Scilab Manual for ANALOG AND DIGITAL COMMUNICATION LABORATORY

by Prof Shaik Aqeel
Electronics and Telecommunication Engineering
Sreyas Institute Of Engineering And Technology[1]

Solutions provided by
Prof Shaik Aqeel
Electronics and Telecommunication Engineering
Sreyas Institute Of Engineering And Technology

November 28, 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

Contents

List of Scilab Solutions 4

1 AMPLITUDE MODULATION AND DEMODULATION AND ITS SPECTRUM ANALYSIS 7

2 DOUBLE SIDE BAND SUPPRESSED CARRIER MODULATION AND DEMODULATION AND ITS SPECTRUM ANALYSIS 12

3 SINGLE SIDE BAND MODULATION AND DEMODULATION AND ITS SPECTRUM ANALYSIS 17

4 FREQUENCY MODULATION AND ITS SPECTRUM ANALYSIS 23

5 PULSE AMPLITUDE MODULATION AND DEMODULATION AND ITS SPECTRUM ANALYSIS 28

6 TIME DIVISION MULTIPLEXING AND DEMULTIPLEXING 32

7 FREQUENCY DIVISION MULTIPLEXING AND DEMULTIPLEXING 38

8 BINARY AMPLITUDE SHIFT KEYING GENERATION AND DETECTION 43

9 BINARY PHASE SHIFT KEYING GENERATION AND DETECTION 48

10 FREQUENCY SHIFT KEYING GENERATION AND DETECTION 53

11 PULSE CODE MODULATION GENERATION AND DETECTION 58

12 DELTA MODULATION GENERATION 63

List of Experiments

Solution 1.1	Exp01	7
Solution 2.0	Exp02	12
Solution 3.0	Exp03	17
Solution 4.0	Exp04	23
Solution 5.0	Exp05	28
Solution 6.0	Exp06	32
Solution 7.0	Exp07	38
Solution 8.0	Exp08	43
Solution 9.0	Exp09	48
Solution 10.0	Exp10	53
Solution 11.0	Exp11	58
Solution 12.0	Exp12	63

List of Figures

1.1 Exp01 10
1.2 Exp01 11

2.1 Exp02 15
2.2 Exp02 16

3.1 Exp03 21
3.2 Exp03 22
3.3 Exp03 22

4.1 Exp04 26
4.2 Exp04 27

5.1 Exp05 31
5.2 Exp05 31

6.1 Exp06 36
6.2 Exp06 36
6.3 Exp06 37

7.1 Exp07 41
7.2 Exp07 42

8.1 Exp08 46
8.2 Exp08 47

9.1 Exp09 51
9.2 Exp09 52

10.1 Exp10 57
10.2 Exp10 57

11.1 Exp11 62
12.1 Exp12 66

Experiment: 1

AMPLITUDE MODULATION AND DEMODULATION AND ITS SPECTRUM ANALYSIS

Scilab code Solution 1.1 Exp01

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

// OS : Windows 10.1
// 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
```

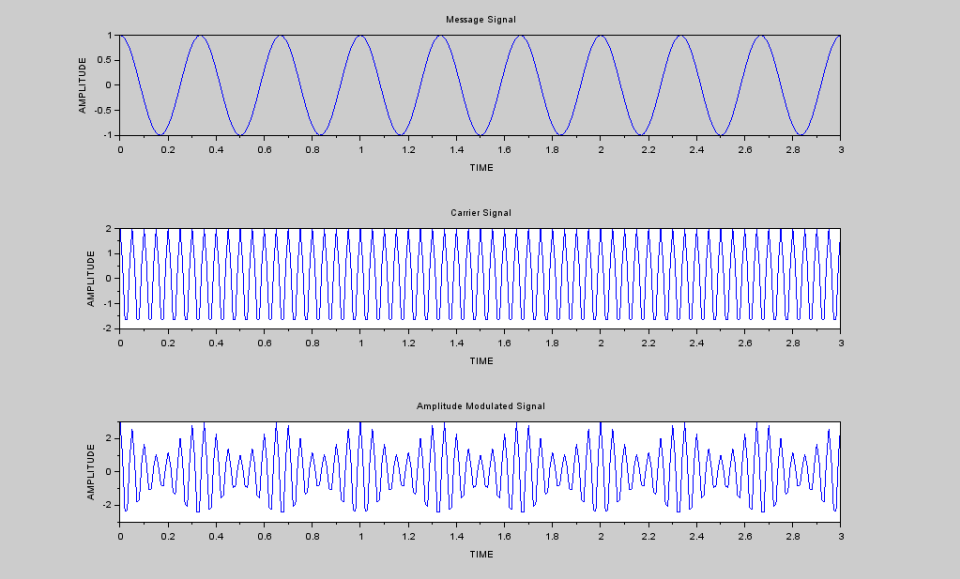

Figure 1.1: Exp01

