enter Cut-Off Frequency Vector:');
28 //wtype=input('Enter the Window Type:','s');
29 //fpar=input('Enter Window Parameter:');
30
31 ftype='bp';
32 forder=33;
33 fs=8000;
34 cfreq=[(450/fs) (500/fs)];
35 wtype='kr';
36 fpar=[0.8 0];
37
38
39 [wft,wfm,fr]=wfir(ftype,forder,cfreq,wtype,fpar);
```

```
40
41 clf();
42 plot(fr,wfm,'b');
43 title('Frequency Responce','color','red','fontsize',
       4);
44 xlabel("Frequency", "fontsize", 2,"color", "blue");
45 ylabel("Magnitude", "fontsize", 2, "color", "blue");
```