Lab1-Report

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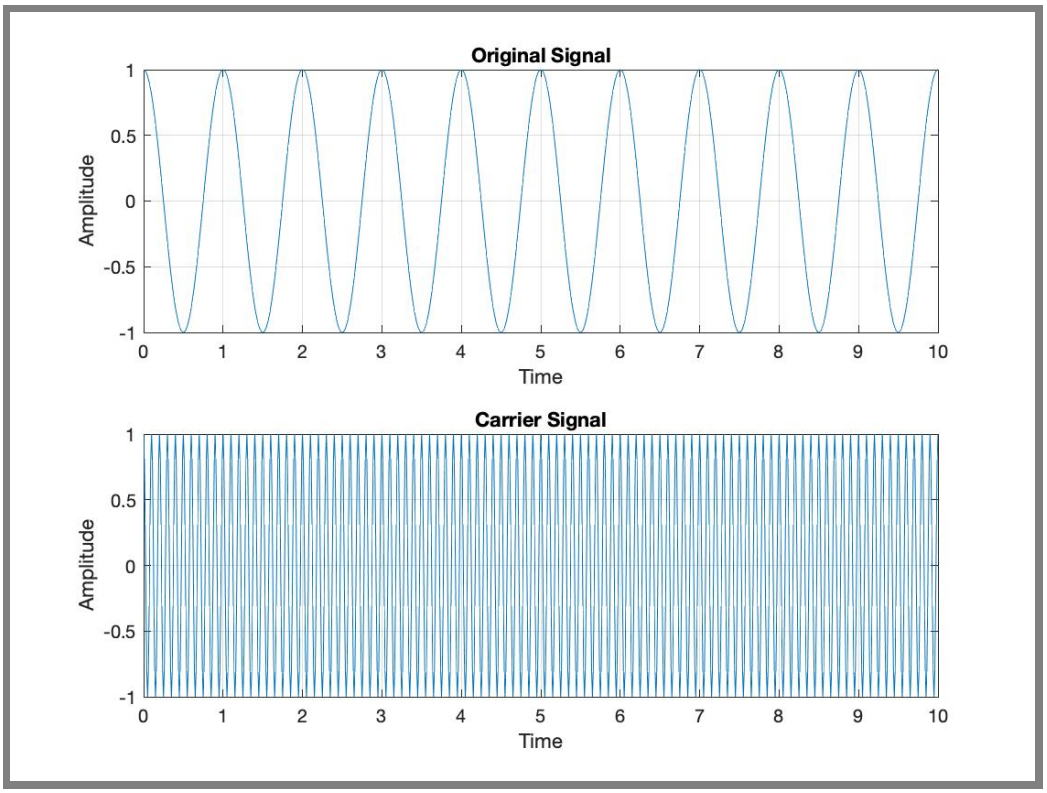
1 Conventional AM-