```
87  //  0.5
```

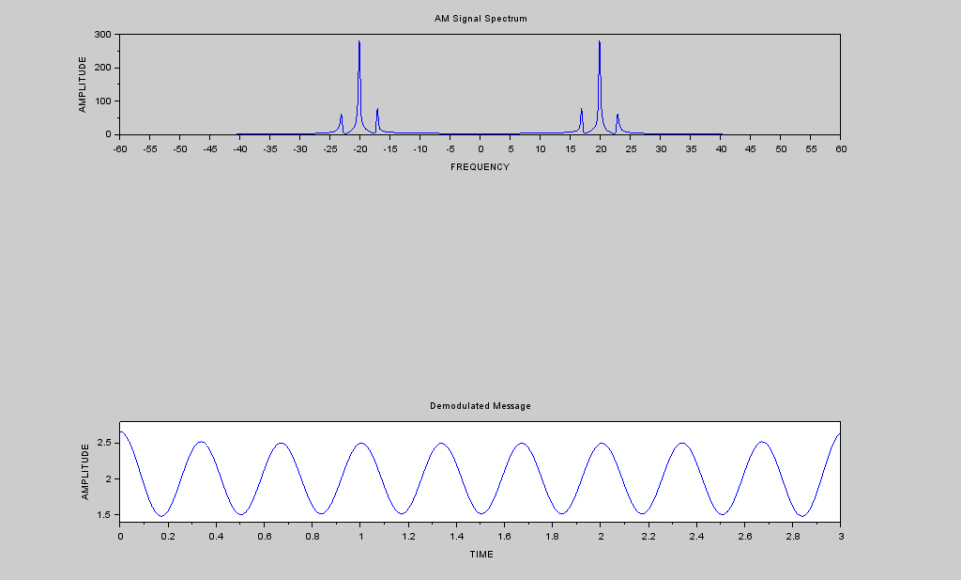

Figure 1.2: Exp01

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
```

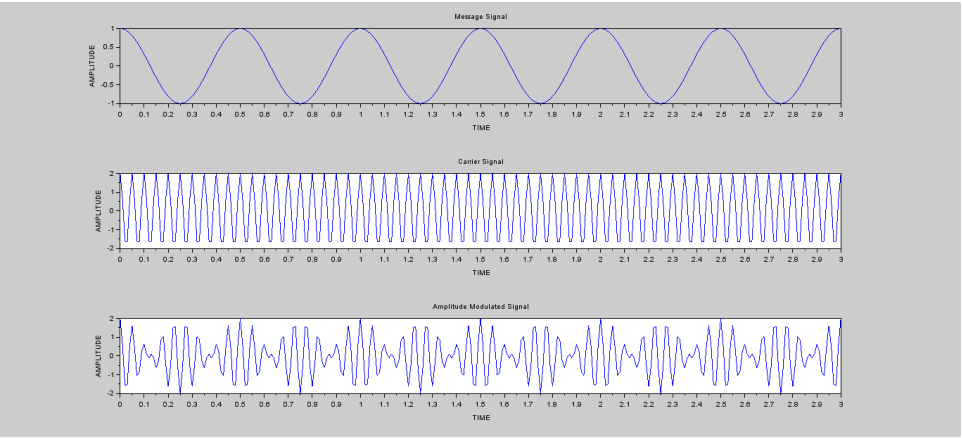

Figure 2.1: Exp02

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

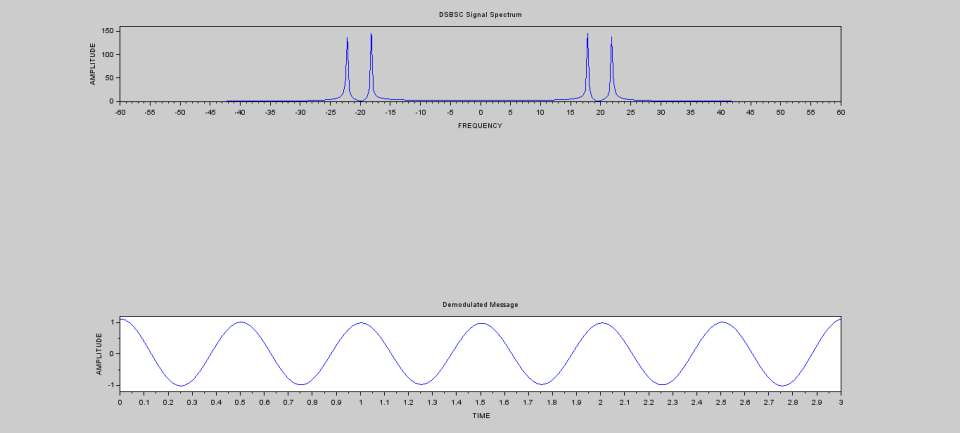

Figure 2.2: Exp02

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
```

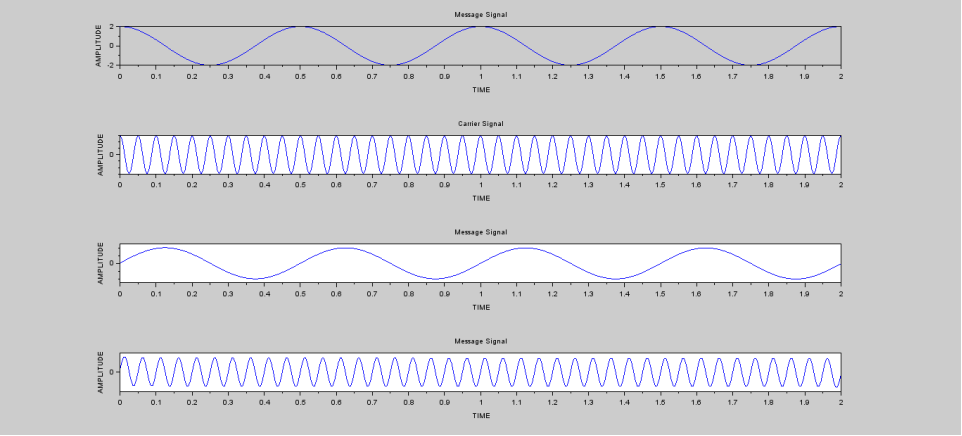

Figure 3.1: Exp03

