



**D Y PATIL
INTERNATIONAL
UNIVERSITY**
AKURDI PUNE

D.Y. PATIL INTERNATIONAL UNIVERSITY

B.TECH CSE FY SEM-2

A.Y. 2022-2023

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SUBJECT: INTRODUCTION TO COMMUNICATION SYSTEMS

BATCH: A1

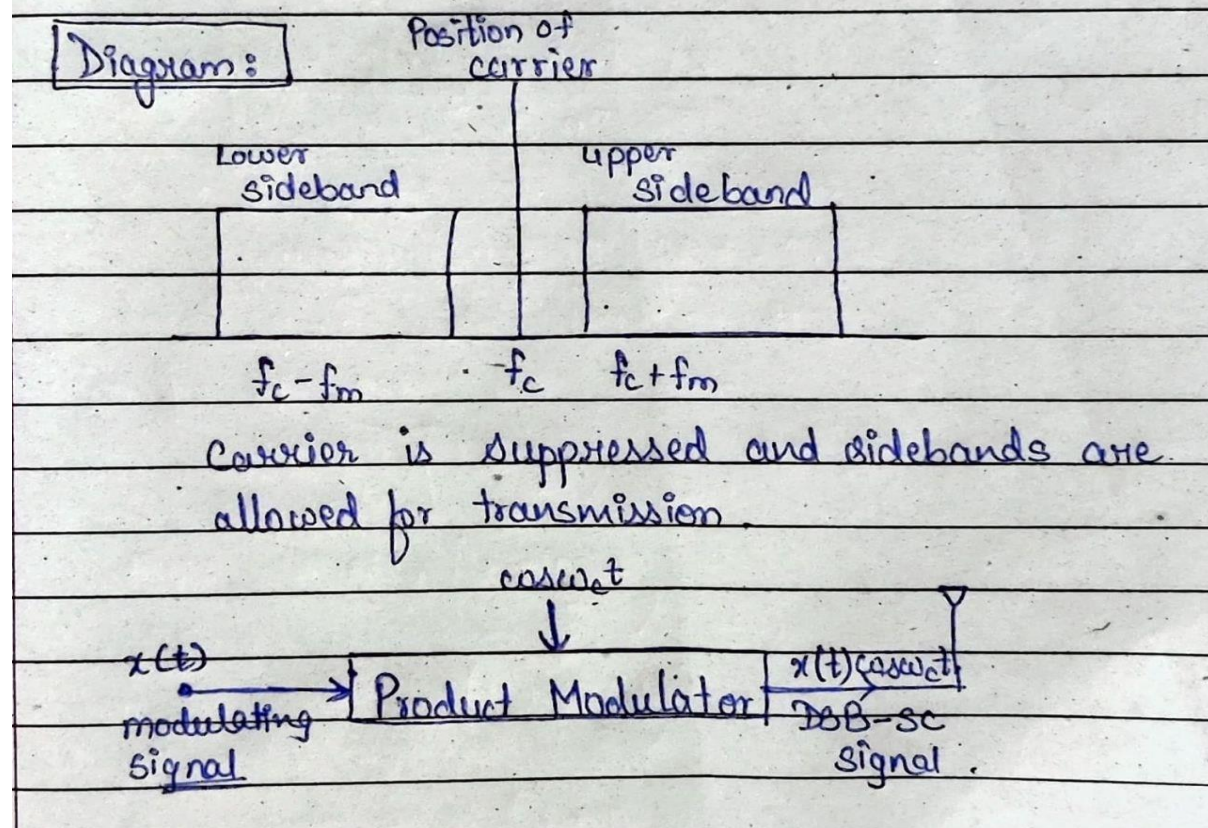
EXPERIMENT: 03

Title: DSB-SC Modulation and Demodulation

Apparatus: Matlab Simulink

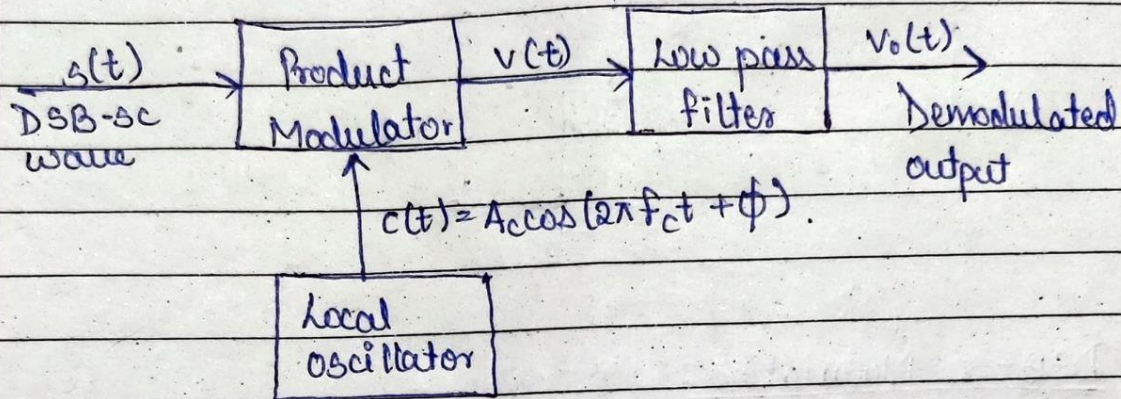
Diagram: DSB-SC Modulation and demodulation

DSB-SC Modulation:



DSB-SC Demodulation

Diagram:



Theory:

Matlab Code DSBSC Modulation:

Code:

```
close all;
Am= 5;
Ac= 5;
t= 0:0.001:2;
fm= 1;
fc= 10;
fs= 100*fc;

x= Am*sin(2*pi*fm*t);
