Scilab Manual for
ANALOG AND DIGITAL COMMUNICATION LABORATORY
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Electronics and Telecommunication Engineering

Sreyas Institute Of Engineering And Technology[1]

Solutions provided by
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Experiment: 1

AMPLITUDE MODULATION AND DEMODULATION AND ITS SPECTRUM ANALYSIS

Scilab code Solution 1.1 Exp01

```
1  //Experiment Number:1
2  //Write a program to perform Amplitude modulation
      and demodulation and study its spectral
      characteristics
3  //Analog and Digital Communication Laboratory
4  //B.Tech II Year II Sem
5  //Student Name:              Enrolment Number:
6  // Course Instructor: Aqeel Shaik
7  // Sreyas Institute Of Engineering & Technology,
      Hyderabad.
8  //
      _____

9
10
11  // OS : Windows 10.1
12  // Scilab 6.0.2
```

```
13
14  clc;
15  clear;
16  close;
17  fm=3;      // Message freq
18  fc=20;    // Carrier freq
19  fs=100
20  t=0:1/fs :3;
21  p=length(t);
22  am=input('Enter the message signal amplitude=');
23  ac=input('Enter the carrier signal amplitude (ac>am)
        =');
24
25  // Message Signal Generation
26
27  msg=am*cos(2*%pi*fm*t);
28
29  figure(1);
30  subplot(3,1,1);
31  plot(t,msg);
32  xlabel('TIME');
33  ylabel('AMPLITUDE')
34  title('Message Signal');
35
36  //Carrier Signal generation
37  carrier=ac*cos(2*%pi*fc*t);
38  subplot(3,1,2);
39  plot(t,carrier);
40  xlabel('TIME');
41  ylabel('AMPLITUDE')
42  title('Carrier Signal');
43
44  ka=1/ac; //Amplitude sensitivity of the modulator
45  u=ka*am;
46  disp(u,'The Modulation Index is ')
47
48  //Amplitude Modulation Generation
49
```

```
50  am_mod=(1+ka.*msg).*carrier;
51  subplot(3,1,3);
52  plot(t,am_mod);
53  xlabel('TIME');
54  ylabel('AMPLITUDE')
55  title('Amplitude Modulated Signal')
56
57  // Frqeuncy Spectrum
58  d=(-p/2:1:p/2-1)*1/3;// Indexing
59  figure(2)
60  subplot(3,1,1);
61  plot(d,abs(fftshift(fft(am_mod))));// FOURIER
        TRANSFORM OF MODULATED SIGNAL
62  xlabel('FREQUENCY');
63  ylabel('AMPLITUDE')
64  title('AM Signal Spectrum')
65
66
67  //Demodulation of AM Signal
68  demod=am_mod.*carrier;
69  k=abs(fft(demod));
70  filt = [ones(1,4*fm), zeros(1,p-4*fm) ];
71  out=k.*filt;
72  subplot(3,1,3);
73  plot(t,ifft(out));
74  xlabel('TIME');
75  ylabel('AMPLITUDE');
76  title('Demodulated Message')
77
78  //Sample Inputs for the Program
79
80  //Enter the message signal amplitude=1
81
82  //Enter the carrier signal amplitude (ac>am)=2
83
84
85  // The Modulation Index is
86
```
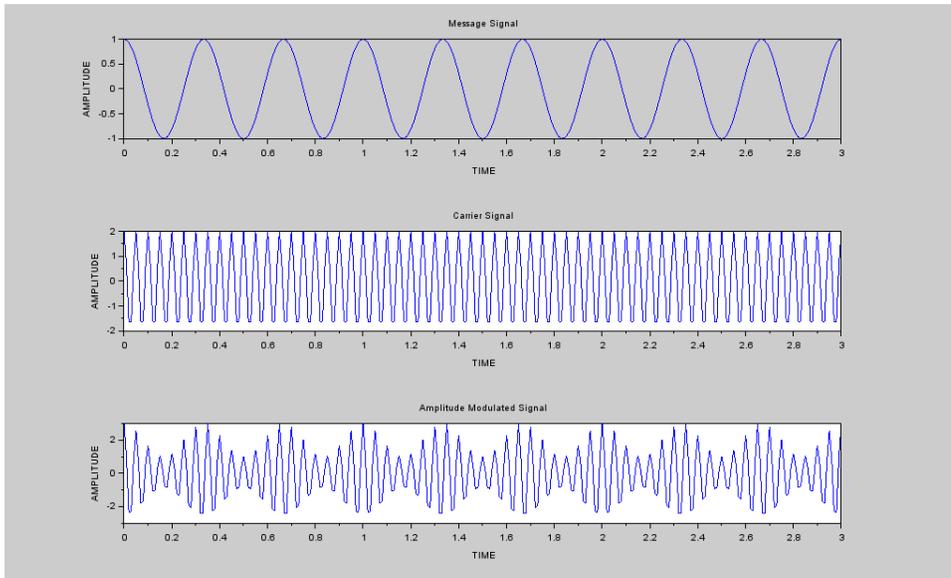
Figure 1.1: Exp01

87   //   0.5
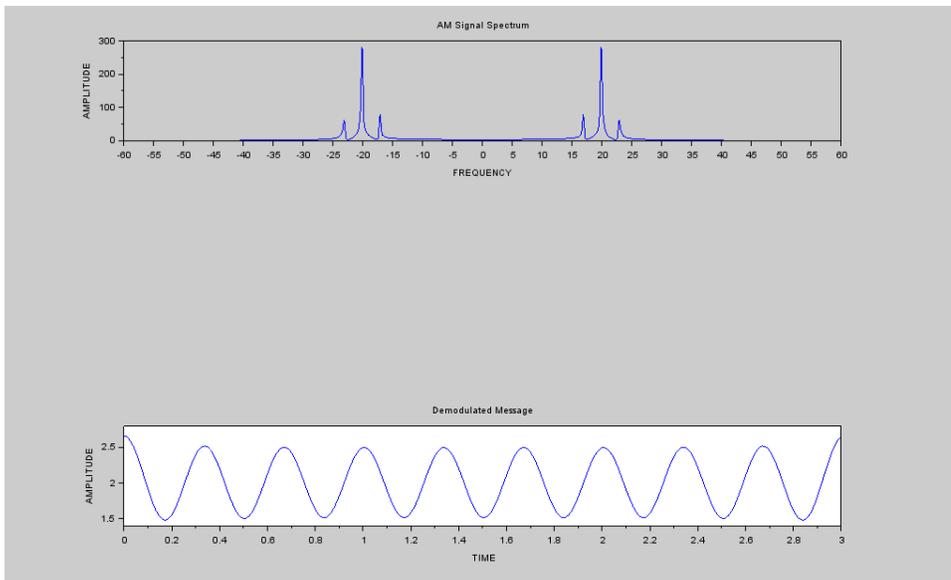
Figure 1.2: Exp01

Experiment: 2

DOUBLE SIDE BAND SUPPRESSED CARRIER MODULATION AND DEMODULATION AND ITS SPECTRUM ANALYSIS

Scilab code Solution 2.0 Exp02

```
1 //Experiment Number:2
2 //Write a program to perform DSBSC modulation and
      demodulation and study its spectral
      characteristics
3 //Analog and Digital Communication Laboratory
4 //B.Tech II Year II Sem
5 //Student Name:              Enrolment Number:
6 // Course Instructor: Aqeel Shaik
7 // Sreyas Institute Of Engineering & Technology,
      Hyderabad.
8 //
      _____
```

```
9
10
11  // OS : Windows 10.1
12  // Scilab 6.0.2
13
14  clc;
15  clear;
16  close;
17
18  fs=100
19  t=0:1/fs :3;
20  p=length(t);
21  fm=input('Enter the message signal frequency =');
22  fc=input('Enter the carrier signal frequency (fc >>>
        fm) =');
23  am=input('Enter the message signal amplitude =');
24  ac=input('Enter the carrier signal amplitude =');
25
26  // Message Signal Generation
27
28  msg=am*cos(2*%pi*fm*t);
29
30  figure(1);
31  subplot(3,1,1);
32  plot(t,msg);
33  xlabel('TIME');
34  ylabel('AMPLITUDE')
35  title('Message Signal');
36
37  //Carrier Signal generation
38  carrier=ac*cos(2*%pi*fc*t);
39  subplot(3,1,2);
40  plot(t,carrier);
41  xlabel('TIME');
42  ylabel('AMPLITUDE')
43  title('Carrier Signal');
44
45  //DSBSC Modulation Generation
```

```
46
47  dsbsc_mod=msg.*carrier;
48  subplot(3,1,3);
49  plot(t,dsbsc_mod);
50  xlabel('TIME');
51  ylabel('AMPLITUDE')
52  title('Amplitude Modulated Signal')
53
54  // Frqeuncy Spectrum
55  d=(-p/2:1:p/2-1)*1/3;
56  figure(2)
57  subplot(3,1,1);
58  plot(d,abs(fftshift(fft(dsbsc_mod))));// FOURIER
        TRANSFORM OF MODULATED SIGNAL
59  xlabel('FREQUENCY');
60  ylabel('AMPLITUDE')
61  title('DSBSC Signal Spectrum')
62
63
64  //Demodulation of DSBSC Signal
65  demod=dsbsc_mod.*carrier;
66  k=abs(fft(demod));
67  filt = [ones(1,4*fm), zeros(1,p-4*fm) ];
68  out=k.*filt;
69  subplot(3,1,3);
70  plot(t,ifft(out));
71  xlabel('TIME');
72  ylabel('AMPLITUDE');
73  title('Demodulated Message')
74
75  // Sample Inputs for the Program
76
77  //Enter the message signal frequency =2
78
79  //Enter the carrier signal frequency (fc>>>fm) =20
80
81  //Enter the message signal amplitude =1
82
```
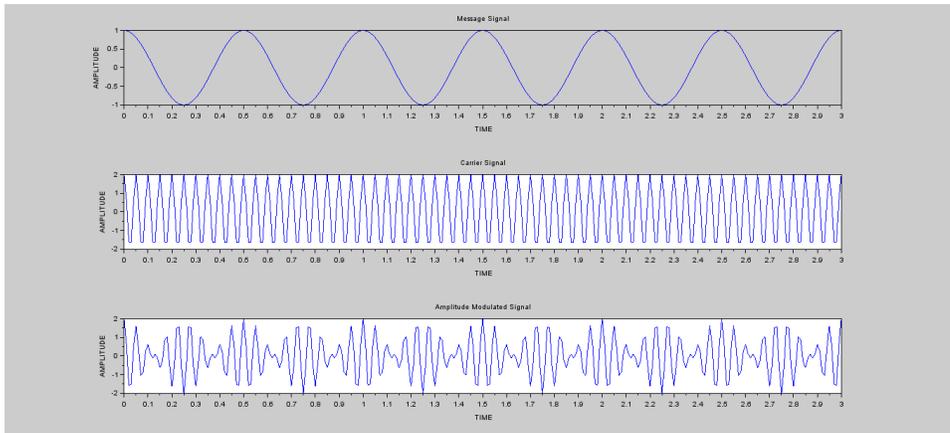
Figure 2.1: Exp02