```
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
```

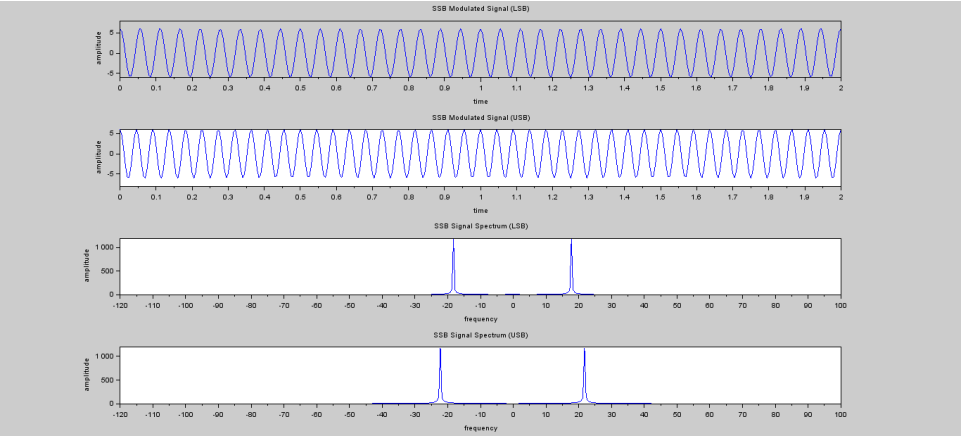

Figure 3.2: Exp03

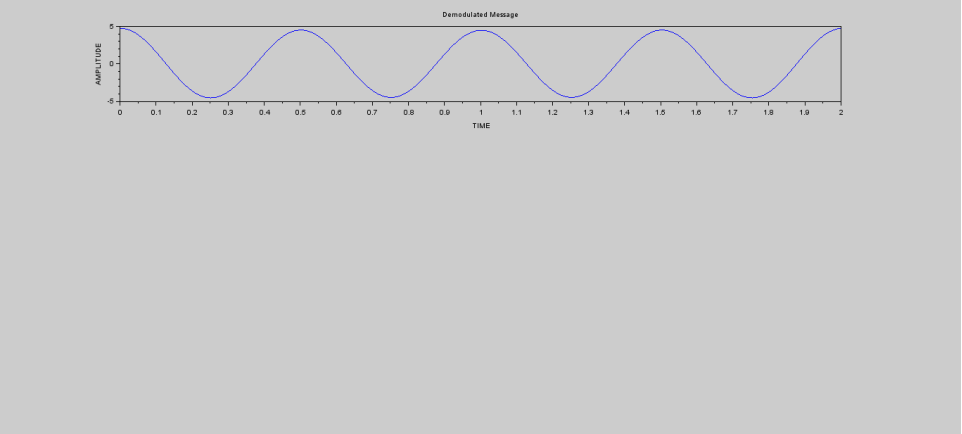

Figure 3.3: Exp03

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.
```