y= Ac*cos(2*pi*fc*t);
z= x.*y;
subplot(3,2,1);
plot(x);
xlabel("time");
ylabel("Amplitude");
title("Modulating signal");
grid on;

subplot(3,2,2);
plot(y);
xlabel("time");
ylabel("Amplitude");
title("carrier signal");
grid on;
```

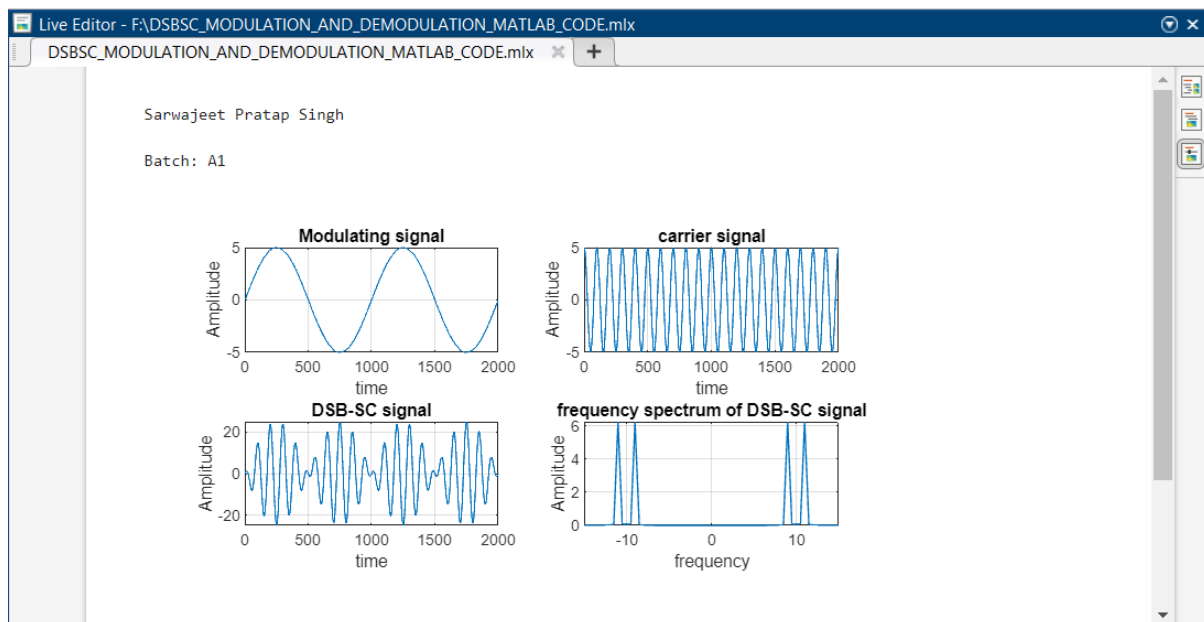
```

subplot(3,2,3);
plot(z);
xlabel("time");
ylabel("Amplitude");
title("DSB-SC signal");
grid on;

ld= length(z);
f = linspace(-fs/2, fs/2,ld);
DSB_SC= fftshift(fft(z,ld)/ld);
subplot(3,2,4);
plot(f, abs(DSB_SC));
xlim([-15,15]);
xlabel("frequency");
ylabel("Amplitude");
title("frequency spectrum of DSB-SC signal");
grid on;
fprintf("Sarwajeet Pratap Singh");
fprintf("Batch: A1");
grid on;