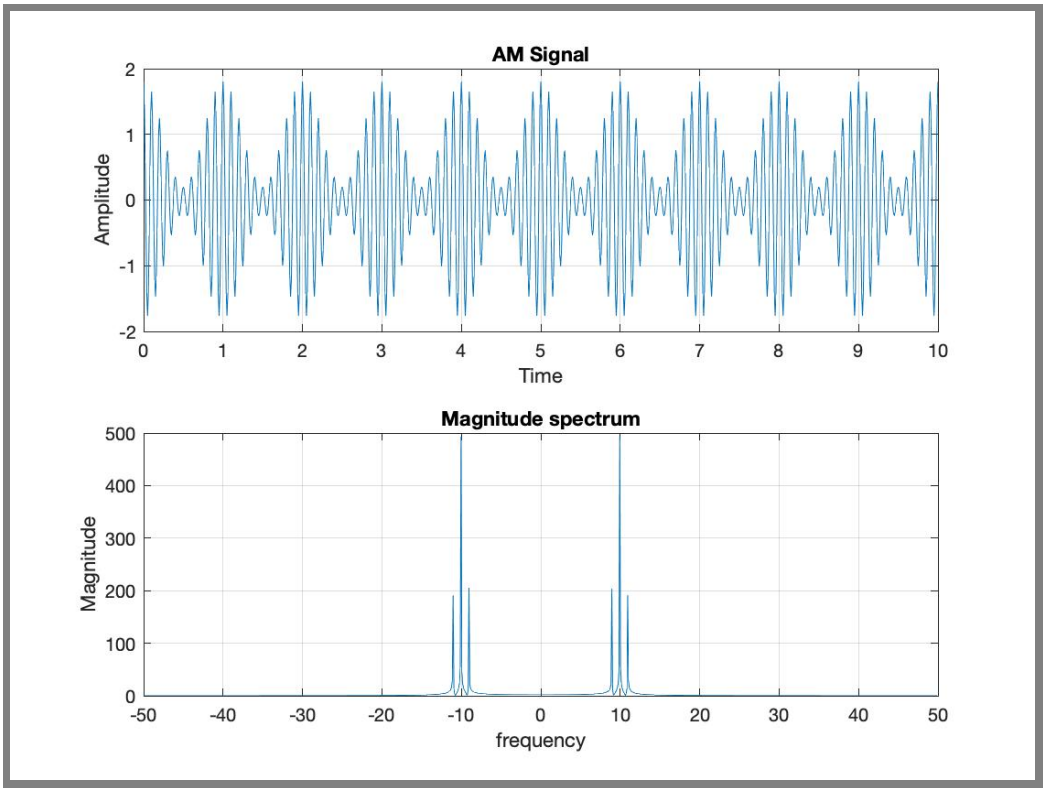
Code-

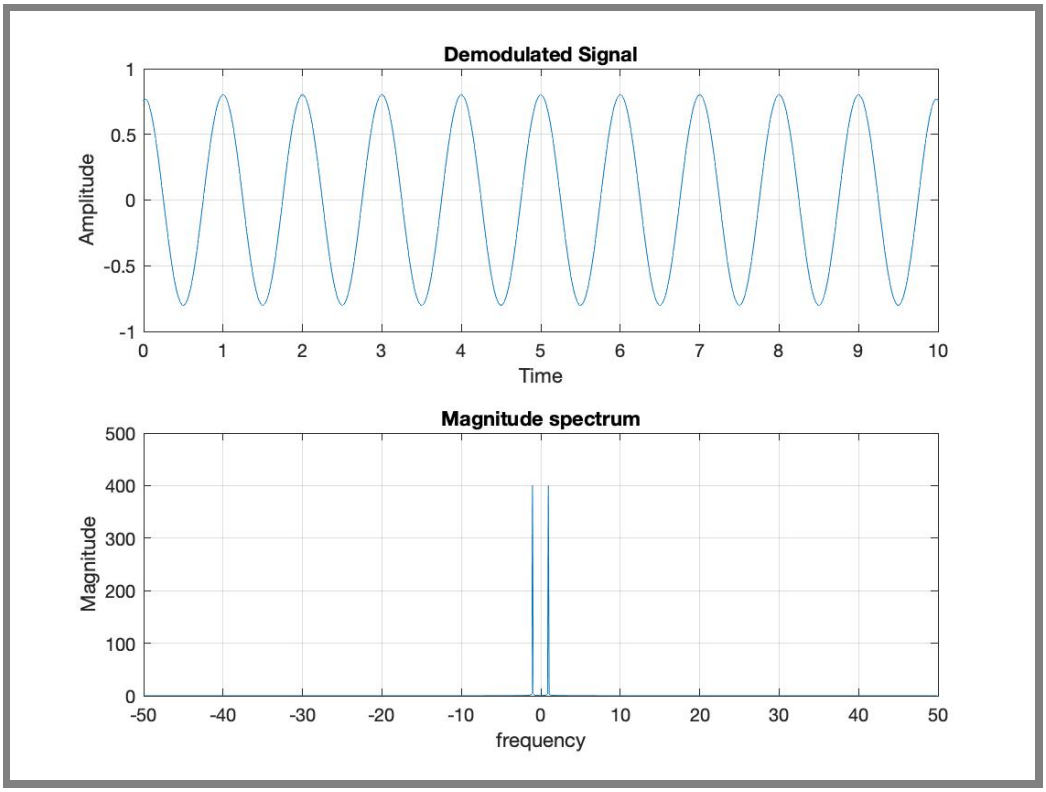
```
clear all;
close all;
t1 = [0:0.01:10];                          %Sampling frequency = 100Hz

%Taking input from user and initializing variables-
fc = input("Carrier Frequency:");
Ac = input("Carrier Amplitude:");

carr = Ac*cos(2*pi*fc*t1);                  %carrier signal
amod = input("Modulation index:");
fm = input("Message Frequency:");
msg = cos(2*pi*fm*t1);                      %message

%Modulation using conventional AM-
AM = Ac*(1 + amod*msg).*carr;

%Taking Fourier Transform of modulated signal-
n = length(AM);
Y = fft(AM);
Fam = fftshift(Y);
fshift = (-n/2:n/2-1)*(100/n);              % zero-centered frequency range
freq = abs(Fam);

%Demodulation of AM signal
demod = envelope(AM,1,'peak')-Ac;

%Taking Fourier Transform of Demodulated signal-
n1 = length(demod);
X = fft(demod);
Fam = fftshift(X);
fshift = (-n1/2:n1/2-1)*(100/n1);           % zero-centered frequency range
freq1 = abs(Fam);

%Plotting initial signals-
```

```
figure(1);

subplot(2,1,1)
plot(t1, msg);
title('Original Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;

subplot(2,1,2)
plot(t1, carr);
title('Carrier Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;



%Plotting Modulated signal-
figure(2);

subplot(2,1,1)
plot(t1, AM);
title('AM Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;

subplot(2,1,2)
plot(fshift, freq);
title('Magnitude spectrum');
xlabel('frequency');
ylabel('Magnitude');
grid on;

%Plotting Demodulated signal-
figure(3);

subplot(2,1,1)
plot(t1, demod);
title('Demodulated Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;

subplot(2,1,2)
plot(fshift, freq1);
title('Magnitude spectrum');
xlabel('frequency');
ylabel('Magnitude');
grid on;
```

Plots for-
Carrier Frequency:10 , Carrier Amplitude:1
Modulation index:0.8 , Message Frequency:1