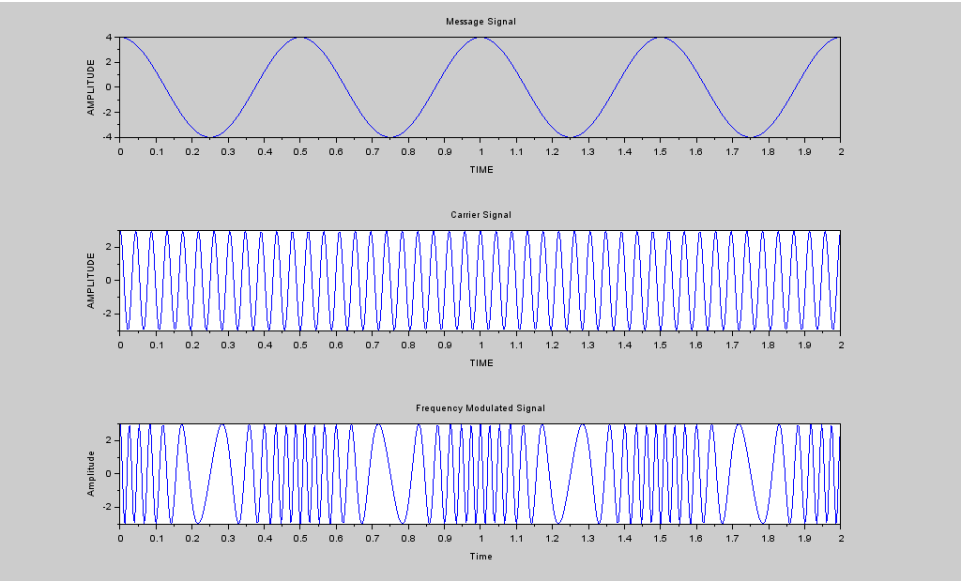

Figure 4.1: Exp04

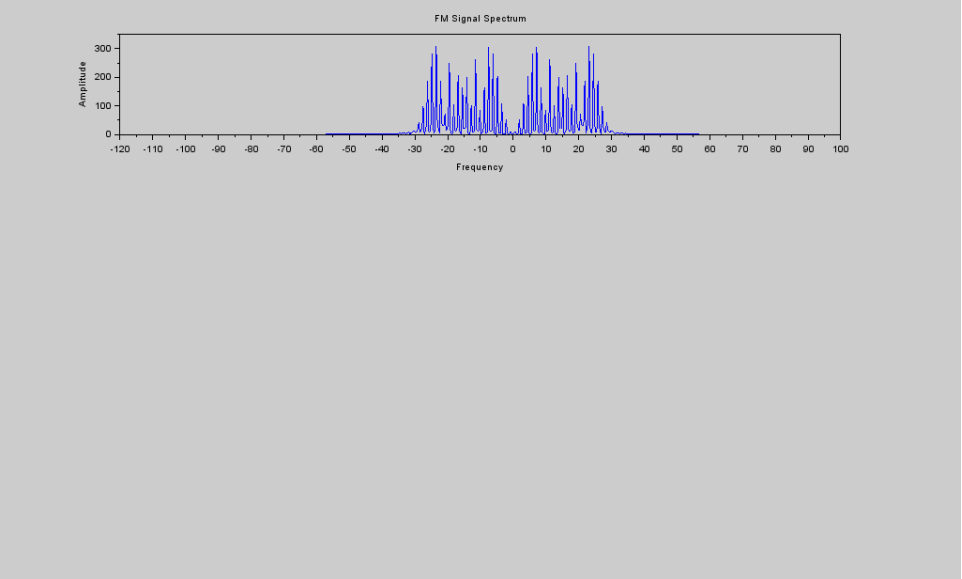

Figure 4.2: Exp04

Experiment: 5

PULSE AMPLITUDE MODULATION AND DEMODULATION AND ITS SPECTRUM ANALYSIS

Scilab code Solution 5.0 Exp05

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

// 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
```

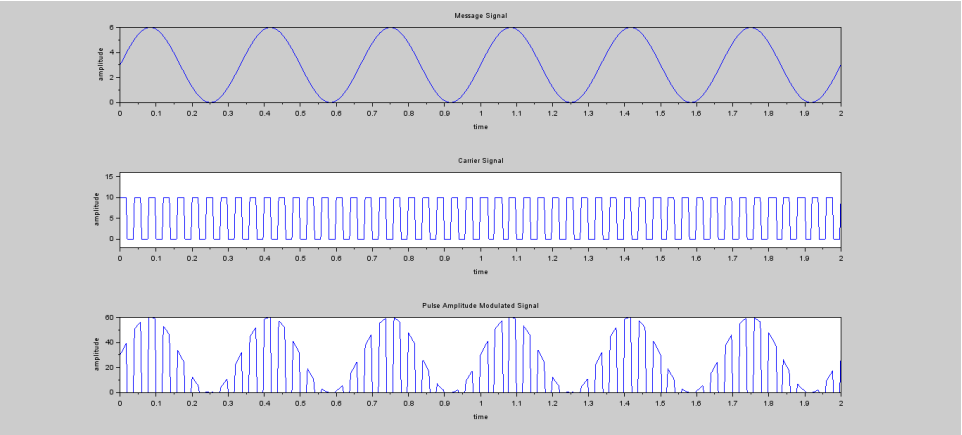

Figure 5.1: Exp05

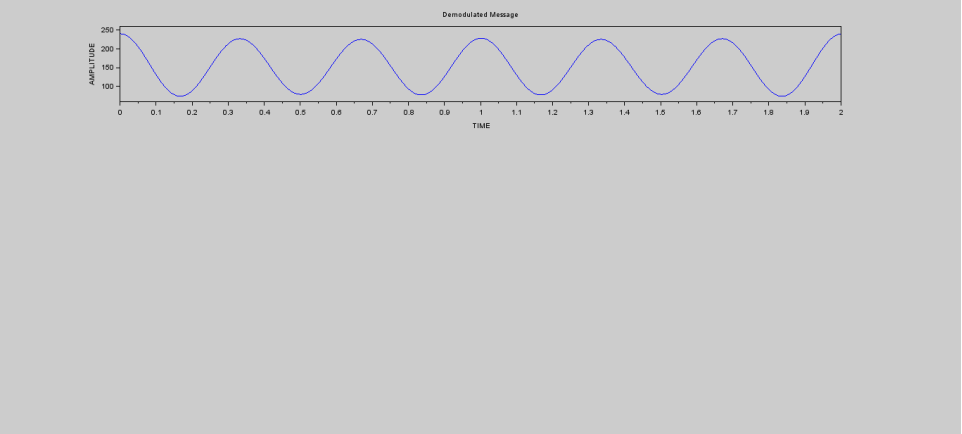

Figure 5.2: Exp05

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)');
```

