Scilab Manual for ANALOG AND DIGITAL COMMUNICATION LABORATORY

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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
```

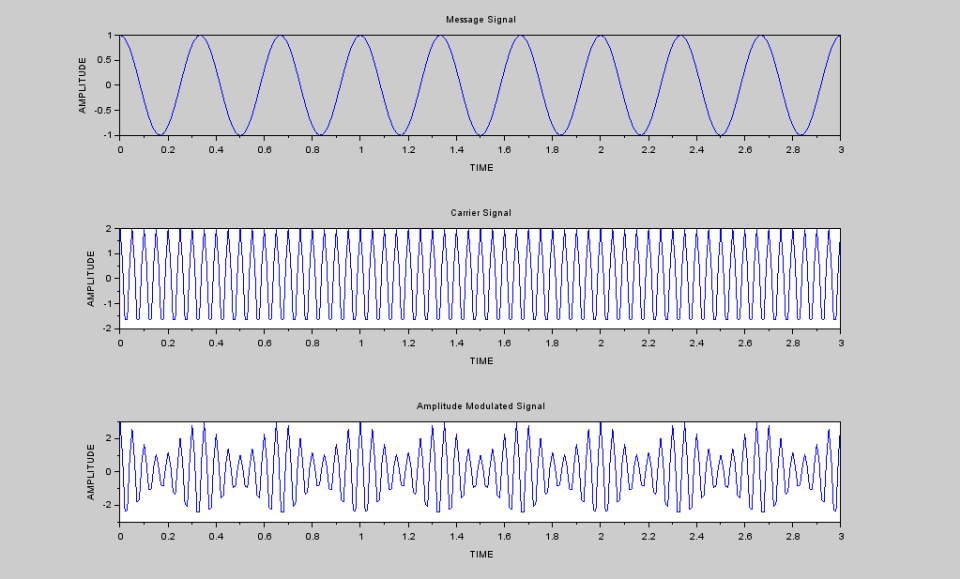

Figure 1.1: Exp01

```
87  //  0.5
```

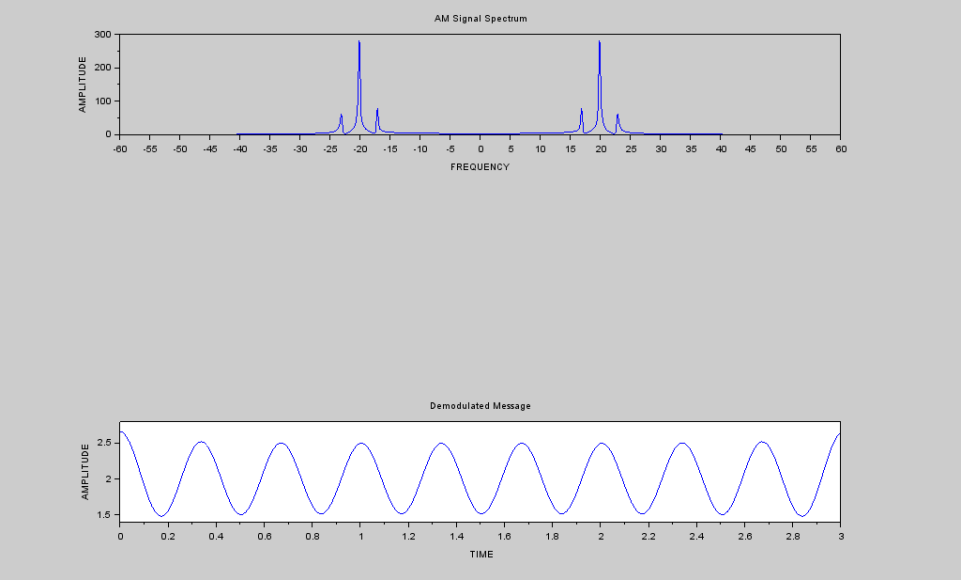

Figure 1.2: Exp01

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
```