83 //Enter the carrier signal amplitude =2
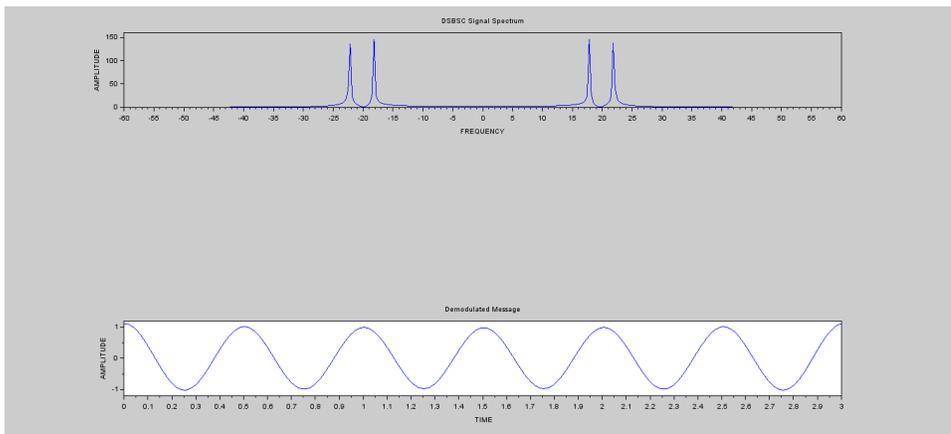
Figure 2.2: Exp02

Experiment: 3

SINGLE SIDE BAND MODULATION AND DEMODULATION AND ITS SPECTRUM ANALYSIS

Scilab code Solution 3.0 Exp03

```
1  //Experiment  Number:3
2  //Write  a  program  to  perform  SSB  modulation  and
       demodulation  and  study  its  spectral
       characteristics
3  //Analog  and  Digital  Communication  Laboratory
4  //B.Tech  II  Year  II  Sem
5  //Student  Name:                  Enrolment  Number:
6  //  Course  Instructor:  Aqeel  Shaik
7  //  Sreyas  Institute  Of  Engineering  &  Technology,
       Hyderabad.
8  //
       _____

9
10
```

```scilab
11  // OS : Windows 10.1
12  // Scilab 6.0.2
13
14  clc;
15  clear;
16  close;
17
18  fs=200
19  t=0:1/fs:2;
20  p=length(t);
21
22  fm=input('Enter the message signal frequency =');
23  fc=input('Enter the carrier signal frequency (fc >>>
       fm) =');
24  am=input('Enter the message signal amplitude =');
25  ac=input('Enter the carrier signal amplitude =');
26
27  // Message Signal Generation
28
29  msg=am*cos(2*%pi*fm*t);
30
31  figure(1);
32  subplot(4,1,1);
33  plot(t,msg);
34  xlabel('TIME');
35  ylabel('AMPLITUDE')
36  title('Message Signal');
37
38  //Carrier Signal generation
39
40  carrier=ac*cos(2*%pi*fc*t);
41
42  subplot(4,1,2);
43  plot(t,carrier);
44  xlabel('TIME');
45  ylabel('AMPLITUDE')
46  title('Carrier Signal');
47
```

```
48
49  // Hilbert Transform of Message Signal
50
51  h_msg=imag(hilbert(msg));
52
53  subplot(4,1,3);
54  plot(t,h_msg);
55  xlabel('TIME');
56  ylabel('AMPLITUDE')
57  title('Message Signal');
58
59  // Hilbert Transform of Carrier Signal
60
61  h_carrier=imag(hilbert(carrier));
62
63  subplot(4,1,4);
64  plot(t,h_carrier);
65  xlabel('TIME');
66  ylabel('AMPLITUDE')
67  title('Message Signal');
68
69
70
71  //SINGLE SIDE BAND MODULATION GENERATION
72  ssbmod_lsb=(msg.*carrier)+(h_msg.*h_carrier) //Lower
        Side Band
73
74  figure(2)
75  subplot(4,1,1);
76  plot(t,ssbmod_lsb);
77  xlabel('time');
78  ylabel('amplitude')
79  title('SSB Modulated Signal (LSB)');
80
81  ssbmod_usb=(msg.*carrier)-(h_msg.*h_carrier) //Upper
        Side Band
82  subplot(4,1,2);
83  plot(t,ssbmod_usb);
```

```
84  xlabel('time');
85  ylabel('amplitude')
86  title('SSB Modulated Signal (USB)');
87
88  //Frqeuncy Spectrum of SSB (LSB) Signal
89  d=(-p/2:1:p/2-1)*1/2;
90  subplot(4,1,3);
91  plot(d,abs(fftshift(fft(ssbmod_lsb))));// Normalized
        Frequency spectrum
92  xlabel('frequency');
93  ylabel('amplitude');
94  title('SSB Signal Spectrum (LSB)')
95
96  //Frqeuncy Spectrum of SSB (USB) Signal
97
98  subplot(4,1,4);
99  plot(d,abs(fftshift(fft(ssbmod_usb))));// Normalized
        Frequency spectrum
100 xlabel('frequency');
101 ylabel('amplitude');
102 title('SSB Signal Spectrum (USB)')
103
104
105 //Demodulation of SSB Signal
106 demod=ssbmod_lsb.*carrier;
107 k=abs(fft(demod));
108 filt = [ones(1,3*fm), zeros(1,p-3*fm) ];
109 out=k.*filt;
110 figure(3)
111 subplot(3,1,1);
112 plot(t,ifft(out));
113 xlabel('TIME');
114 ylabel('AMPLITUDE');
115 title('Demodulated Message')
116
117 // Sample Inputs for the Program
118
119 //Enter the message signal frequency =2
```
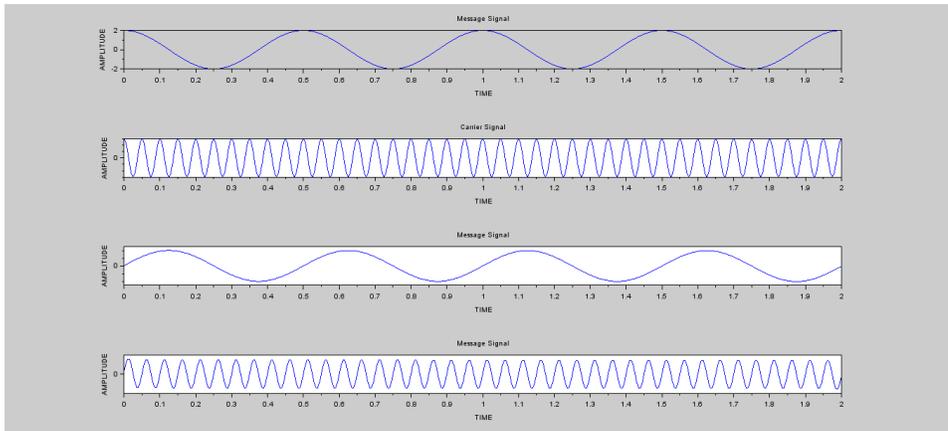
Figure 3.1: Exp03

```
120
121  //Enter  the  carrier  signal  frequency  (fc>>>fm)  =20
122
123  //Enter  the  message  signal  amplitude  =2
124
125  //Enter  the  carrier  signal  amplitude  =3
```
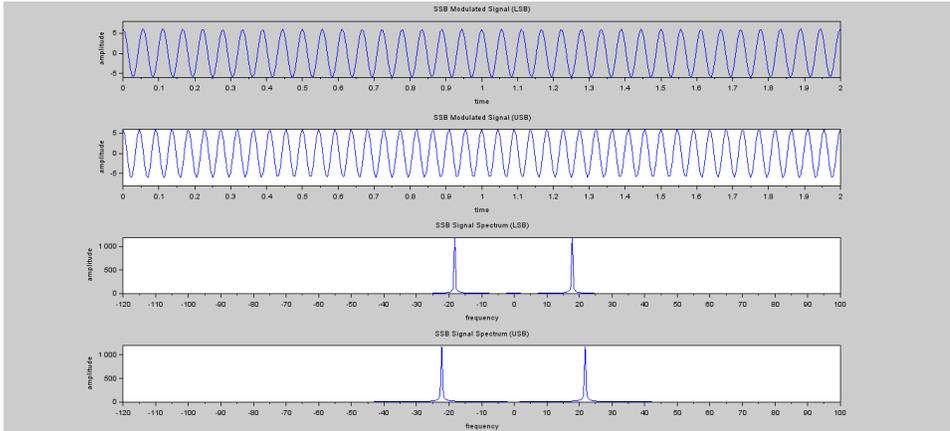
Figure 3.2: Exp03