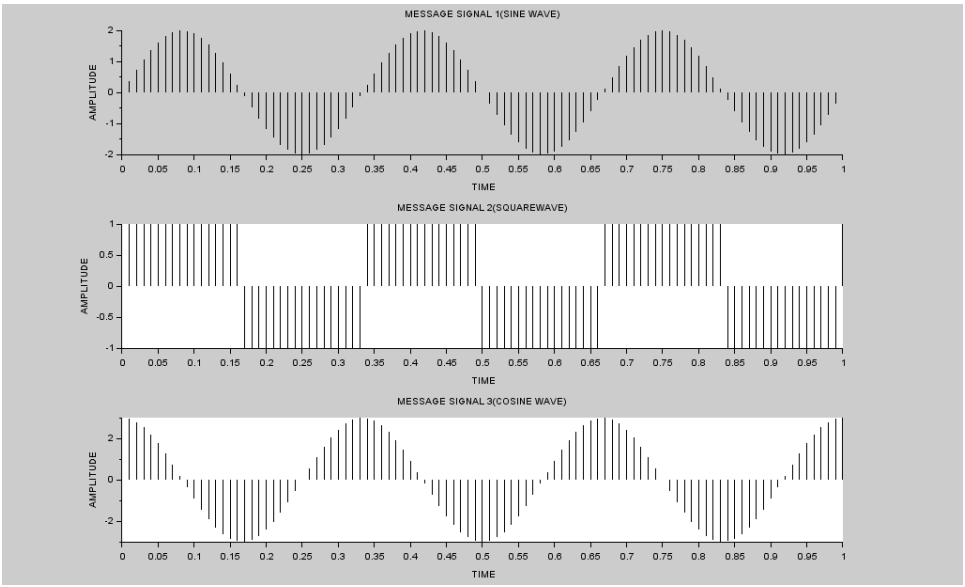

Figure 6.1: Exp06

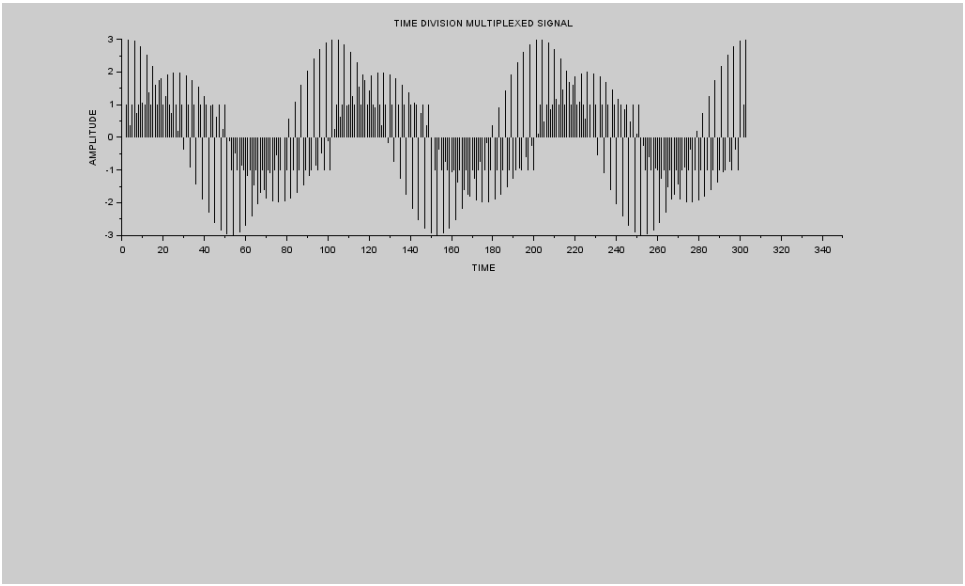

Figure 6.2: Exp06

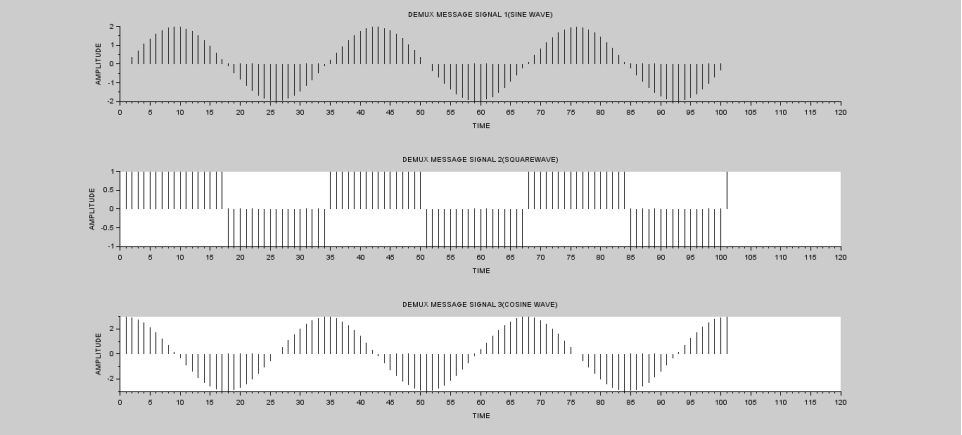

Figure 6.3: Exp06

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);
```

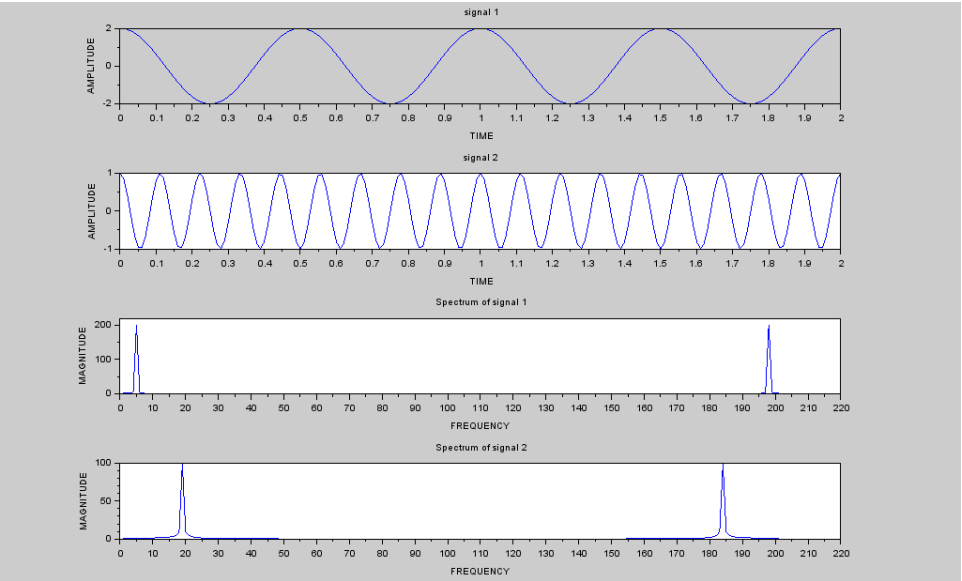

Figure 7.1: Exp07