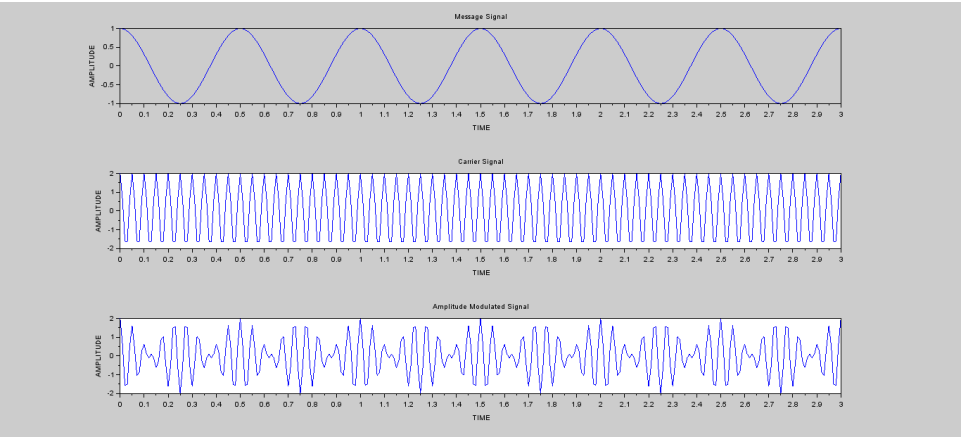

Figure 2.1: Exp02

```
83 //Enter the carrier signal amplitude =2
```

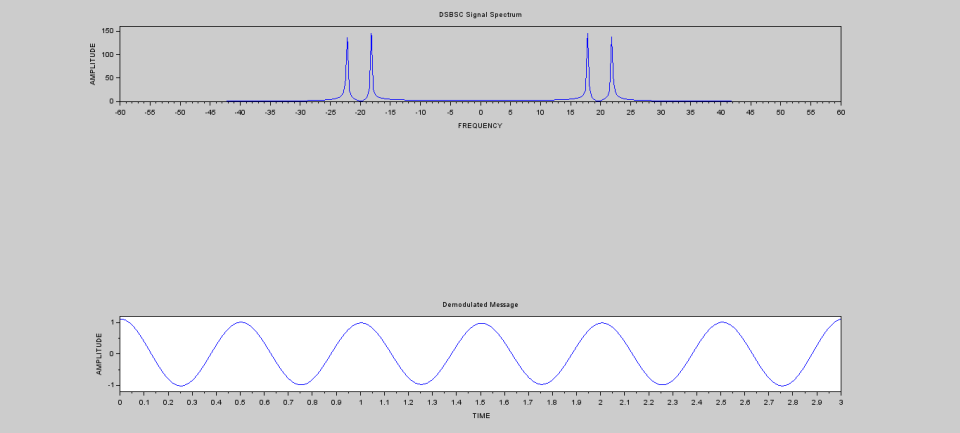

Figure 2.2: Exp02

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
```

```
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
```

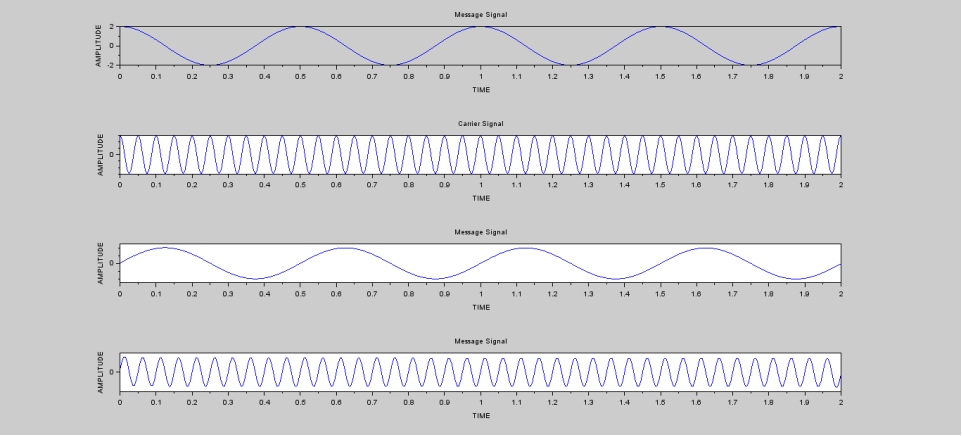

Figure 3.1: Exp03

```
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
```

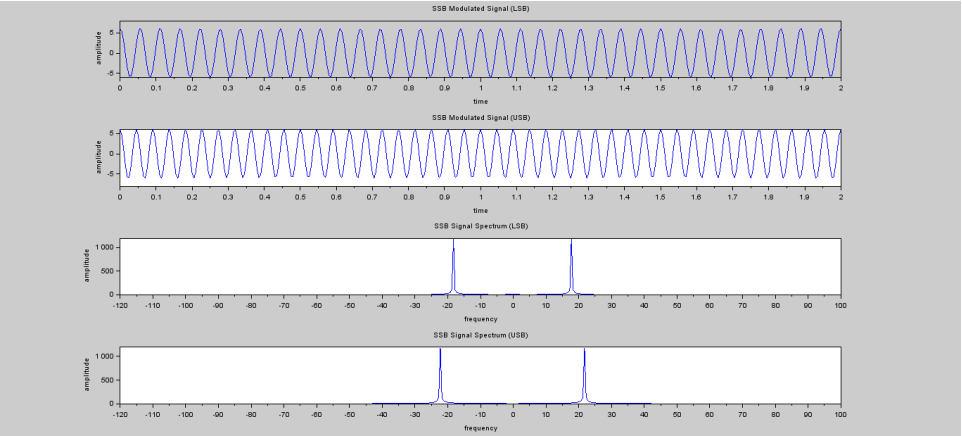

Figure 3.2: Exp03

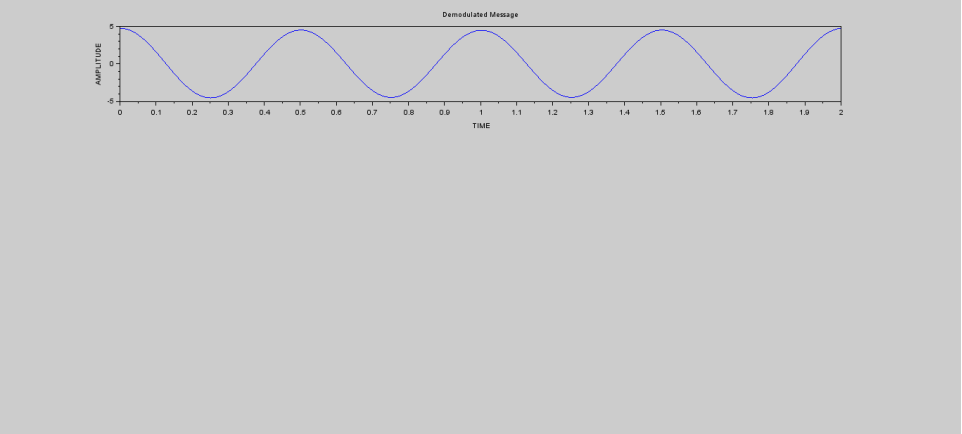

Figure 3.3: Exp03

Experiment: 4

FREQUENCY MODULATION AND ITS SPECTRUM ANALYSIS

Scilab code Solution 4.0 Exp04