Figure 3.3: Exp03

22
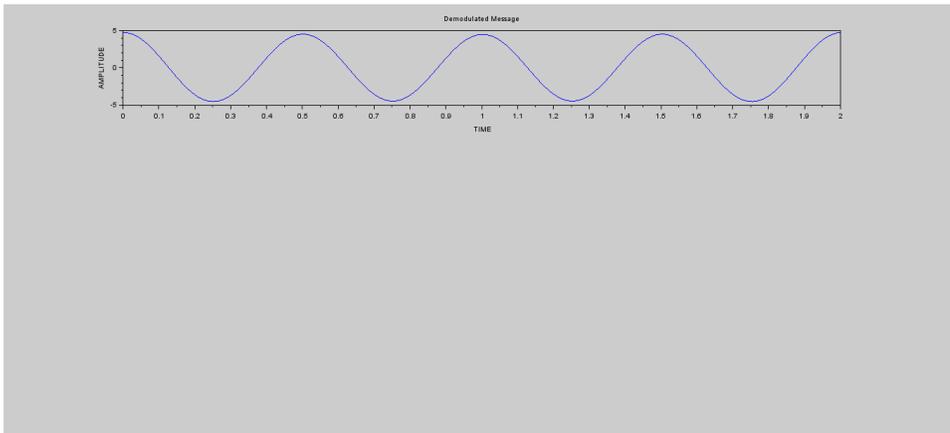
Experiment: 4

FREQUENCY MODULATION AND ITS SPECTRUM ANALYSIS

Scilab code Solution 4.0 Exp04

```scilab
1  //Experiment Number:4
2  //Write a program to perform Frequency modulation
     and study of its spectral characteristics
3  //Analog and Digital Communication Laboratory
4  //B.Tech II Year II Sem
5  //Student Name:               Enrolment Number:
6  // Course Instructor: Aqeel Shaik
7  // Sreyas Institute Of Engineering & Technology,
     Hyderabad.
8  //_____

9
10
11 // OS : Windows 10.1
12 // Scilab 6.0.2
13
```

```
14 clc;
15 clear;
16 close;
17
18 fs=300
19 t=0:1/fs:2;
20 p=length(t);
21
22 fm=input('Enter the message signal frequency =');
23 fc=input('Enter the carrier signal frequency (fc>>>
       fm) =');
24 am=input('Enter the message signal amplitude =');
25 ac=input('Enter the carrier signal amplitude =');
26
27 // Message Signal Generation
28
29 msg=am*cos(2*%pi*fm*t);
30
31 figure(1);
32 subplot(3,1,1);
33 plot(t,msg);
34 xlabel('TIME');
35 ylabel('AMPLITUDE')
36 title('Message Signal');
37
38 //Carrier Signal generation
39
40 carrier=ac*cos(2*%pi*fc*t);
41
42 subplot(3,1,2);
43 plot(t,carrier);
44 xlabel('TIME');
45 ylabel('AMPLITUDE')
46 title('Carrier Signal');
47
48 // Frequency Modulation Generation
49 kf=4;
50 mod_index=(kf*am)/fm;
```

```scilab
51  disp(mod_index, 'The Modulation Index is');
52
53  fm_mod=ac*cos((2*%pi*fc*t)+(mod_index.*sin(2*%pi*fm*
        t)));
54  subplot(3,1,3);
55  plot(t,fm_mod);
56  xlabel('Time');
57  ylabel('Amplitude')
58  title('Frequency Modulated Signal');
59
60  // Frqeuncy Spectrum
61
62  d=(-p/2:1:p/2-1)*1/3;
63  figure(2)
64  subplot(3,1,1);
65  plot(d,abs(fftshift(fft(fm_mod))));// FOURIER
        TRANSFORM OF MODULATED SIGNAL
66  xlabel('Frequency');
67  ylabel('Amplitude');
68  title('FM Signal Spectrum')
69
70  //Sample Inputs for Program
71
72  //Enter the message signal frequency =2
73
74  //Enter the carrier signal frequency (fc>>>fm) =23
75
76  //Enter the message signal amplitude =4
77
78  //Enter the carrier signal amplitude =3
79
80
81   //The Modulation Index is
82
83   //   8.
```
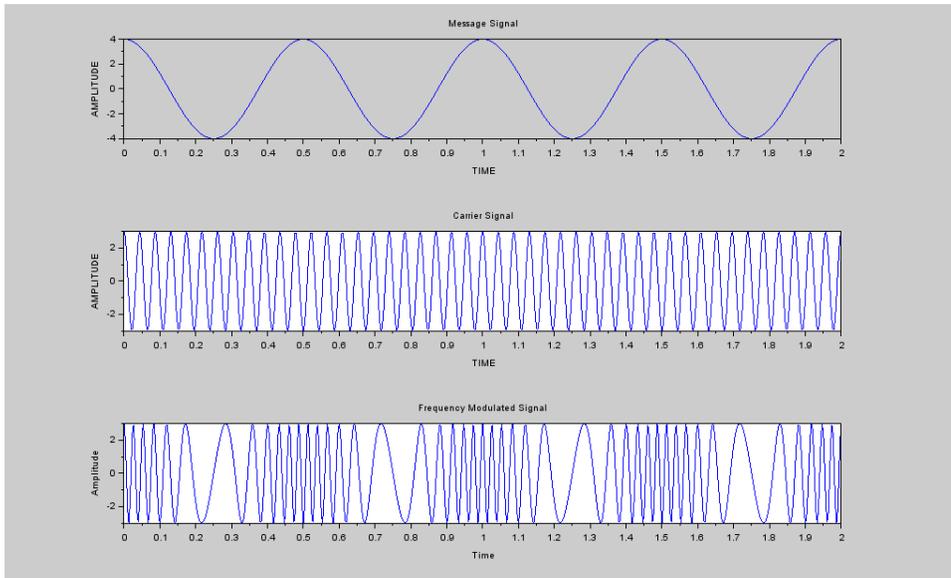
Figure 4.1: Exp04
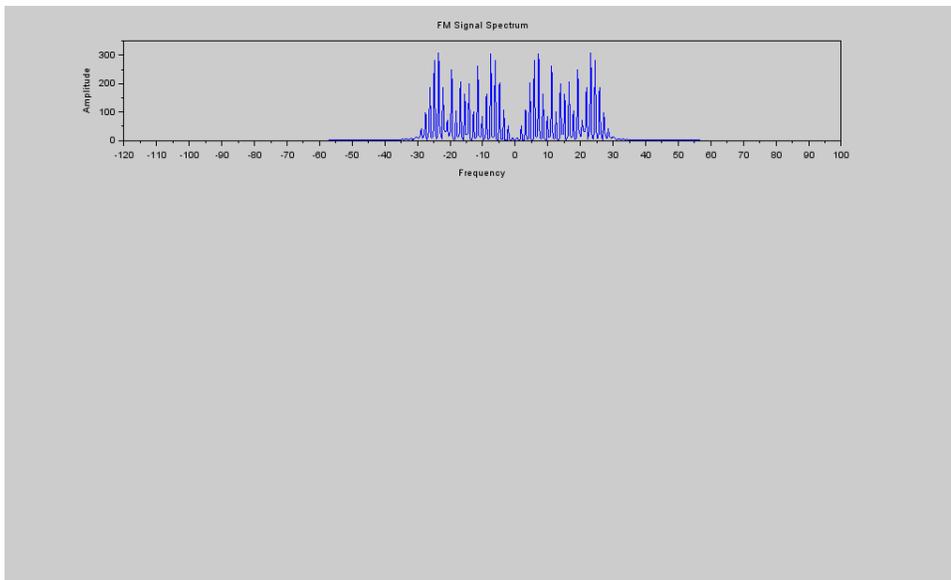
Figure 4.2: Exp04