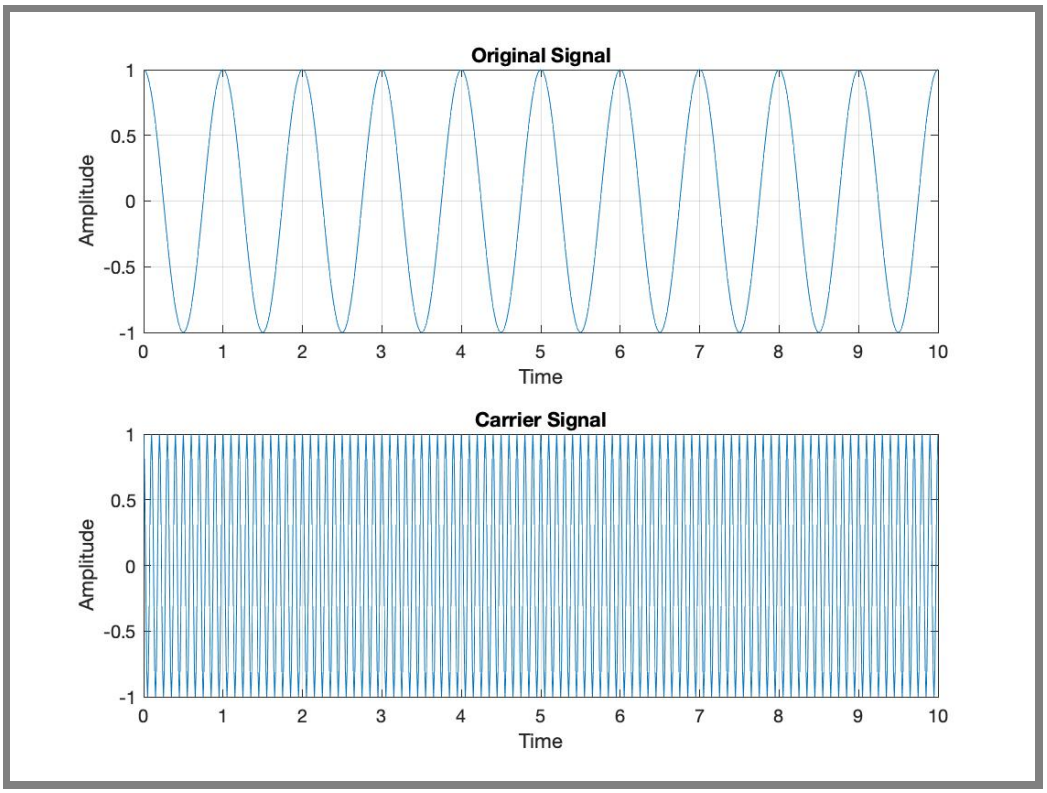
2 DSB-SC-

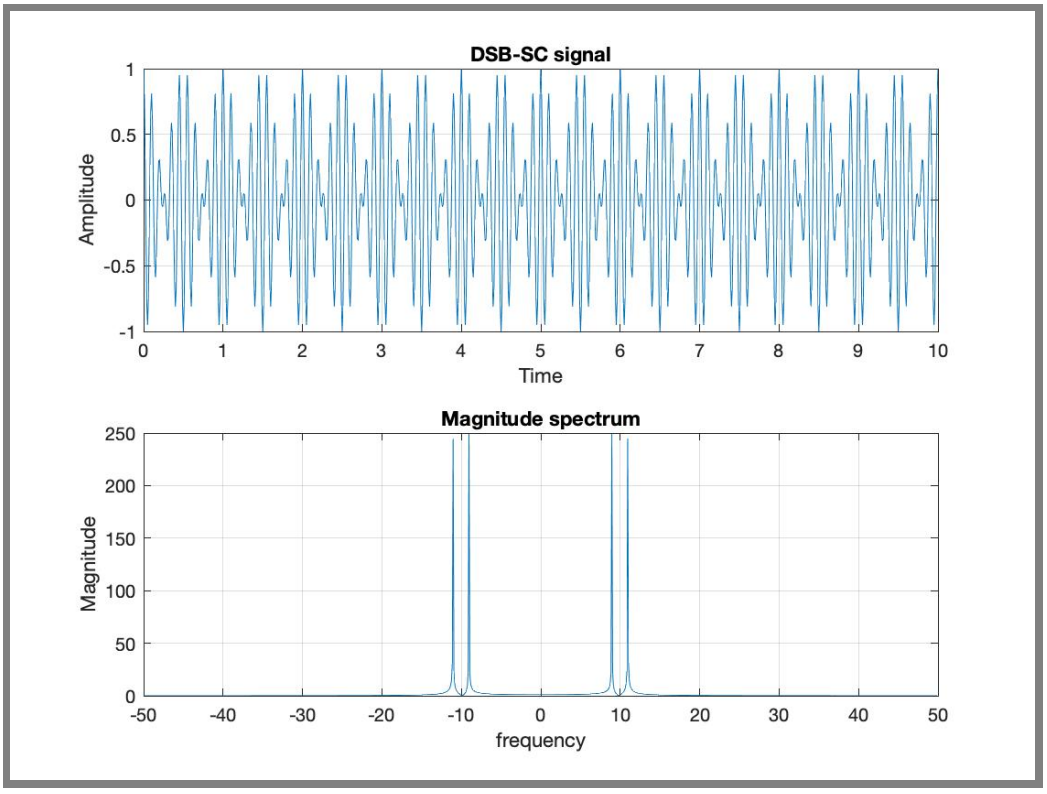
Code-

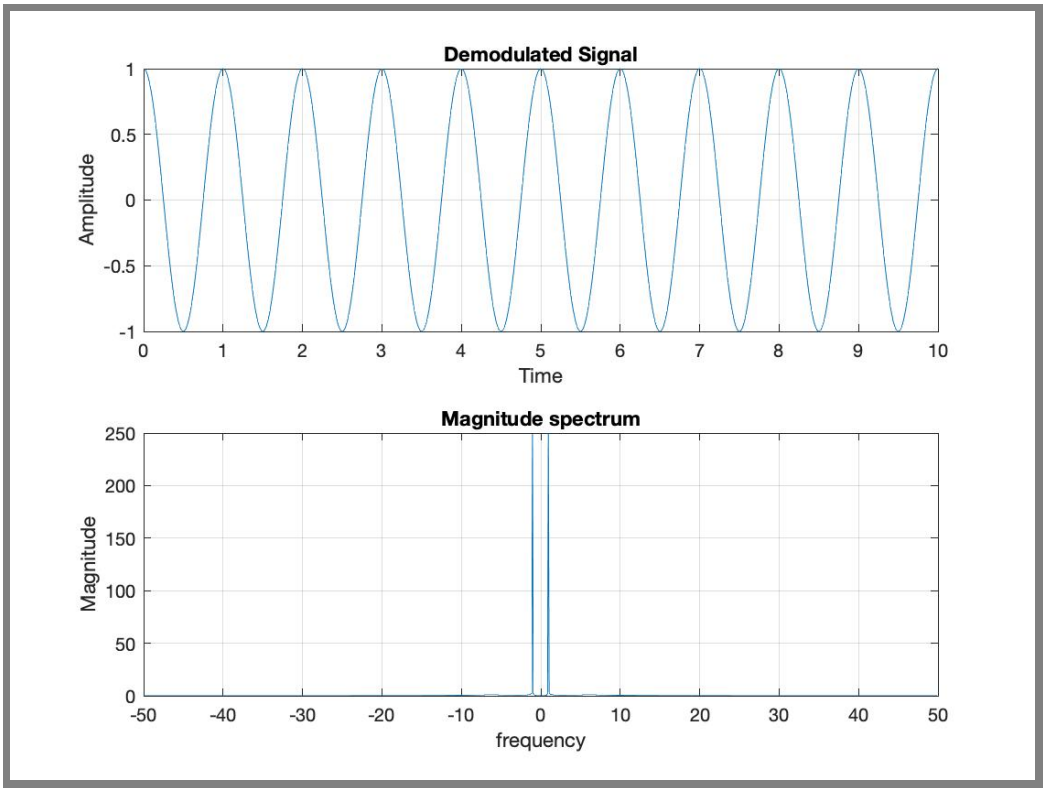
```
clear all;
close all;
t1 = [0:0.01:10];                    %Sampling frequency = 100Hz

fc = input("Carrier Frequency:");
Ac = input("Carrier Amplitude:");
% Carrier Signal
carr = Ac*cos(2*pi*fc*t1);
fm = input("Message Frequency:");
%Message Signal
msg = cos(2*pi*fm*t1);
% DSB-SC is Modulated signal
DSB_SC = msg.*carr;

%Taking Fourier Transform of modulated signal-
n = length(DSB_SC);
Y = fft(DSB_SC);
Fam = fftshift(Y);
fshift = (-n/2:n/2-1)*(100/n);       % zero-centered frequency range
freq = abs(Fam);

%Demodulating Signal
X = DSB_SC .* cos(2*pi*fc*t1);
demod = lowpass(X,fc/3,100)          %Passing through a lowpass filter