```
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;
```

```
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.
```

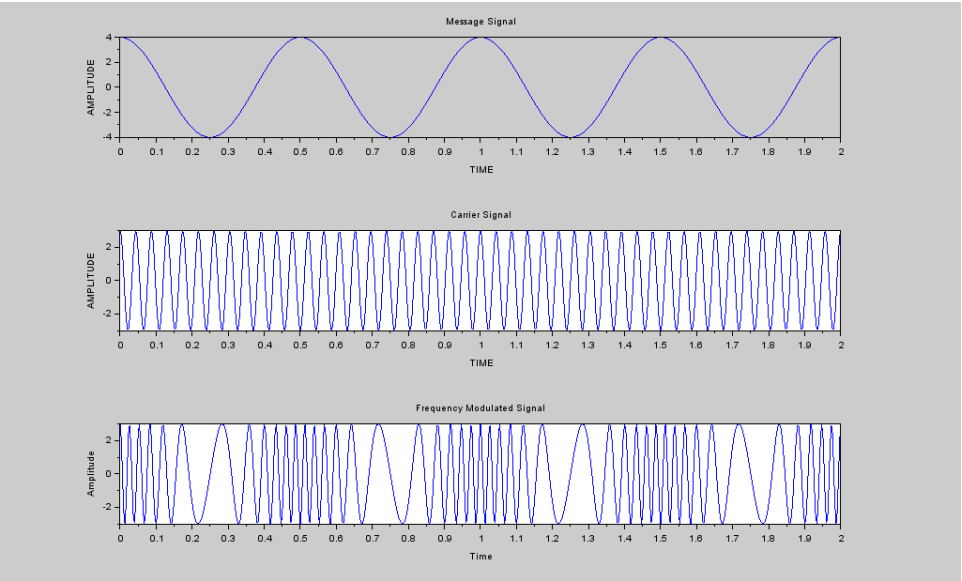

Figure 4.1: Exp04

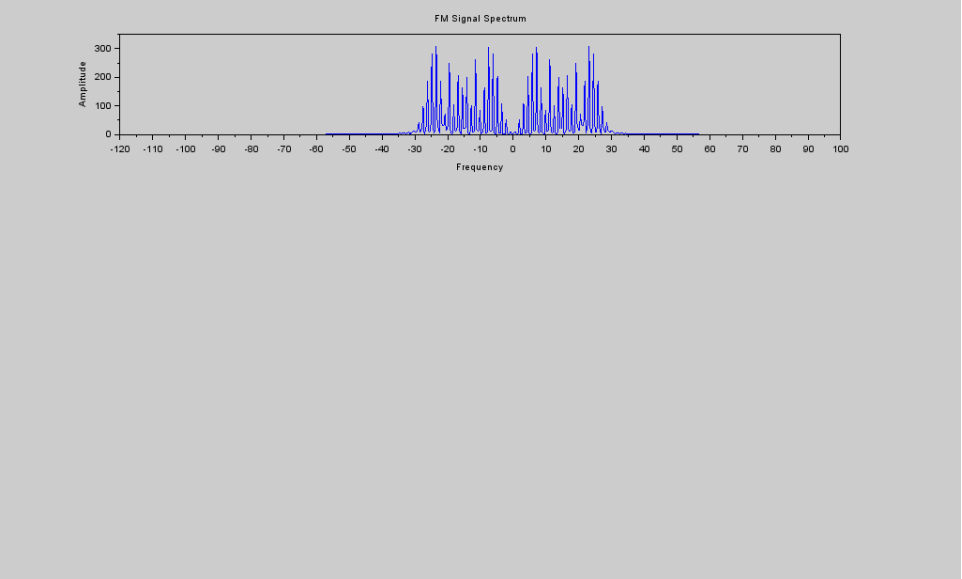

Figure 4.2: Exp04

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
```

```
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
```