Experiment: 5

PULSE AMPLITUDE MODULATION AND DEMODULATION AND ITS SPECTRUM ANALYSIS

Scilab code Solution 5.0 Exp05

```
1  //Experiment  Number:5
2  //Write  a  program  to  perform  Pulse  Amplitude
       modulation  and  demodulation
3  //Analog  and  Digital  Communication  Laboratory
4  //B.Tech  II  Year  II  Sem
5  //Student  Name:                Enrolment  Number:
6  //  Course  Instructor:  Aqeel  Shaik
7  //  Sreyas  Institute  Of  Engineering  &  Technology,
       Hyderabad.
8  //
       _____

9
10
11  //  OS  :  Windows  10.1
```

```scilab
12  // Scilab 6.0.2
13
14  clc;
15  clear;
16  close;
17
18  fs=300
19  t=0:1/fs :2;
20  p=length(t);
21  fm=input('Enter the message signal frequency =');
22  fc=input('Enter the carrier signal frequency (fc >>>
        fm) =');
23  am=input('Enter the message signal amplitude =');
24  ac=input('Enter the carrier signal amplitude =');
25
26
27  // Message Signal Generation
28  msg=am+am*sin(2*%pi*fm*t);
29  figure(1);
30  subplot(3,1,1);
31  plot(t,msg);
32  xlabel('time');
33  ylabel('amplitude')
34  title('Message Signal');
35
36  //Carrier Signal generation
37  carrier=ac+ac*squarewave(2*%pi*fc*t);
38
39  subplot(3,1,2);
40  plot(t,carrier);
41  h=gca();
42  h.data_bounds=[0,-1;2,3*ac]
43  xlabel('time');
44  ylabel('amplitude')
45  title('Carrier Signal');
46
47  //Generation of PAM Signal
48  pam_mod=msg.*carrier;
```

```
49 subplot(3,1,3);
50 plot(t,pam_mod);
51 xlabel('time');
52 ylabel('amplitude')
53 title('Pulse Amplitude Modulated Signal');
54
55 //Demodulation of PAM Signal
56 demod=pam_mod.*carrier;
57 k=abs(fft(demod));
58 filt = [ones(1,3*fm), zeros(1,p-3*fm) ];
59 out=k.*filt;
60 figure(2)
61 subplot(3,1,1);
62 plot(t,ifft(out));
63 xlabel('TIME');
64 ylabel('AMPLITUDE');
65 title('Demodulated Message')
66
67 //Sample inputs for program
68 //Enter the message signal frequency =3
69
70 //Enter the carrier signal frequency (fc>>>fm) =25
71
72 //Enter the message signal amplitude =3
73
74 //Enter the carrier signal amplitude =5
```
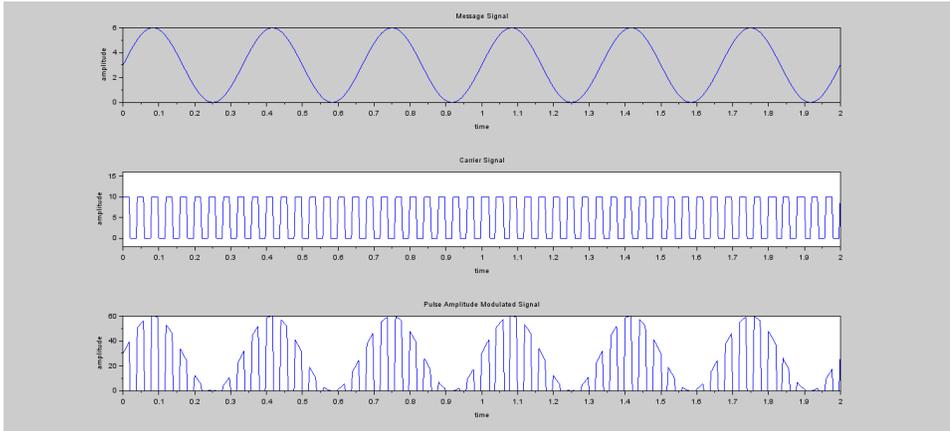
Figure 5.1: Exp05

Figure 5.2: Exp05

31
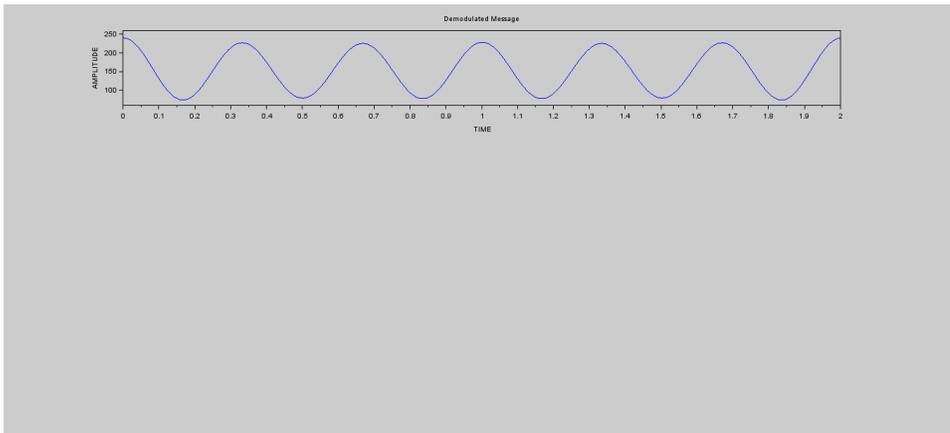
Experiment: 6

TIME DIVISION MULTIPLEXING AND DEMULTIPLEXING

Scilab code Solution 6.0 Exp06

```scilab
1  //Experiment  Number:6
2  //Write  a  program  to  perform  Time  division
        multiplexing  and  demultiplexing  of  3  signals
3  //Analog  and  Digital  Communication  Laboratory
4  //B.Tech  II  Year  II  Sem
5  //Student  Name:                Enrolment  Number:
6  //  Course  Instructor:  Aqeel  Shaik
7  //  Sreyas  Institute  Of  Engineering  &  Technology,
      Hyderabad.
8  //_____

9
10
11  //  OS  :  Windows  10.1
12  //  Scilab  6.0.2
13
```

```scilab
14  clc;
15  close;
16  clear
17  fs=100
18  t=0:1/fs:1;
19
20  //GENERATION OF 3 MESSAGE SIGNALS FOR MULTIPLEXING
21
22      //Message Signal 1
23  message_1 = 2*sin(2*%pi*3*t);//Sine signal of
       frequency 3hz
24  figure(1)
25  subplot(3,1,1)
26  plot2d3(t,message_1)
27  xlabel('TIME');
28  ylabel('AMPLITUDE')
29  title('MESSAGE SIGNAL 1(SINE WAVE)');
30
31      //Message Signal
32  message_2 = 1*squarewave(2*%pi*3*t); //Squarewave
       signal of frequency 3hz
33  subplot(3,1,2)
34  plot2d3(t,message_2)
35  xlabel('TIME');
36  ylabel('AMPLITUDE')
37  title('MESSAGE SIGNAL 2(SQUAREWAVE)');
38
39      //Message Signal 3
40  message_3 = 3*cos(2*%pi*3*t) //Cosine signal of
       frequency 3hz
41  subplot(3,1,3)
42  plot2d3(t,message_3)
43  xlabel('TIME');
44  ylabel('AMPLITUDE')
45  title('MESSAGE SIGNAL 3(COSINE WAVE)');
46
47
48  // GENERATIONN OF TIME DIVISION MULTIPLEXED SIGNAL
```

```
49
50  tdm=0;
51  j=1
52
53  for i=1:3:3*length(t)
54
55          tdm(i)=message_1(j);
56          i=i+1;
57          tdm(i)=message_2(j);
58          i=i+1;
59          tdm(i)=message_3(j);
60          j=j+1
61
62  end
63
64  figure(2)
65  subplot(2,1,1)
66  plot2d3(tdm)
67  xlabel('TIME');
68  ylabel('AMPLITUDE')
69  title('TIME DIVISION MULTIPLEXED SIGNAL');
70
71    // DEMULTIPLEXING OF TDM SIGNAL
72
73  n=1
74      for k=1:1:length(t)
75
76          m3(k)=tdm(n)
77          n=n+1;
78          m4(k)=tdm(n)
79          n=n+1;
80          m5(k)=tdm(n)
81          n=n+1;
82
83  end
84
85
86  figure(3)
```

```
87
88 subplot(3,1,1)
89 plot2d3(m3)
90 xlabel('TIME');
91 ylabel('AMPLITUDE')
92 title('DEMUX MESSAGE SIGNAL 1(SINE WAVE)');
93
94 subplot(3,1,2)
95 plot2d3(m4)
96 xlabel('TIME');
97 ylabel('AMPLITUDE')
98 title('DEMUX MESSAGE SIGNAL 2(SQUAREWAVE)');
99
100
101 subplot(3,1,3)
102 plot2d3(m5)
103 xlabel('TIME');
104 ylabel('AMPLITUDE')
105 title('DEMUX MESSAGE SIGNAL 3(COSINE WAVE)');
```
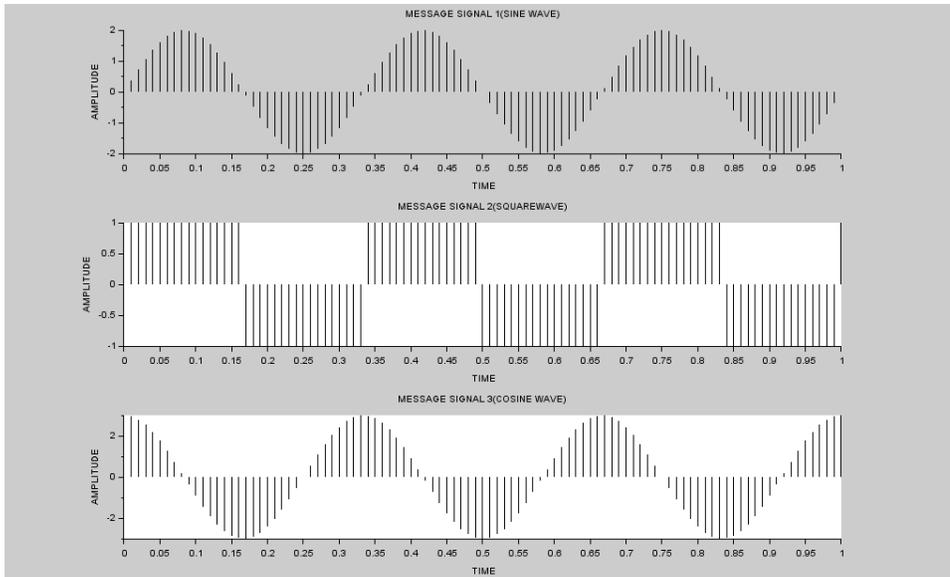
Figure 6.1: Exp06
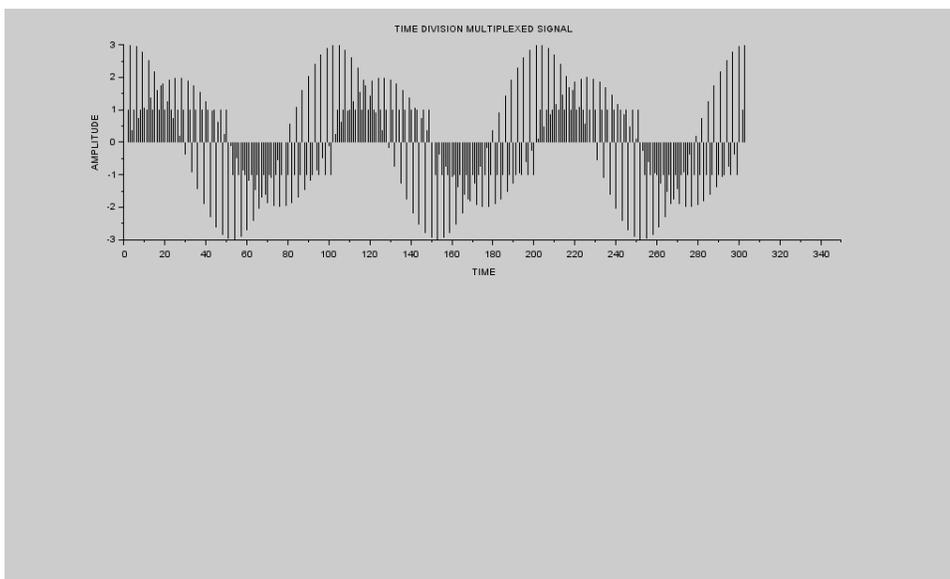
Figure 6.2: Exp06