```

Output:



Matlab Code DSBSC Demodulation:

```
close all;
Am= 5;
Ac= 5;
t= 0:0.001:2;
fm= 1;
fc= 10;
fs= 100*fc;

x= Am*sin(2*pi*fm*t);
y= Ac*cos(2*pi*fc*t);
z= x.*y;
subplot(3,2,1);
plot(x);
xlabel("time");
ylabel("Amplitude");
title("Modulating signal");
grid on;

subplot(3,2,2);
plot(y);
xlabel("time");
ylabel("Amplitude");
title("carrier signal");
grid on;

subplot(3,2,3);
plot(z);
xlabel("time");
ylabel("Amplitude");
title("DSB-SC signal");
grid on;

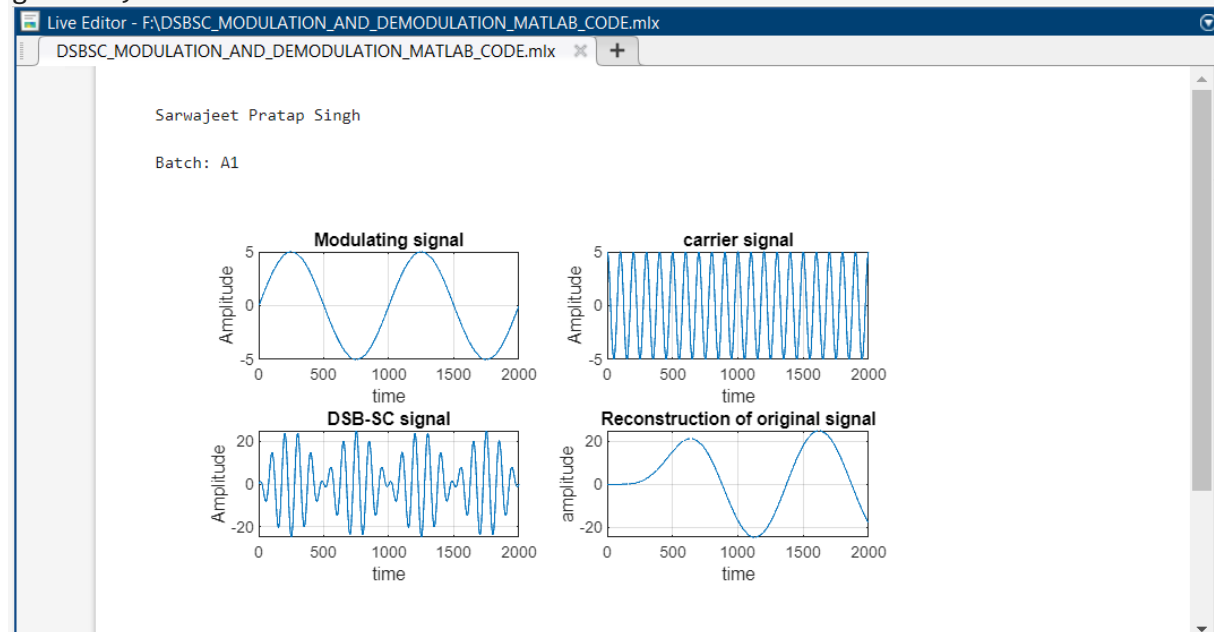
ld= length(z);
f = linspace(-fs/2, fs/2,ld);
DSB_SC= fftshift(fft(z,ld)/ld);
subplot(3,2,4);
plot(f, abs(DSB_SC));
xlim([-15,15]);
xlabel("frequency");
ylabel("Amplitude");
title("frequency spectrum of DSB-SC signal");
grid on;

bm= 2*z.*y;
bm1= bm/Ac;
```

```

nf= fm/fs;
[num,den]= butter(5,3*nf);
reconstructed= filter(num,den,bm1);
subplot(3,2,4);
plot(reconstructed);
xlabel("time");
ylabel("amplitude");
title("Reconstruction of original signal");
grid on;
fprintf("Sarwajeet Pratap Singh");
fprintf("Batch: A1");
grid on;