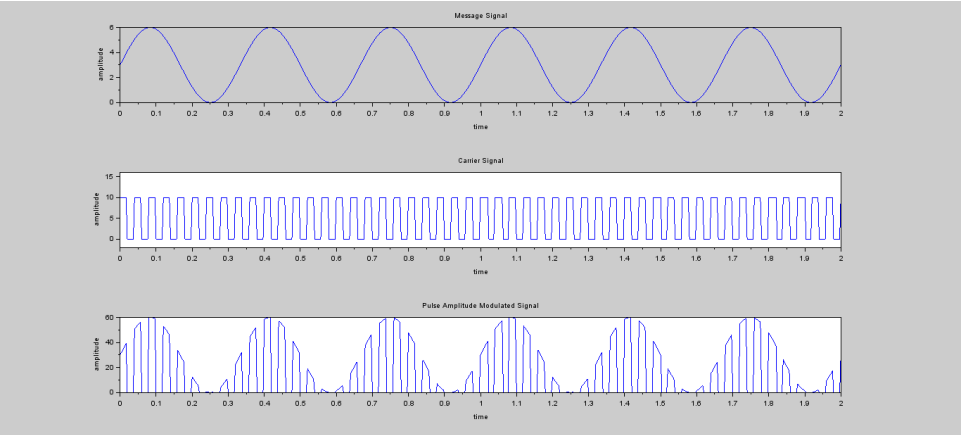

Figure 5.1: Exp05

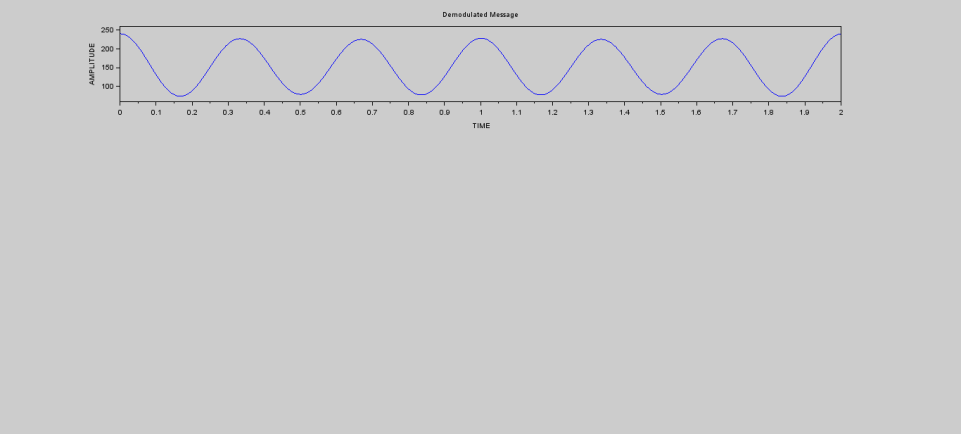

Figure 5.2: Exp05

Experiment: 6

TIME DIVISION MULTIPLEXING AND DEMULTIPLEXING

Scilab code Solution 6.0 Exp06

```
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
```

```
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)');
```