36
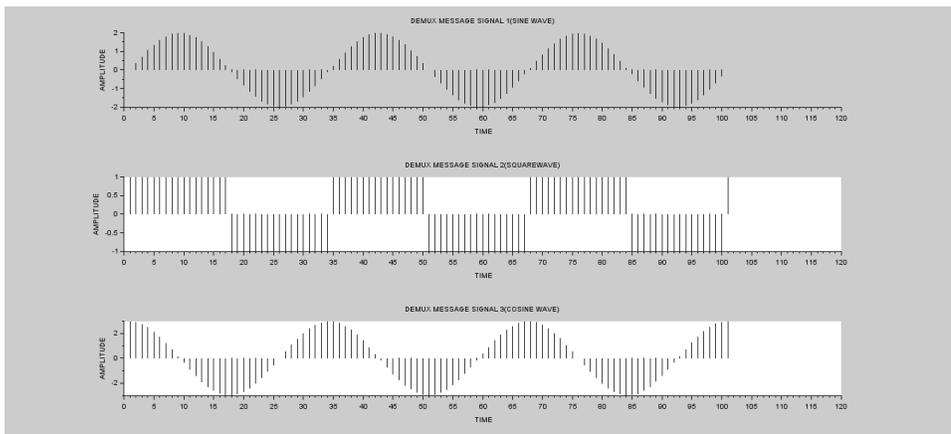
Figure 6.3: Exp06

Experiment: 7

FREQUENCY DIVISION MULTIPLEXING AND DEMULTIPLEXING

Scilab code Solution 7.0 Exp07

```
1  //Experiment Number:7
2  //Write a program to perform Freqency division
       multiplexing and demultiplexing of 2 signals
3  //Analog and Digital Communication Laboratory
4  //B.Tech II Year II Sem
5  //Student Name:              Enrolment Number:
6  // Course Instructor: Aqeel Shaik
7  // Sreyas Institute Of Engineering & Technology,
       Hyderabad.
8  //_____

9
10
11 // OS : Windows 10.1
12 // Scilab 6.0.2
13
```

```
14  clc;
15  clear;
16  close;
17  fs=100
18  t = 0:1/fs:2;
19
20  //Message signal 1
21
22  msg_1 = 2*cos(2*%pi*2*t); // Cosine signal of
        frequency 2hz
23  figure(1)
24  subplot(4,1,1);
25  plot(t,msg_1);
26  title("signal 1");
27  xlabel('TIME');
28  ylabel('AMPLITUDE')
29
30  // Message signal 2
31  msg_2 = cos(2*%pi*9*t); //Cosine signal of frequency
        9hz
32  subplot(4,1,2);
33  plot(t,msg_2);
34  title("signal 2");
35  xlabel('TIME');
36  ylabel('AMPLITUDE')
37
38  // Frequency Response of Signal-1
39  freqres_msg1 = abs(fft(msg_1));
40  subplot(4,1,3);
41  plot(freqres_msg1);
42  title('Spectrum of signal 1');
43  xlabel('FREQUENCY');
44  ylabel('MAGNITUDE');
45
46  // Frequency Response of Signal-2
47  freqres_msg2 = abs(fft(msg_2));
48  subplot(4,1,4);
49  plot(freqres_msg2);
```

```matlab
50  title("Spectrum of signal 2");
51  xlabel('FREQUENCY');
52  ylabel('MAGNITUDE');
53
54
55  // Frequency Division Multiplexing
56
57  freqres =freqres_msg1+freqres_msg2 ;
58  figure(2)
59  subplot(3,1,1);
60  plot(freqres);
61  xlabel('FREQUENCY');
62  ylabel('MAGNITUDE');
63  title("FREQUENCY DIVSION MULTIPLEXED SIGNALS");
64
65
66  // Freqency Demultiplexing
67  //Applying filter for signal 1 (Filtering in
        Frequency domian)
68
69  filter_1 = [ones(1,10),zeros(1,180),ones(1,11)];
70  dz1 =freqres.*filter_1;
71  demod_msg1 = ifft(dz1);
72  subplot(3,1,2)
73  plot(demod_msg1);
74  title("Recovered signal 1");
75  xlabel('TIME');
76  ylabel('AMPLITUDE')
77
78
79  // Applying filter for signal 2(Filtering in
        Frequency domian)
80
81  filter_2 = [zeros(1,10),ones(1,180),zeros(1,11)];
82  dz2 =freqres.*filter_2;
83  demod_msg2 = ifft(dz2);
84  subplot(3,1,3)
85  plot(demod_msg2);
```
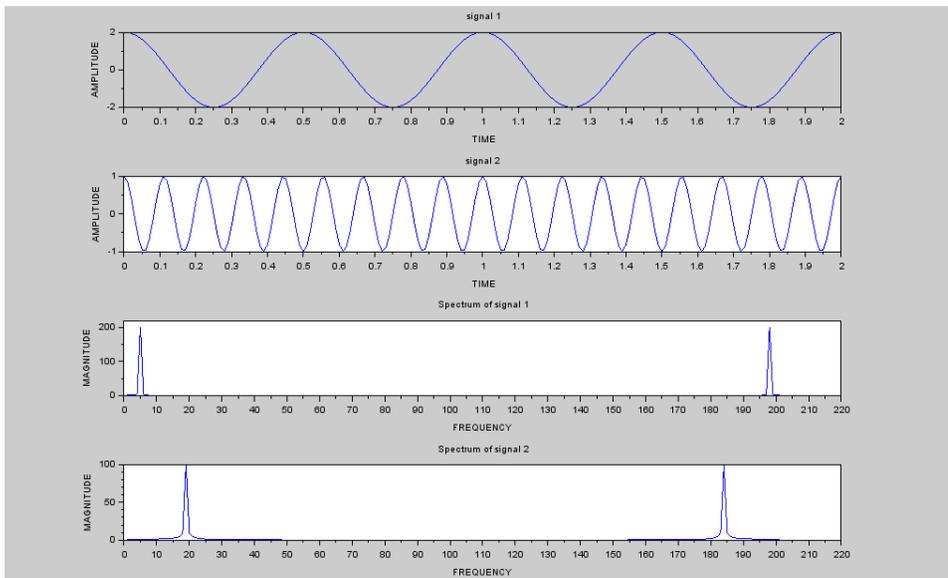
Figure 7.1: Exp07

```
86  title(" Recovered  signal  2");
87  xlabel('TIME');
88  ylabel('AMPLITUDE')
```
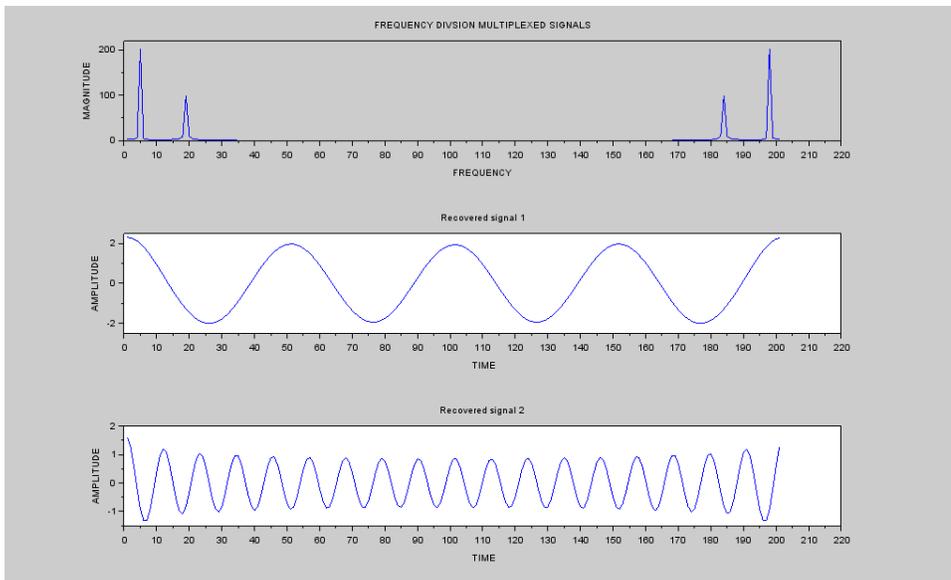
Figure 7.2: Exp07