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

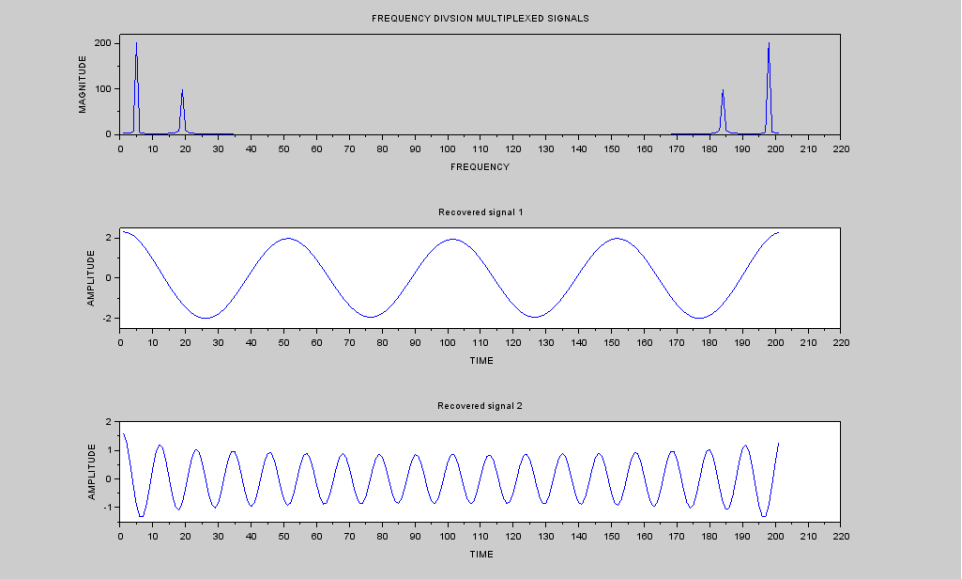

Figure 7.2: Exp07

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
```

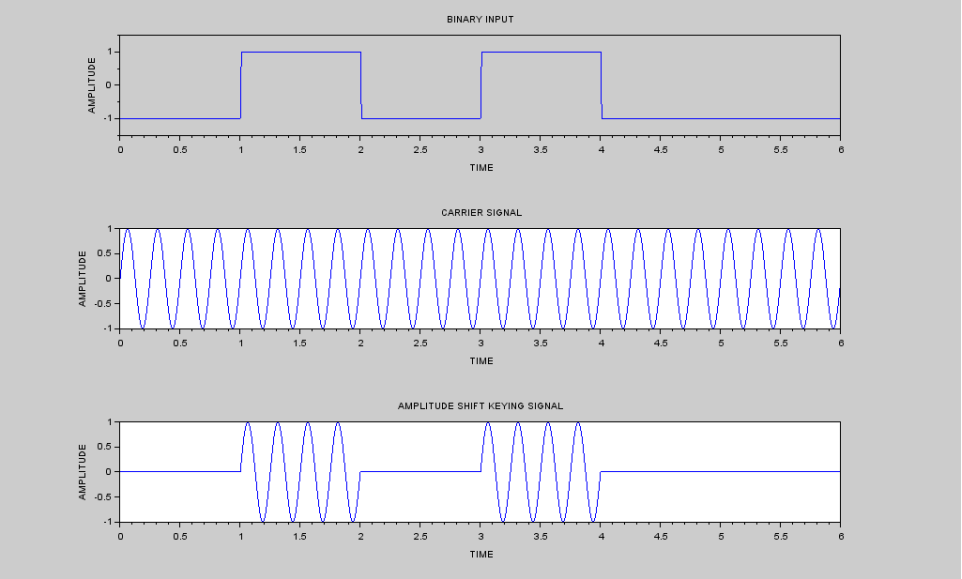

Figure 8.1: Exp08

```
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]
```