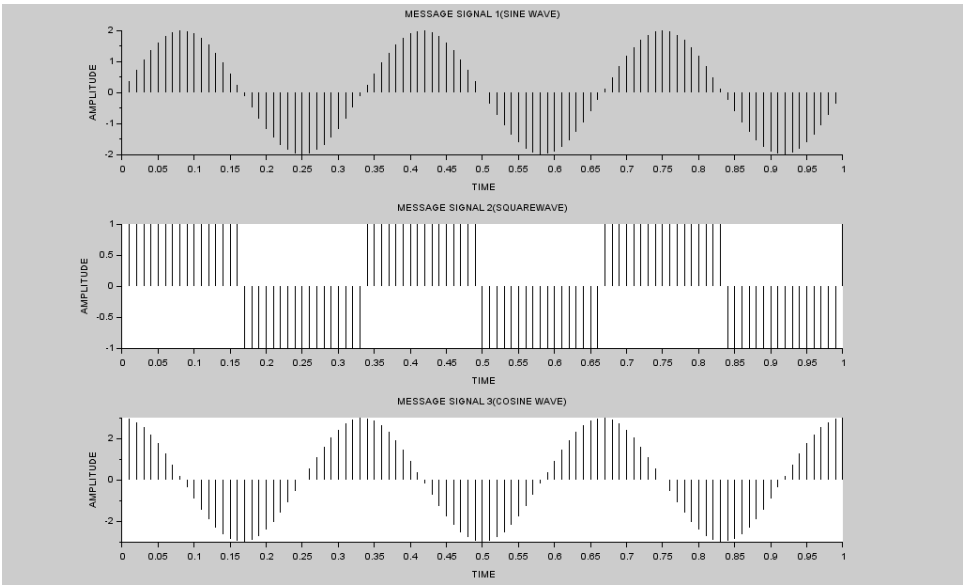

Figure 6.1: Exp06

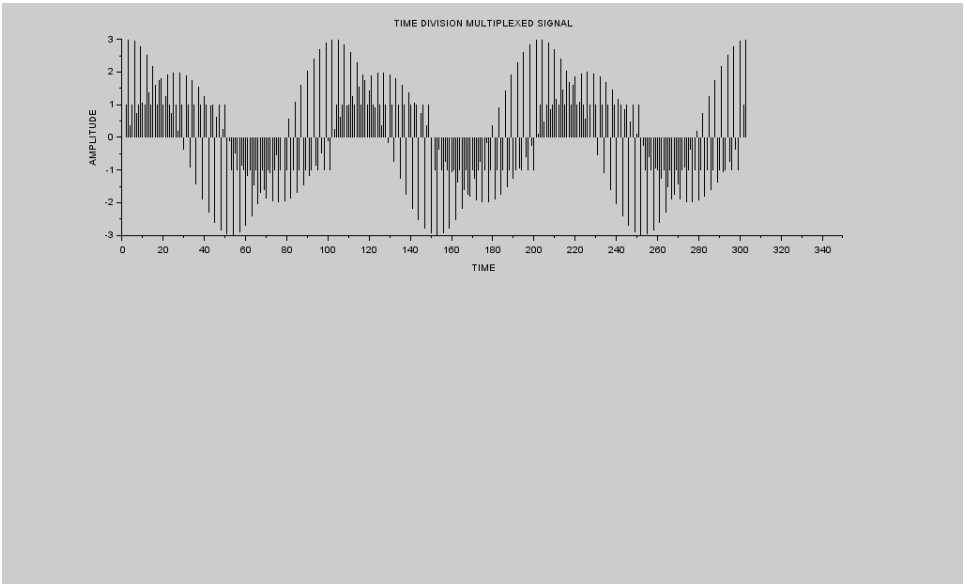

Figure 6.2: Exp06

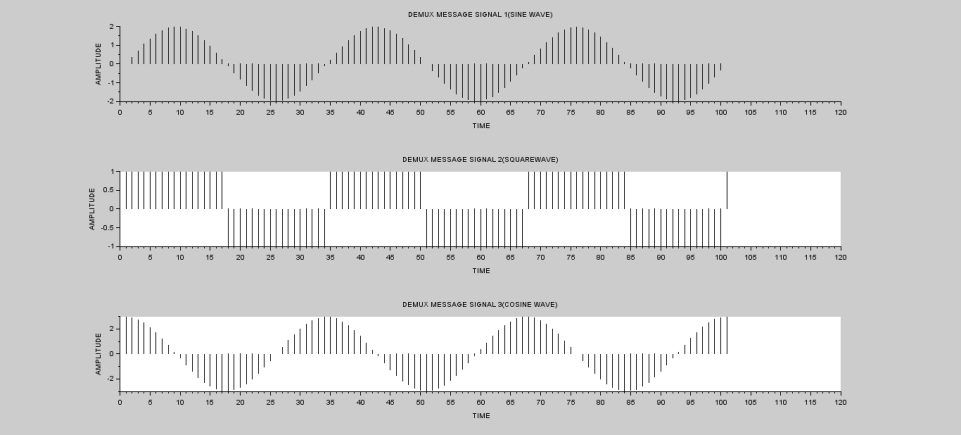

Figure 6.3: Exp06

Experiment: 7

FREQUENCY DIVISION MULTIPLEXING AND DEMULTIPLEXING

Scilab code Solution 7.0 Exp07

```
1 //Experiment Number:7
2 //Write a program to perform Freqeuncy 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
```

```
clc;
clear;
close;
fs=100
t = 0:1/fs:2;

//Message signal 1

msg_1 = 2*cos(2*%pi*2*t); // Cosine signal of
   frequency 2hz
figure(1)
subplot(4,1,1);
plot(t,msg_1);
title("signal 1");
xlabel('TIME');
ylabel('AMPLITUDE')

// Message signal 2
msg_2 = cos(2*%pi*9*t); //Cosine signal of frequency
    9hz
subplot(4,1,2);
plot(t,msg_2);
title("signal 2");
xlabel('TIME');
ylabel('AMPLITUDE')

// Frequency Response of Signal-1
freqres_msg1 = abs(fft(msg_1));
subplot(4,1,3);
plot(freqres_msg1);
title('Spectrum of signal 1');
xlabel('FREQUENCY');
ylabel('MAGNITUDE');

// Frequency Response of Signal-2
freqres_msg2 = abs(fft(msg_2));
subplot(4,1,4);
plot(freqres_msg2);
```

```
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);
```

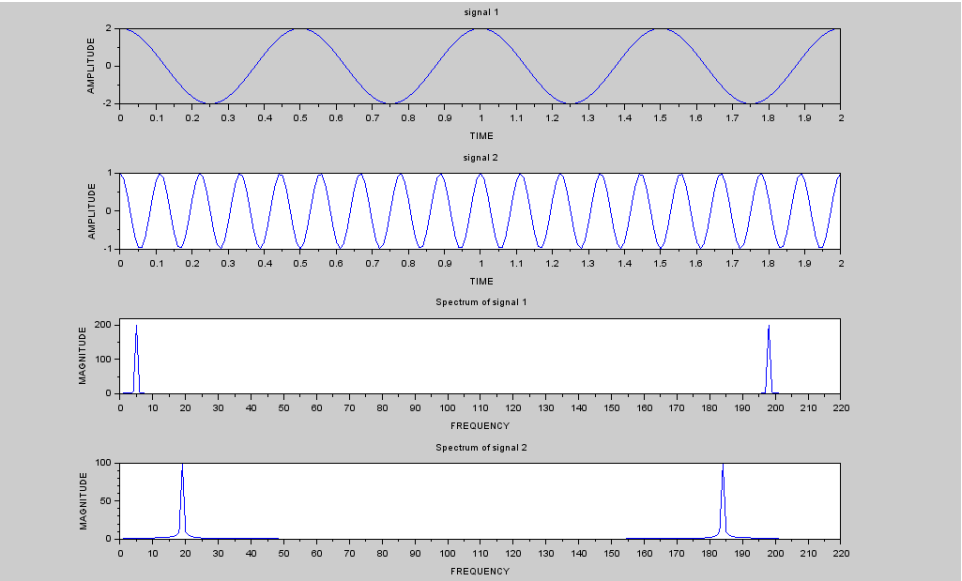

Figure 7.1: Exp07

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

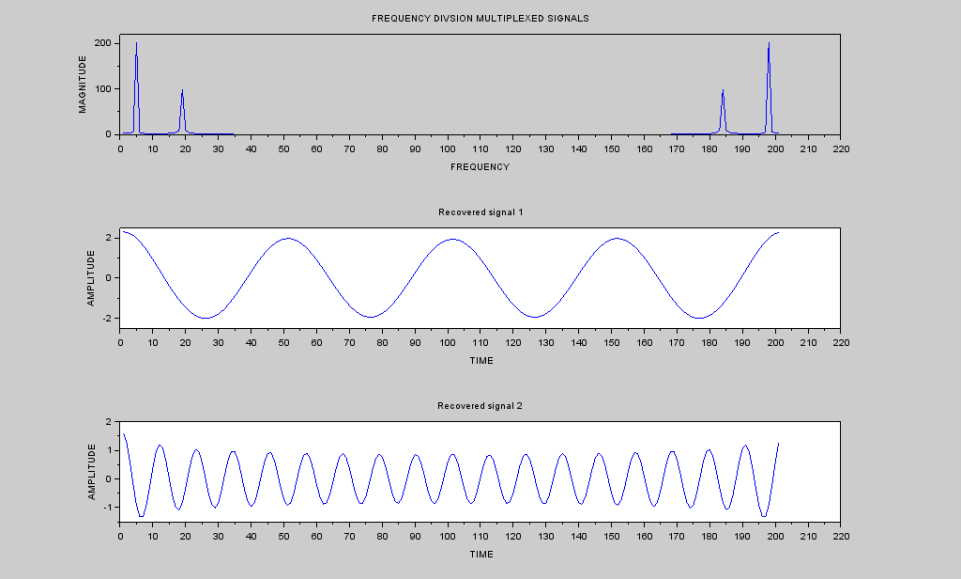

Figure 7.2: Exp07

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
```

```
clc
clear
close

n=[0 1 0 1 0 0];    // Random binary Input

// Binary to polar conversion of Bits

for m=1:length(n)
     if n(m)==0
         nn(m)=-1;
     else
         nn(m)=1;
     end
end