Experiment: 8

BINARY AMPLITUDE SHIFT KEYING GENERATION AND DETECTION

Scilab code Solution 8.0 Exp08

```
1  //Experiment Number:8
2  //Write a program to perform Binary Amplitude Shift
       Keying Generation and Detection
3  //Analog and Digital Communication Laboratory
4  //B.Tech II Year II Sem
5  //Student Name:                Enrolment Number:
6  // Course Instructor: Aqeel Shaik
7  // Sreyas Institute Of Engineering & Technology,
       Hyderabad.
8  //_____

9
10
11 // OS : Windows 10.1
12 // Scilab 6.0.2
13
```

```
14  clc
15  clear
16  close
17
18  n=[0 1 0 1 0 0];     // Random binary Input
19
20  // Binary to polar conversion of Bits
21
22  for m=1:length(n)
23        if n(m)==0
24              nn(m)=-1;
25        else
26              nn(m)=1;
27        end
28  end
29
30
31  // Generating NRZ Waveform from bit sequence of  bit
          duration 1 sec
32
33  i=1;
34  t=0:0.01:length(n);
35
36  for j=1:length(t)
37      if t(j)<=i
38          data(j)=nn(i);
39      else
40
41              i=i+1;
42              data(j)=nn(i);
43
44      end
45
46  end
47
48  figure(1)
49  subplot(3,1,1);
50  plot(t,data');
```

```scilab
51  h=gca();
52  h.data_bounds=[0,-1.5;length(n),1.5]
53  xlabel('TIME');
54  ylabel('AMPLITUDE')
55  title('BINARY INPUT');
56
57  //Carrier Generation
58  carrier=sin(2.*%pi*4*t);
59  subplot(3,1,2);
60  plot(t,carrier);
61  xlabel('TIME');
62  ylabel('AMPLITUDE')
63  title('CARRIER SIGNAL ');
64
65
66    //AMPLITUDE SHIFT KEYING SIGNAL GENERATION
67  for j=1:length(t)
68      if data(j)==1
69          ask(j)=carrier(j);
70      else
71          ask(j)=0;
72      end
73
74  end
75
76
77  subplot(3,1,3);
78  plot(t,ask');
79  xlabel('TIME');
80  ylabel('AMPLITUDE')
81  title('AMPLITUDE SHIFT KEYING SIGNAL');
82
83
84  //Demodualation of ASK Signal
85  for j=1:length(t)
86      if ask(j)==carrier(j)
87          demod(j)=1
88      else
```
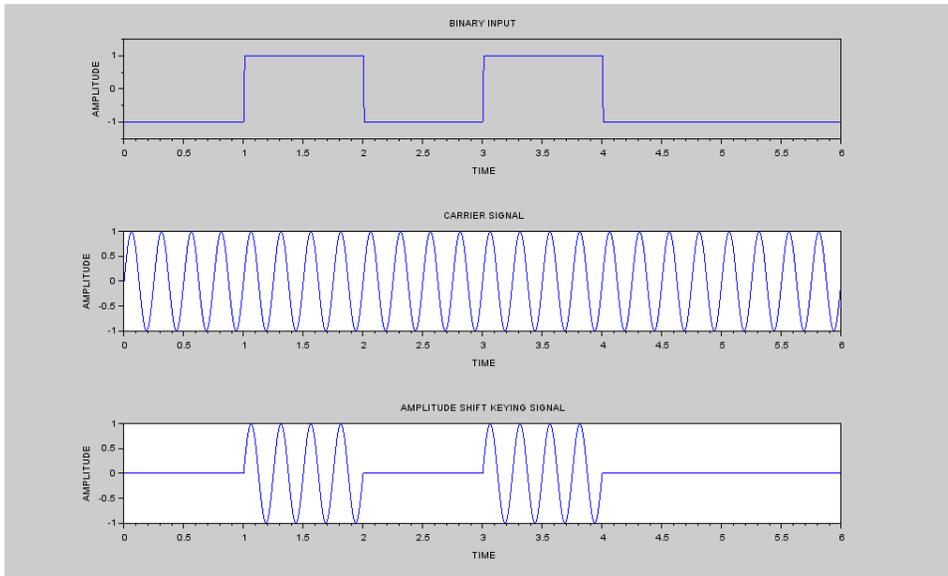
Figure 8.1: Exp08

```
 89             demod(j)=-1
 90         end
 91
 92   end
 93
 94   figure(2)
 95   subplot(3,1,1)
 96   plot(t,demod')
 97   xlabel('TIME');
 98   ylabel('AMPLITUDE')
 99   title('DEMODULATED MESSAGE SIGNAL');
100   h=gca();
101   h.data_bounds=[0,-1.5;length(n),1.5]
```
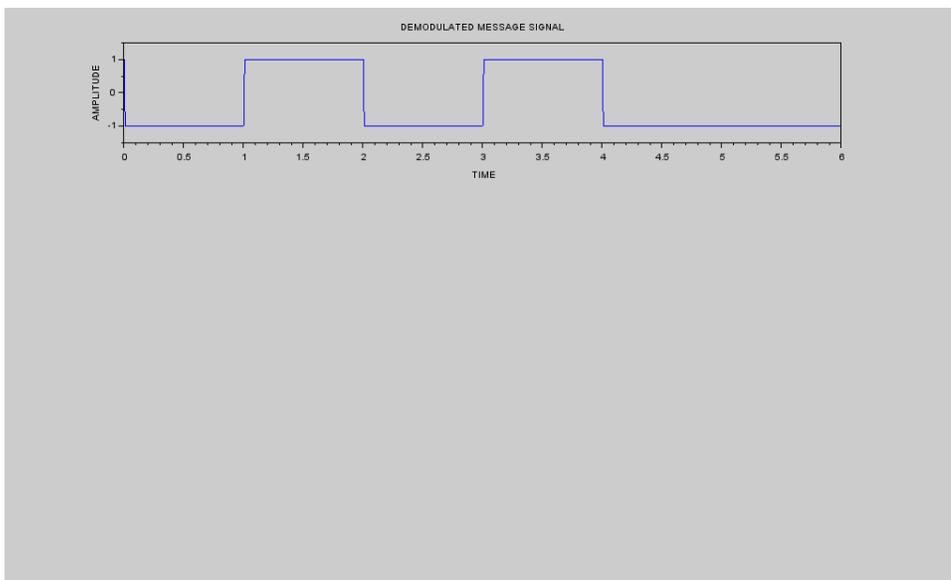
Figure 8.2: Exp08