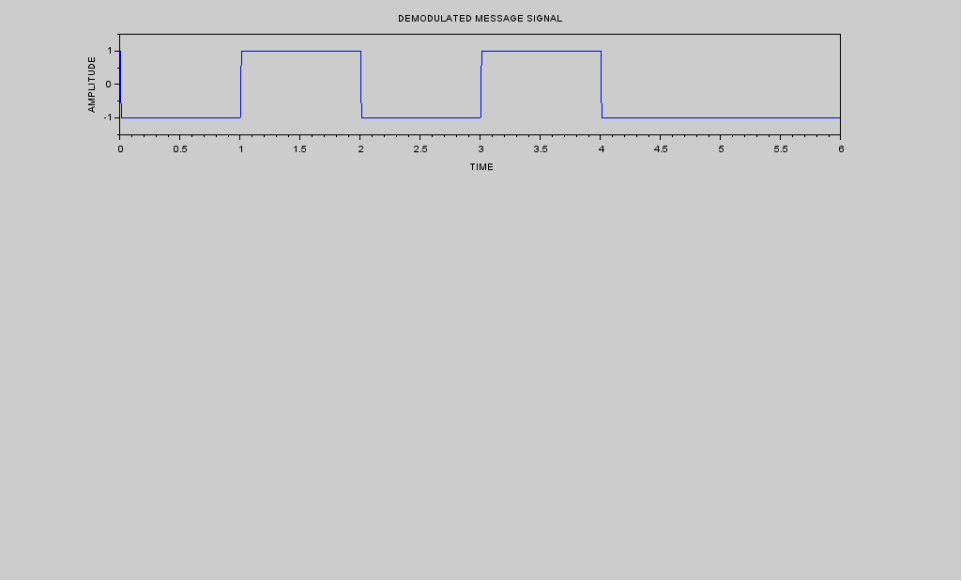

Figure 8.2: Exp08

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');
```

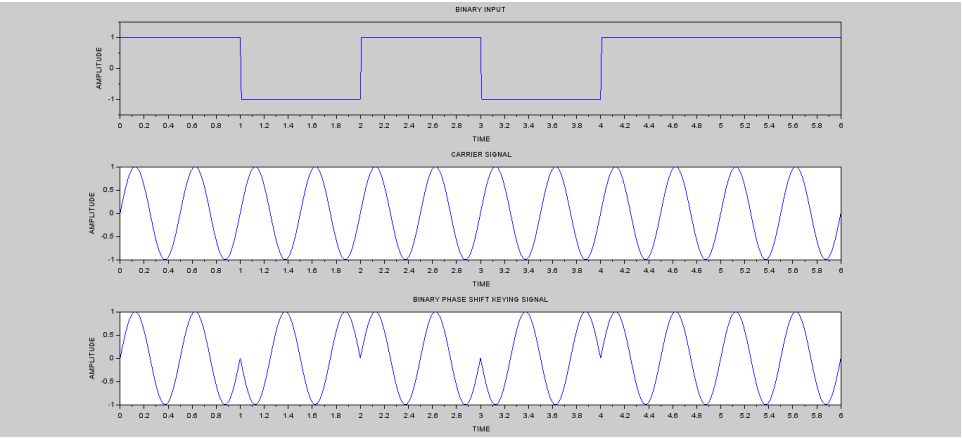

Figure 9.1: Exp09

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

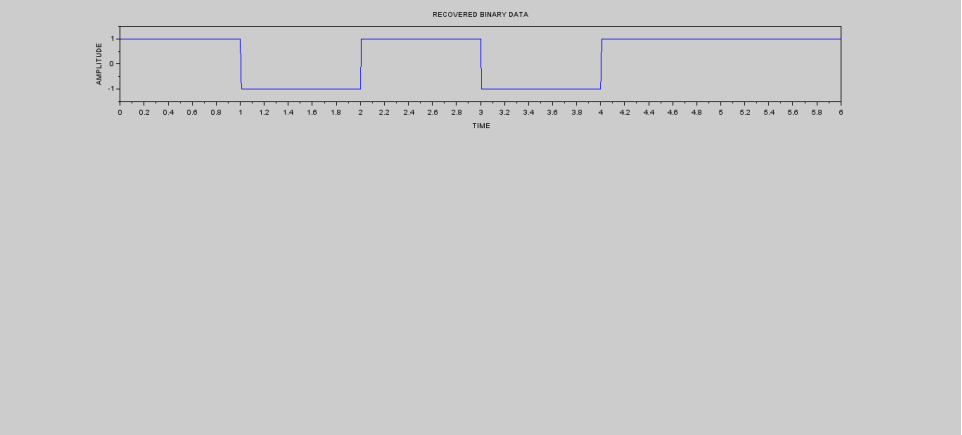

Figure 9.2: Exp09

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]
```