// Generating NRZ Waveform from bit sequence of  bit
    duration 1 sec

i=1;
t=0:0.01:length(n);

for j=1:length(t)
    if t(j)<=i
        data(j)=nn(i);
    else

        i=i+1;
        data(j)=nn(i);

    end

end

figure(1)
subplot(3,1,1);
plot(t,data');
```

```
h=gca();
h.data_bounds=[0,-1.5;length(n),1.5]
xlabel('TIME');
ylabel('AMPLITUDE')
title('BINARY INPUT');

//Carrier Generation
carrier=sin(2.*%pi*4*t);
subplot(3,1,2);
plot(t,carrier);
xlabel('TIME');
ylabel('AMPLITUDE')
title('CARRIER SIGNAL ');


  //AMPLITUDE SHIFT KEYING SIGNAL GENERATION
for j=1:length(t)
    if data(j)==1
        ask(j)=carrier(j);
    else
        ask(j)=0;
    end

end


subplot(3,1,3);
plot(t,ask');
xlabel('TIME');
ylabel('AMPLITUDE')
title('AMPLITUDE SHIFT KEYING SIGNAL');


//Demodualation of ASK Signal
for j=1:length(t)
    if ask(j)==carrier(j)
        demod(j)=1
    else
```

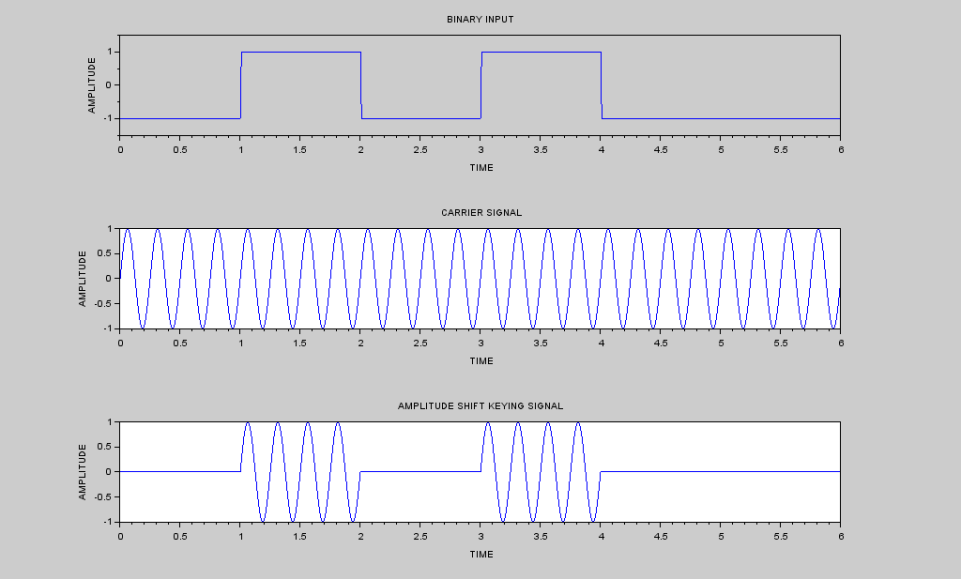

Figure 8.1: Exp08

```
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]
```

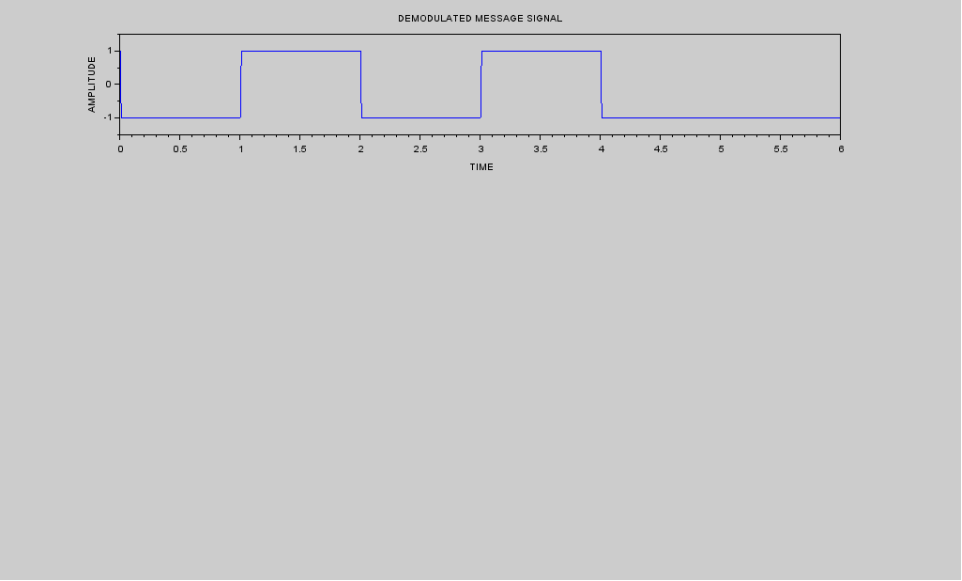

Figure 8.2: Exp08

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
```

```
clear
clc
close

n=[1 0 1 0 1 1];//INPUT RANDOM BINARY SEQUENCE

// BINARY TO POLAR CONVERSION
for m=1:length(n)
     if n(m)==0
         nn(m)=-1;
     else
         nn(m)=1;
     end
end

 // Generating NRZ Waveform from bit sequence of
    bit duration 1 sec

i=1;
t=0:0.01:length(n);

for j=1:length(t)
    if t(j)<=i
        data(j)=nn(i);
    else

        i=i+1;
        data(j)=nn(i);

    end
end

// Plotting of NRZ Data Waveform
figure(1)
subplot(3,1,1);
plot(t,data');
h=gca();
h.data_bounds=[0,-1.5;length(n),1.5]
```

```
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');
```