Experiment: 9

BINARY PHASE SHIFT KEYING GENERATION AND DETECTION

Scilab code Solution 9.0 Exp09

```
1  //Experiment Number:9
2  //Write a program to perform Binary Phase Shift
        Keying Generation and Detection
3  //Analog and Digital Communication Laboratory
4  //B.Tech II Year II Sem
5  //Student Name:            Enrolment Number:
6  // Course Instructor: Aqeel Shaik
7  // Sreyas Institute Of Engineering & Technology,
       Hyderabad.
8  //_____

9
10
11 // OS : Windows 10.1
12 // Scilab 6.0.2
13
```

```
14  clear
15  clc
16  close
17
18  n=[1 0 1 0 1 1]; //INPUT RANDOM BINARY SEQUENCE
19
20  // BINARY TO POLAR CONVERSION
21  for m=1:length(n)
22      if n(m)==0
23          nn(m)=-1;
24      else
25          nn(m)=1;
26      end
27  end
28
29   // Generating NRZ Waveform from bit sequence of
        bit duration 1 sec
30
31  i=1;
32  t=0:0.01:length(n);
33
34  for j=1:length(t)
35      if t(j)<=i
36          data(j)=nn(i);
37      else
38
39          i=i+1;
40          data(j)=nn(i);
41
42      end
43  end
44
45  // Plotting of NRZ Data Waveform
46  figure(1)
47  subplot(3,1,1);
48  plot(t,data');
49  h=gca();
50  h.data_bounds=[0,-1.5;length(n),1.5]
```

```scilab
51  xlabel('TIME');
52  ylabel('AMPLITUDE')
53  title('BINARY INPUT');
54
55   //Carrier Generation
56
57  carrier=sin(2.*%pi*2*t);
58  subplot(3,1,2);
59  plot(t,carrier);
60  xlabel('TIME');
61  ylabel('AMPLITUDE')
62  title('CARRIER SIGNAL');
63
64
65  //Generation of BPSK Signal
66  z=carrier';
67  bpsk=data.*z;
68  subplot(3,1,3);
69  plot(t,bpsk');
70  xlabel('TIME');
71  ylabel('AMPLITUDE')
72  title('BINARY PHASE SHIFT KEYING SIGNAL');
73
74
75  //Demodulation of BPSK Signal
76  for j=1:length(t)
77      if carrier(j)==bpsk(j)
78          demod(j)=1;
79      else
80          demod(j)=-1;
81      end
82
83  end
84
85  figure(2)
86  subplot(3,1,1);
87  plot(t,demod');
88  xlabel('TIME');
```
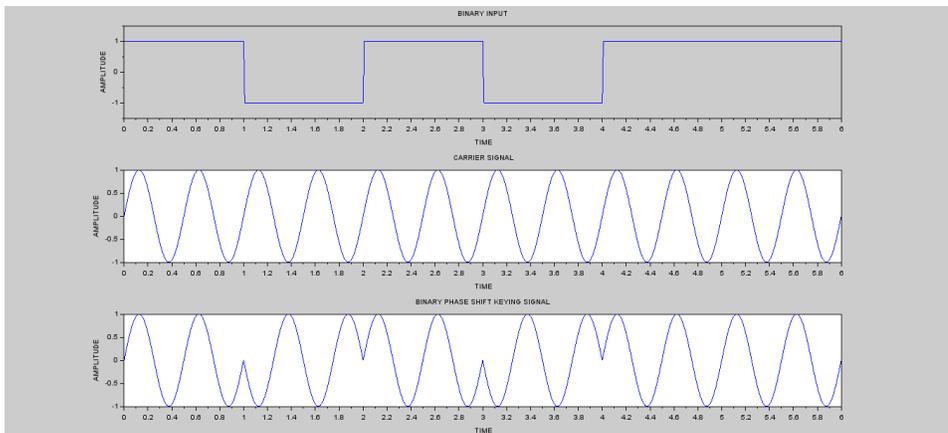
Figure 9.1: Exp09

```
89  ylabel('AMPLITUDE')
90  title('RECOVERED BINARY DATA');
91  h=gca();
92  h.data_bounds=[0,-1.5;6,1.5]
```
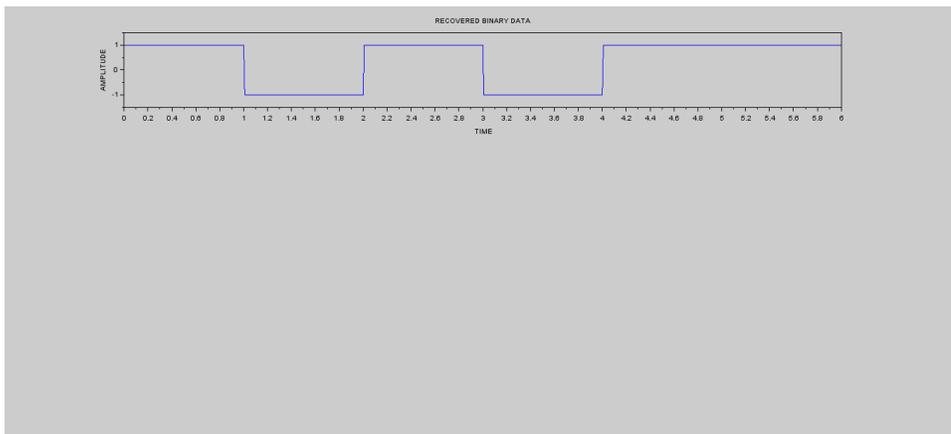
Figure 9.2: Exp09

Experiment: 10

FREQUENCY SHIFT KEYING GENERATION AND DETECTION

Scilab code Solution 10.0 Exp10

```scilab
1  //Experiment Number:10
2  //Write a program to perform Frequency Shift Keying
       Generation and Detection
3  //Analog and Digital Communication Laboratory
4  //B.Tech II Year II Sem
5  //Student Name:              Enrolment Number:
6  // Course Instructor: Aqeel Shaik
7  // Sreyas Institute Of Engineering & Technology,
       Hyderabad.
8  //_____

9
10
11 // OS : Windows 10.1
12 // Scilab 6.0.2
13
```

```
14  clc
15  clear
16  close
17
18  n=[1 0 1 0 0 1];    // Random binary Input
19
20  // Binary to polar conversion of Bits
21
22  for m=1:length(n)
23      if n(m)==0
24          nn(m)=-1;
25      else
26          nn(m)=1;
27      end
28  end
29
30
31  // Generating NRZ Waveform from bit sequence of  bit
        duration 1 sec
32
33  i=1;
34  t=0:0.01:length(n);
35
36  for j=1:length(t)
37      if t(j)<=i
38          data(j)=nn(i);
39      else
40
41          i=i+1;
42          data(j)=nn(i);
43
44      end
45
46  end
47
48   //Plotting of NRZ Data
49
50  figure(1)
```

```
51  subplot (3 ,1 ,1);
52  plot (t ,data ');
53  h= gca ();
54  h. data_bounds =[0 , -1.5; length (n) ,1.5]
55  xlabel ( 'TIME ');
56  ylabel ( 'AMPLITUDE ')
57  title ( 'BINARY INPUT ');
58
59  // Carrier  Generation
60  carrier_1 = sin (2.*% pi *8*t); //  Higher  Frequency
        Carrier
61  subplot (3 ,1 ,2);
62  plot (t , carrier_1 );
63  xlabel ( 'TIME ');
64  ylabel ( 'AMPLITUDE ')
65  title ( 'CARRIER SIGNAL 1 ');
66
67  carrier_2 = sin (2.*% pi *3*t);   //  Lower  Frequency
        Carrier
68  subplot (3 ,1 ,3);
69  plot (t , carrier_2 );
70  xlabel ( 'TIME ');
71  ylabel ( 'AMPLITUDE ')
72  title ( 'CARRIER SIGNAL 2 ');
73
74    //FSK SIGNAL GENERATION
75  for j =1: length (t)
76      if data (j) ==1
77          fsk (j)= carrier_1 (j);
78      else
79          fsk (j)= carrier_2 (j);
80      end
81
82  end
83
84  figure (2)
85  subplot (3 ,1 ,1);
86  plot (t , fsk ');
```

```
87  xlabel('TIME');
88  ylabel('AMPLITUDE')
89  title('FREQUENCY SHIFT KEYING SIGNAL');
90
91
92  //Demodualation of FSK Signal
93  for j=1:length(t)
94      if fsk(j)==carrier_1(j)
95          demod(j)=1
96      else
97          demod(j)=-1
98      end
99
100 end
101
102 figure(2)
103 subplot(3,1,2)
104 plot(t,demod')
105 xlabel('TIME');
106 ylabel('AMPLITUDE')
107 title('RECOVERED BINARY DATA');
108 h=gca();
109 h.data_bounds=[0,-1.5;length(n),1.5]
```
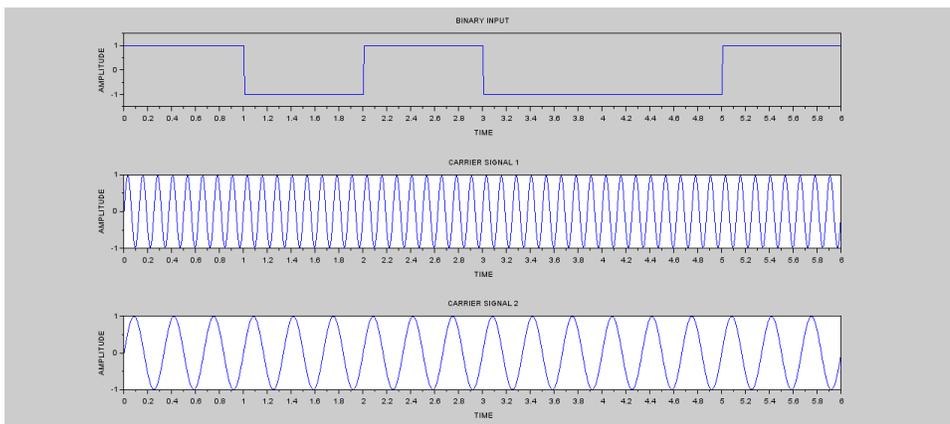
Figure 10.1: Exp10