```



MATLAB SIMULATION OF DSB-SC MODULATION

Modulating Signal:

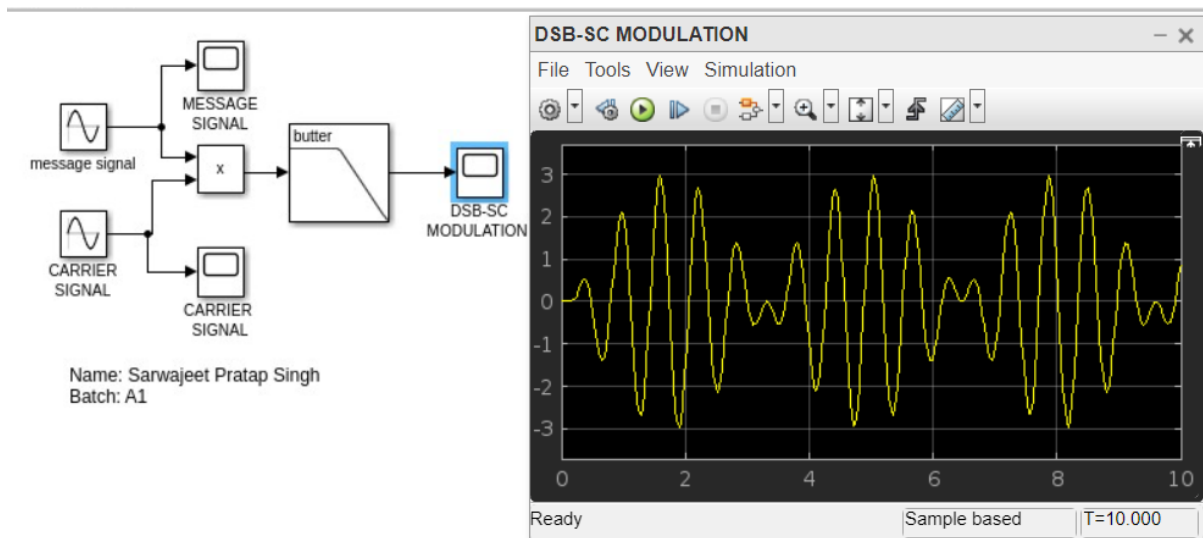
Frequency: 1rad/sec

Amplitude: 1

Carrier Signal:

Frequency: 10rad/sec

Amplitude: 3



MATLAB SIMULATION OF DSB-SC DEMODULATION

Modulating Signal:

Frequency: 1rad/sec

Amplitude: 1

Carrier Signal:

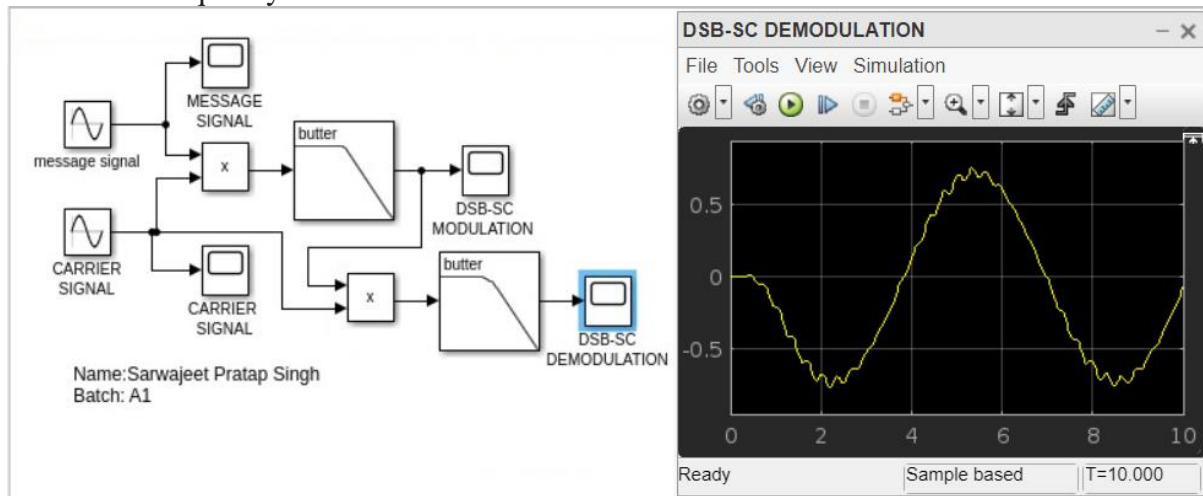
Frequency: 10rad/sec

Amplitude: 3

Band Pass Filter (2ND):