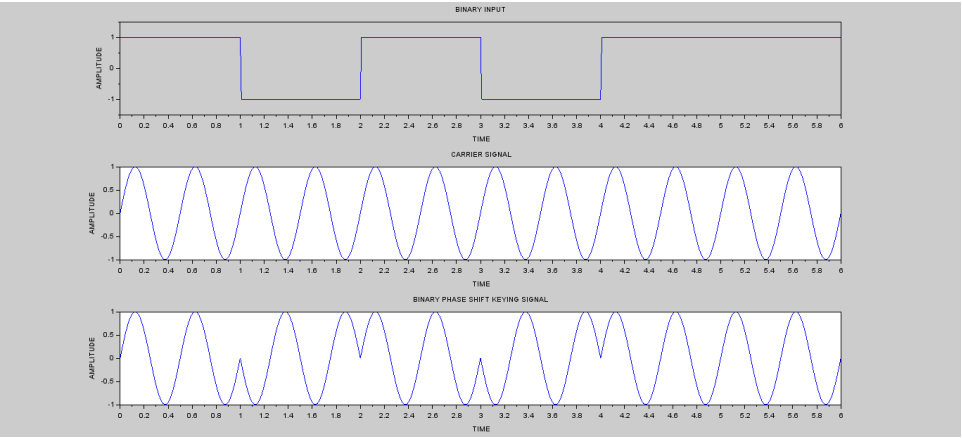

Figure 9.1: Exp09

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

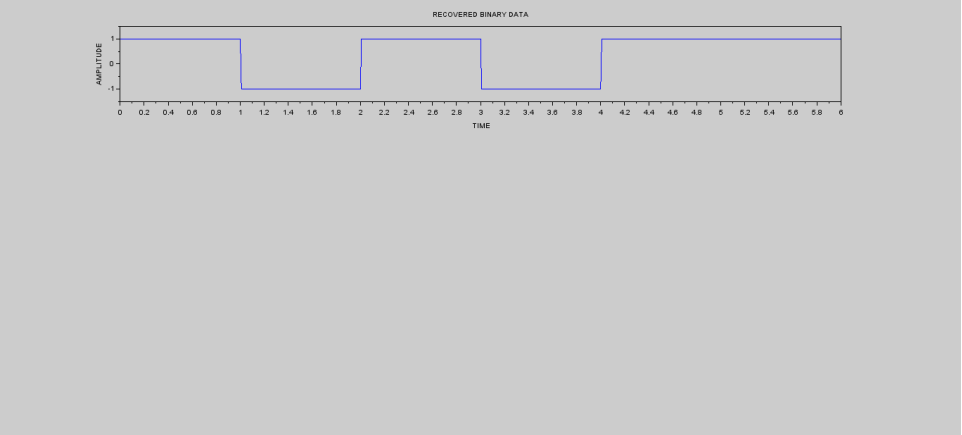

Figure 9.2: Exp09

Experiment: 10

FREQUENCY SHIFT KEYING GENERATION AND DETECTION

Scilab code Solution 10.0 Exp10

```
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)
```

```
subplot(3,1,1);
plot(t,data');
h=gca();
h.data_bounds=[0,-1.5;length(n),1.5]
xlabel('TIME');
ylabel('AMPLITUDE')
title('BINARY INPUT');

//Carrier Generation
carrier_1=sin(2.*%pi*8*t); // Higher Frequency
   Carrier
subplot(3,1,2);
plot(t,carrier_1);
xlabel('TIME');
ylabel('AMPLITUDE')
title('CARRIER SIGNAL 1');

carrier_2=sin(2.*%pi*3*t);  // Lower Frequency
   Carrier
subplot(3,1,3);
plot(t,carrier_2);
xlabel('TIME');
ylabel('AMPLITUDE')
title('CARRIER SIGNAL 2');

  //FSK SIGNAL GENERATION
for j=1:length(t)
    if data(j)==1
        fsk(j)=carrier_1(j);
    else
        fsk(j)=carrier_2(j);
    end

end

figure(2)
subplot(3,1,1);
plot(t,fsk');
```

```
xlabel('TIME');
ylabel('AMPLITUDE')
title('FREQUENCY SHIFT KEYING SIGNAL');


//Demodualation of FSK Signal
for j=1:length(t)
    if fsk(j)==carrier_1(j)
        demod(j)=1
    else
        demod(j)=-1
    end

end

figure(2)
subplot(3,1,2)
plot(t,demod')
xlabel('TIME');
ylabel('AMPLITUDE')
title('RECOVERED BINARY DATA');
h=gca();
h.data_bounds=[0,-1.5;length(n),1.5]
```