Figure 10.2: Exp10

57
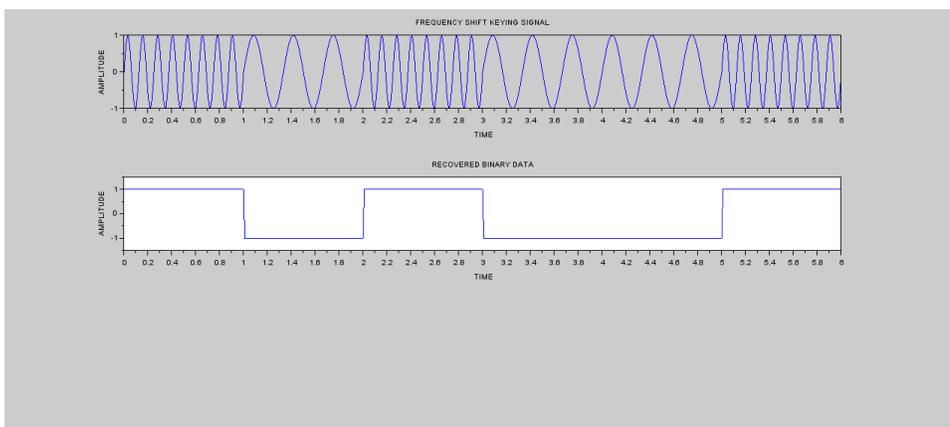
Experiment: 11

PULSE CODE MODULATION GENERATION AND DETECTION

Scilab code Solution 11.0 Exp11

```
1  //Experiment Number:11
2  //Write a program to perform Pulse Code Modulation
       Generation and Detection
3  //Analog and Digital Communication Laboratory
4  //B.Tech II Year II Sem
5  //Student Name:              Enrolment Number:
6  // Course Instructor: Aqeel Shaik
7  // Sreyas Institute Of Engineering & Technology,
      Hyderabad.
8  //_____

9
10
11 // OS : Windows 10.1
12 // Scilab 6.0.2
13
```

```
14 clc;
15 close;
16 clear;
17 f=2;
18 fs=20*f;//Sampling Frequency
19 t=0:1/fs:2;
20 a=2;
21
22 msg=a*sin(2.*%pi*f*t);
23 subplot(3,1,1);
24 plot(t,msg)
25 xlabel('TIME');
26 ylabel('AMPLITUDE')
27 title('Message Signal');
28
29
30 x1=msg+a;//Level Shifting to onesided signal
31 disp(x1,'Discrete Sampled Values of Message Signal')
      // Displays sampled values
32
33 quant=round(x1);//Quantization
34 disp(quant,'Quantized Sampled Values'); //Displays
      quantized values
35 enco=dec2bin(quant);//Encoding into binary data
36
37
38
39 deco=bin2dec(enco);//Recovering Analog Message
      signal
40 recover=deco-a;
41 subplot(3,1,2);
42 plot(t,recover)
43 xlabel('TIME');
44 ylabel('AMPLITUDE')
45 title('Recovered Signal');
46 h=gca();
47 h.data_bounds=[0,-3;2,3]
48
```

```
49
50  subplot(3,1,3);
51  plot(t,msg,t,recover ,'r');
52  xlabel('TIME');
53  ylabel('AMPLITUDE')
54  title('Recovered VS Original Signal');
55  h=gca();
56  h.data_bounds=[0,-3;2,3]
57
58
59  //Discrete Sampled Values of Message Signal
60
61
62          // column 1 to 12
63
64    // 2.    2.618034    3.1755705    3.618034    3.902113
              4.    3.902113    3.618034    3.1755705
          2.618034    2.    1.381966
65
66          // column 13 to 23
67
68    // 0.8244295    0.381966    0.097887    0.    0.097887
              0.381966    0.8244295    1.381966    2.
          2.618034    3.1755705
69
70           //column 24 to 34
71
72     //3.618034    3.902113    4.    3.902113    3.618034
              3.1755705    2.618034    2.    1.381966
          0.8244295    0.381966
73
74          // column 35 to 46
75
76     //0.097887    0.    0.097887    0.381966    0.8244295
              1.381966    2.    2.618034    3.1755705
          3.618034    3.902113    4.
77
78          // column 47 to 57
```

```
79
80   //  3.902113    3.618034    3.1755705    2.618034    2.
         1.381966    0.8244295    0.381966    0.097887
         0.    0.097887
81
82           //column 58 to 68
83
84   //  0.381966    0.8244295    1.381966    2.    2.618034
         3.1755705    3.618034    3.902113    4.
      3.902113    3.618034
85
86           // column 69 to 79
87
88    //3.1755705    2.618034    2.    1.381966
        0.8244295    0.381966    0.097887    0.
        0.097887    0.381966    0.8244295
89
90           //column 80 to 81
91
92    //  1.381966    2.
93
94   //Quantized Sampled Values
95
96
97           // column 1 to 24
98
99    //2.    3.    3.    4.    4.    4.    4.    4.    3.    3.
            2.    1.    1.    0.    0.    0.    0.    0.    1.
            1.    2.    3.    3.    4.
100
101          // column 25 to 48
102
103   //4.    4.    4.    4.    3.    3.    2.    1.    1.    0.
            0.    0.    0.    0.    1.    1.    2.    3.    3.
            4.    4.    4.    4.    4.
104
105          //column 49 to 72
106
```

61
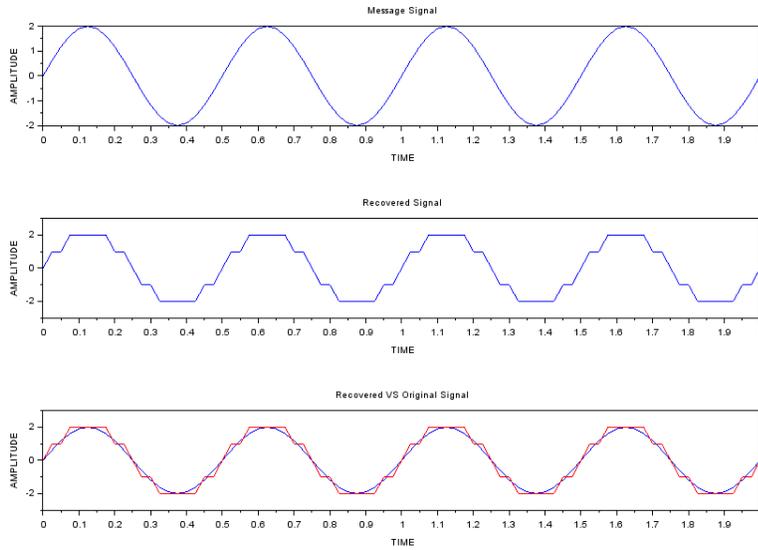
Figure 11.1: Exp11

```
107        //3.      3.      2.      1.      1.      0.      0.      0.      0.      0.
                     1.      1.      2.      3.      3.      4.      4.      4.      4.
                     4.      3.      3.      2.      1.
108
109              //column 73 to 81
110
111        //  1.      0.      0.      0.      0.      0.      1.      1.      2.
```

Experiment: 12

DELTA MODULATION GENERATION

Scilab code Solution 12.0 Exp12

```
1  //Experiment Number:12
2  //Write a program to perform Delta Modulation
       Generation and Demodulation
3  //Analog and Digital Communication Laboratory
4  //B.Tech II Year II Sem
5  //Student Name:              Enrolment Number:
6  // Course Instructor: Aqeel Shaik
7  // Sreyas Institute Of Engineering & Technology,
       Hyderabad.
8  //
       _____

9
10
11 // OS : Windows 10.1
12 // Scilab 6.0.2
13
14 clc
15 clear
```

```
16  close
17
18  am=input('Enter  the  message  signal  amplitude  =');
19  fm=input('Enter  the  message  signal  frequency  =');
20  // Higher  Samplig  Frequency  gives  better  recovery  of
          message  Signal
21  fs=input('Enter  the  sampling  frequency(50-300)  =');
22  t=0:1/fs:1;
23
24  msg=am*sin(2.*%pi*fm*t);
25  p=length(msg);
26
27  subplot(3,1,1)
28  plot(t,msg);
29  title('Message  Signal  ');
30  xlabel('TIME');
31  ylabel('Amplitude');
32
33  delta=(2.*%pi*am*fm)/fs; //To  prevent  slope  overload
          distortion  and  Granualar  Noise
34  disp(delta,'The  Step  Size  is')
35
36
37  // Generation  of  Delta  Modulation
38  delta_mod=0
39  for  i=1:p
40      if  msg(i)>delta_mod(i)
41          d(i)=1;
42          delta_mod(i+1)=delta_mod(i)+delta;
43      else
44          d(i)=0;
45          delta_mod(i+1)=delta_mod(i)-delta;
46      end
47  end
48
49
50  subplot(3,1,2)
51  plot2d2(delta_mod)
```

64

```
52  title('Delta Modulated Output');
53  xlabel('TIME');
54  ylabel('AMPLITUDE');
55
56
57  // Recovery of Message signal (Demodulation)
58  demod=0
59  for i=1:p
60      if d(i)==1;
61
62          demod(i+1)=delta_mod(i)+delta;
63      else
64
65          demod(i+1)=delta_mod(i)-delta;
66      end
67  end
68
69  subplot(3,1,3)
70  plot(demod);
71  title('RECOVERED MESSAGE SIGNAL');
72  xlabel('TIME');
73  ylabel('AMPLITUDE');
74
75  //Sample Inputs for program
76  //Enter the message signal amplitude =2
77
78  //Enter the message signal frequency =4
79
80  //Enter the sampling frequency(50-300) =150
81
82
83   //The Step Size is
84
85     //0.3351032
```

Figure 12.1: Exp12