```

```
%Taking Fourier Transform of Demodulated signal-
n = length(demod);
Z = fft(demod);
Fam1 = fftshift(Z);
fshift = (-n/2:n/2-1)*(100/n);      % zero-centered frequency range
freq1 = abs(Fam1);

%Plotting initial signals-
figure(1);
subplot(2,1,1)
plot(t1, msg);
title('Original Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;
subplot(2,1,2)
plot(t1, carr);
title('Carrier Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;

%Plotting Modulated signal-
figure(2);
subplot(2,1,1)
plot(t1, DSB_SC);
title('DSB-SC signal');
xlabel('Time');
ylabel('Amplitude');
grid on;
subplot(2,1,2)
plot(fshift, freq);
title('Magnitude spectrum');
xlabel('frequency');
ylabel('Magnitude');
grid on;

%Plotting Demodulated signal-
figure(3);
subplot(2,1,1)
plot(t1, msg);
title('Demodulated Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;
subplot(2,1,2)
plot(fshift, freq1);
title('Magnitude spectrum');
xlabel('frequency');
ylabel('Magnitude');
grid on;
```

Plots for-
Carrier Frequency:10 , Carrier Amplitude:1
Message Frequency:1







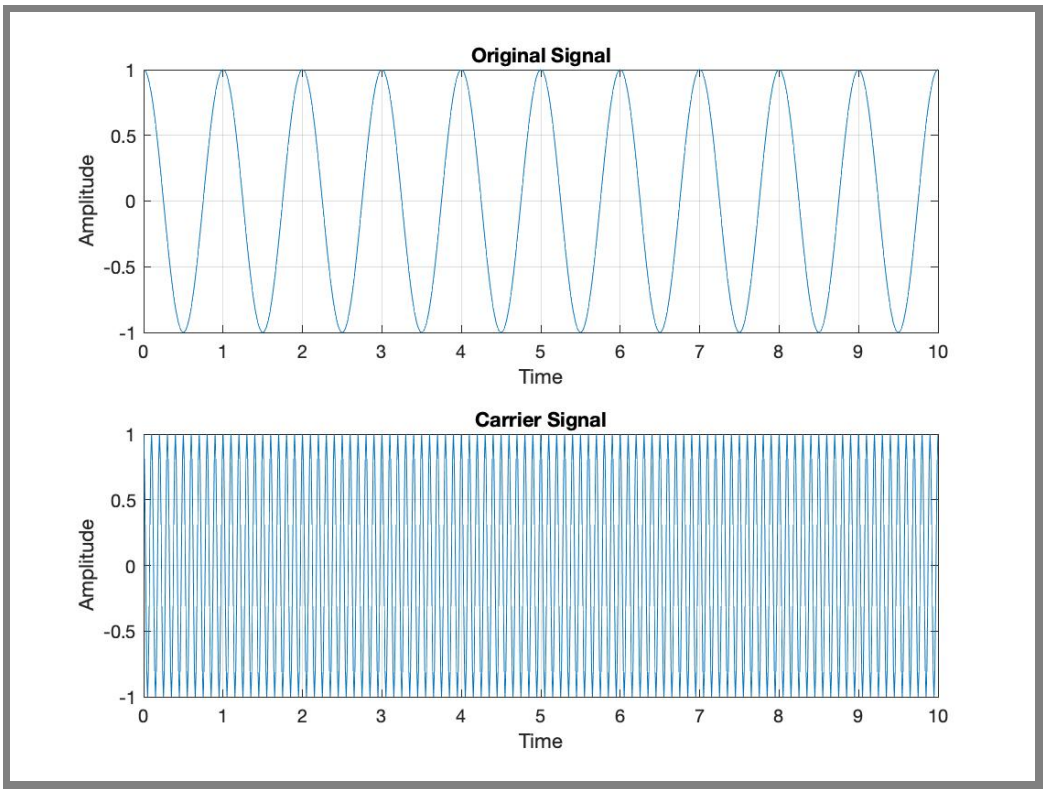
3 SSB-SC-

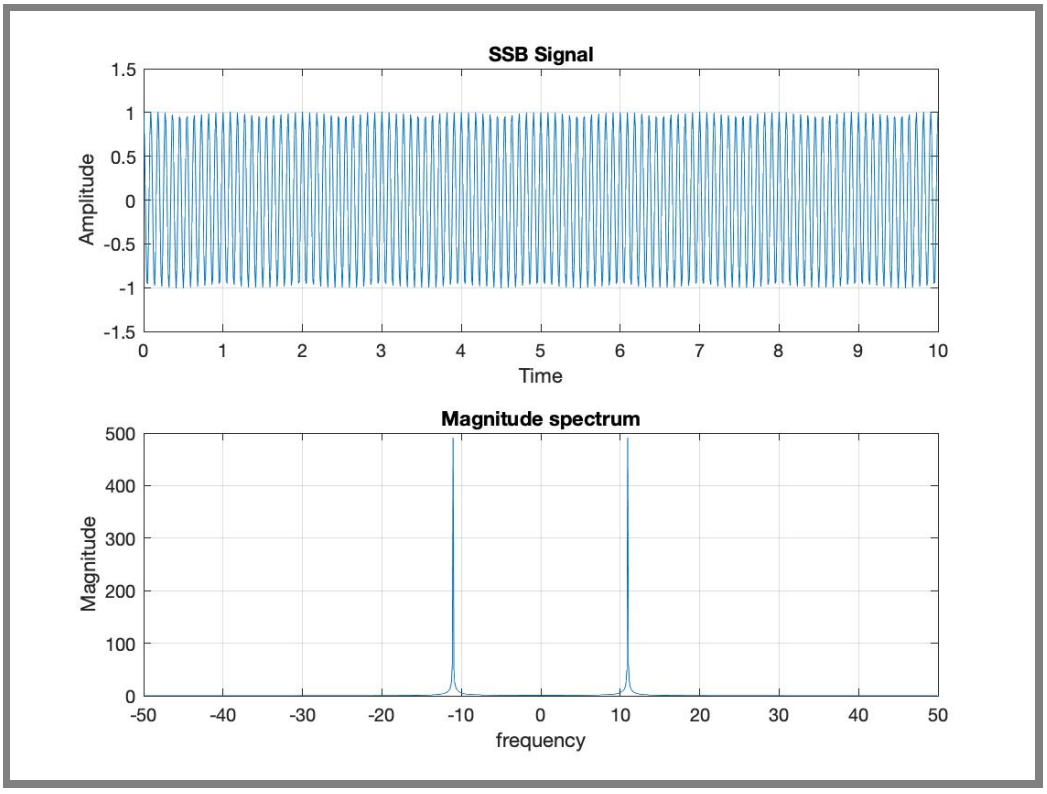
Code-

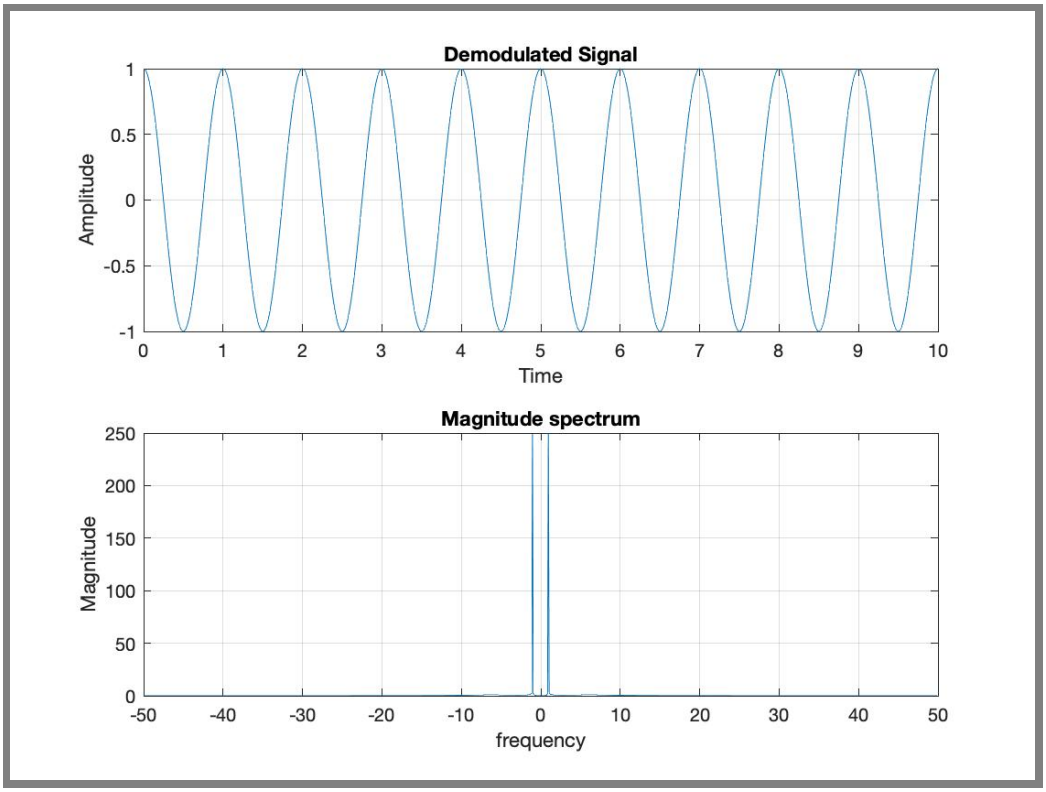
```
clear all;
close all;
t1 = [0:0.01:10];                          %Sampling frequency = 100Hz

fc = input("Carrier Frequency:");
fm = input("Message Frequency:");
%Carrier Signal-
carr = cos(2*pi*fc*t1);
%Message Signal-
msg = cos(2*pi*fm*t1);
msg_h = imag(hilbert(msg));                %Taking Hilbert transform
%Modulated Signal-
SSB = msg .* cos(2 * pi * fc * t1) - msg_h .* sin(2 * pi * fc * t1);

%Taking Fourier Transform of modulated signal-
n = length(SSB);
Y = fft(SSB);
Fam = fftshift(Y);
fshift = (-n/2:n/2-1)*(100/n);             % zero-centered frequency range
freq = abs(Fam);

%Demodulating Signal-
X = SSB .* cos(2*pi*fc*t1);
demod = lowpass(X,fc/3,100)                %Passing through a lowpass filter

```

```
%Taking Fourier Transform of Demodulated signal-
n = length(demod);
Z = fft(demod);
Fam1 = fftshift(Z);
fshift = (-n/2:n/2-1)*(100/n);          % zero-centered frequency range
freq1 = abs(Fam1);

%Plotting initial signals-
figure(1);
subplot(2,1,1)
plot(t1, msg);
title('Original Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;
subplot(2,1,2)
plot(t1, carr);
title('Carrier Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;

%Plotting Modulated signal-
figure(2);
subplot(2,1,1)
plot(t1, SSB);
title('SSB Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;
subplot(2,1,2)
plot(fshift, freq);
title('Magnitude spectrum');
xlabel('frequency');
ylabel('Magnitude');
grid on;

%Plotting Demodulated signal-
figure(3);
subplot(2,1,1)
plot(t1, msg);
title('Demodulated Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;
subplot(2,1,2)
plot(fshift, freq1);
title('Magnitude spectrum');
xlabel('frequency');
ylabel('Magnitude');
grid on;
```

Plots for-
Carrier Frequency:10
Message Frequency:1






Demodulated Signal
Amplitude
Time
Magnitude spectrum
Magnitude
frequency