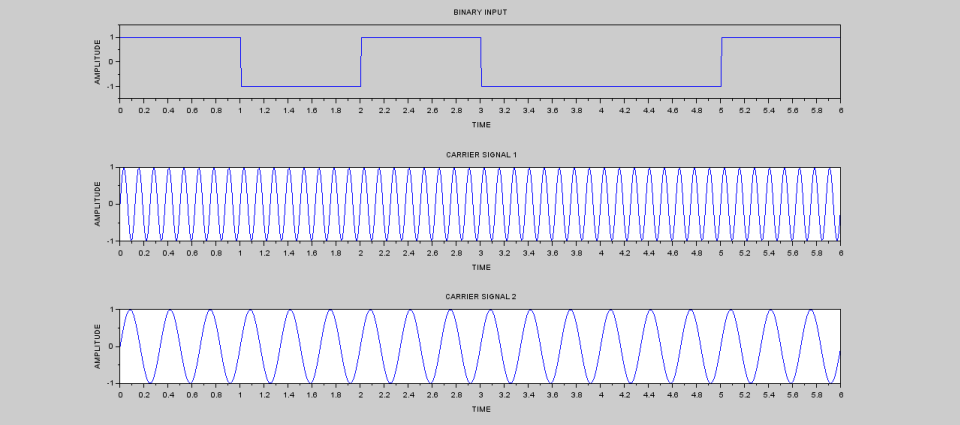

Figure 10.1: Exp10

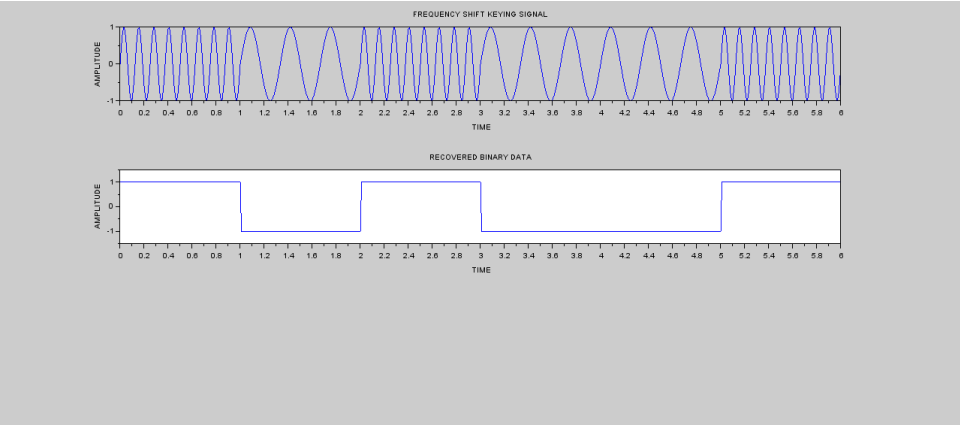

Figure 10.2: Exp10

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
```

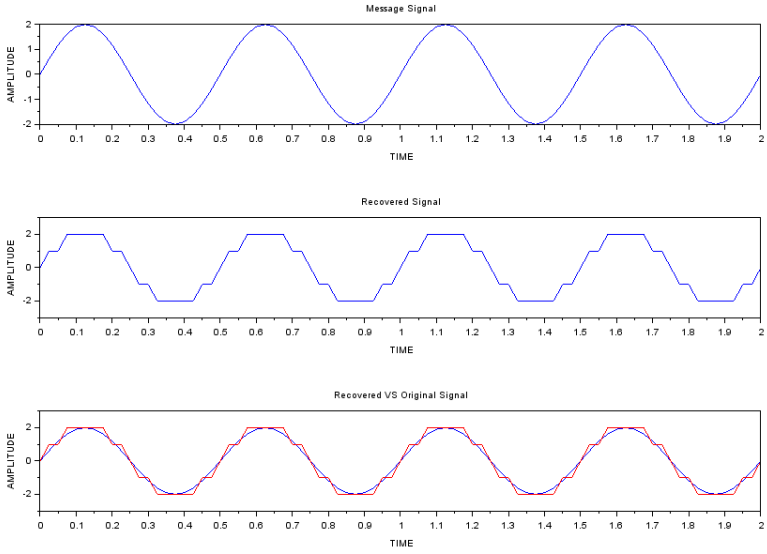

Figure 11.1: Exp11

```
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)
```

```
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
```

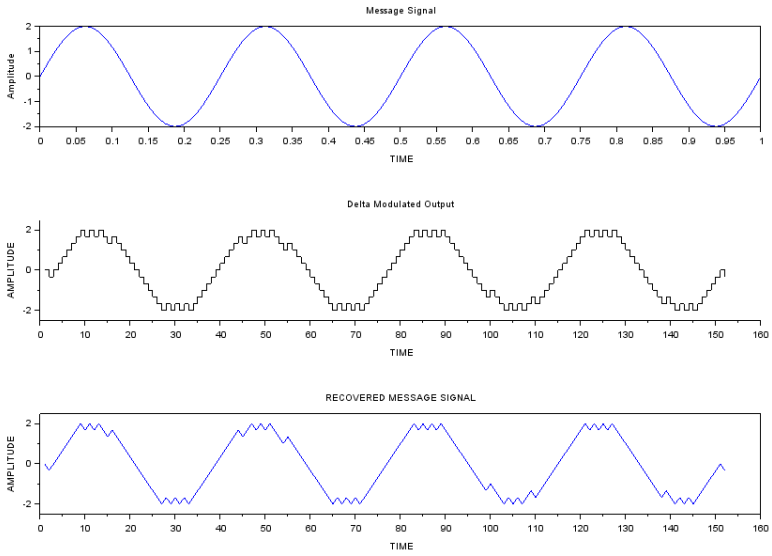

Figure 12.1: Exp12