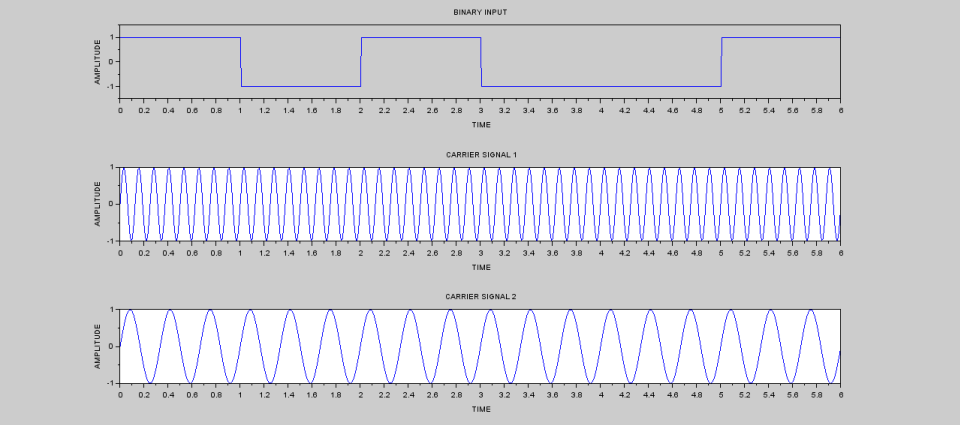

Figure 10.1: Exp10

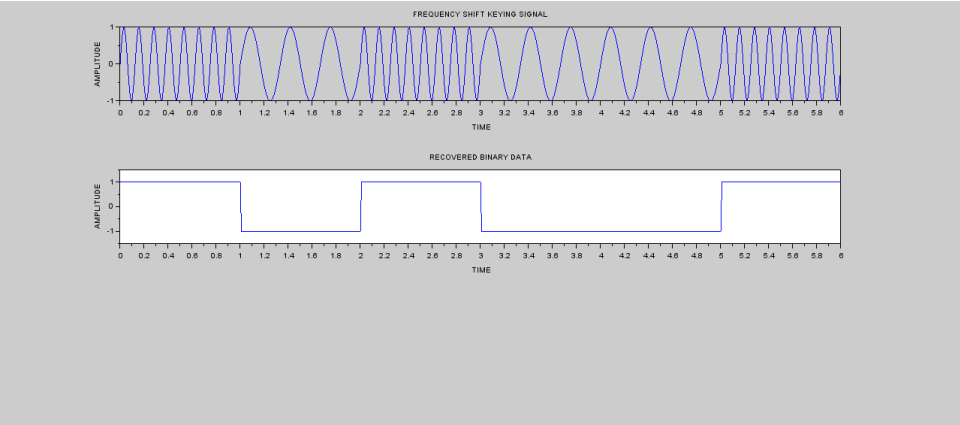

Figure 10.2: Exp10

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
```

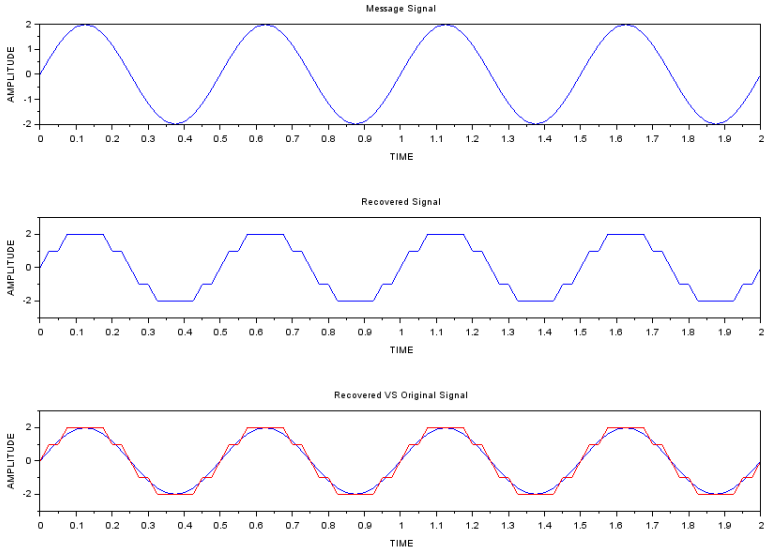

Figure 11.1: Exp11

```
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
```

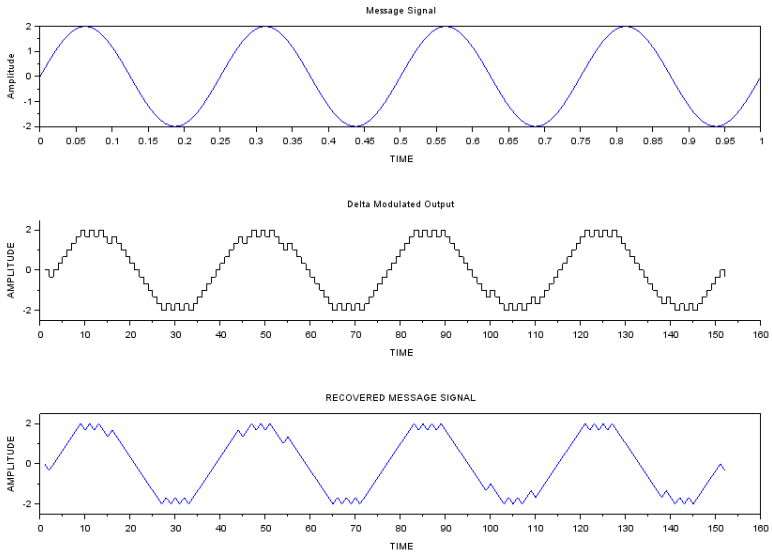

Figure 12.1: Exp12