Filter Order: 3

Pass Band Frequency: 4rad/s

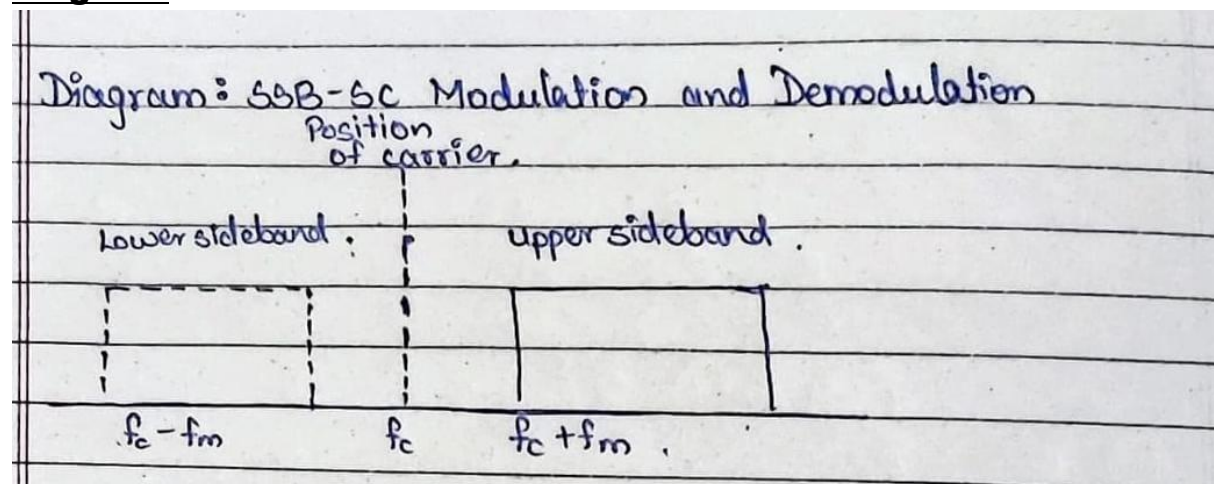


EXPERIMENT: 04

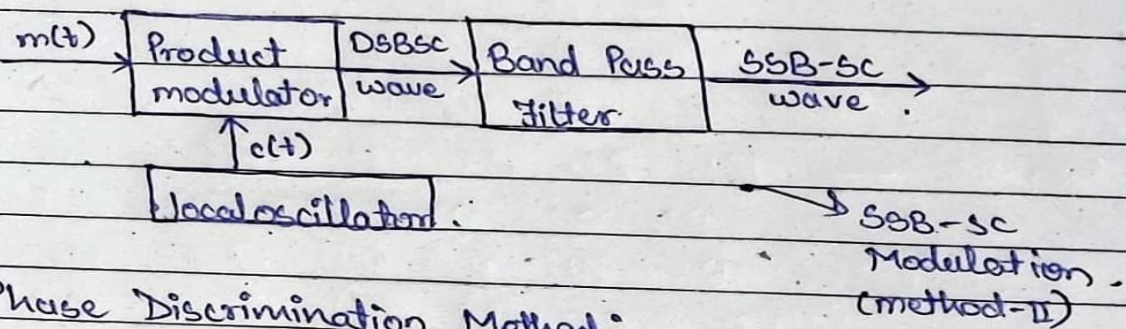
Title: SSB-SC MODULATION AND DEMODULATION

Apparatus: MATLAB

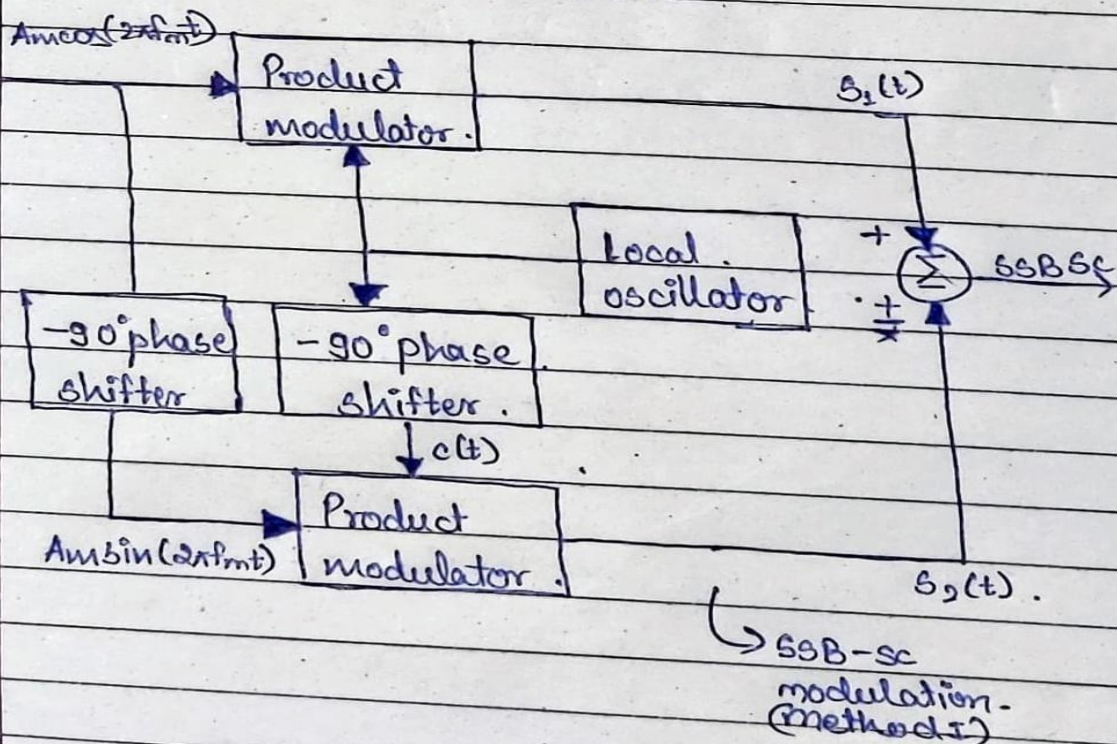
Diagram: SSB-SC MODULATION AND DEMODULATION



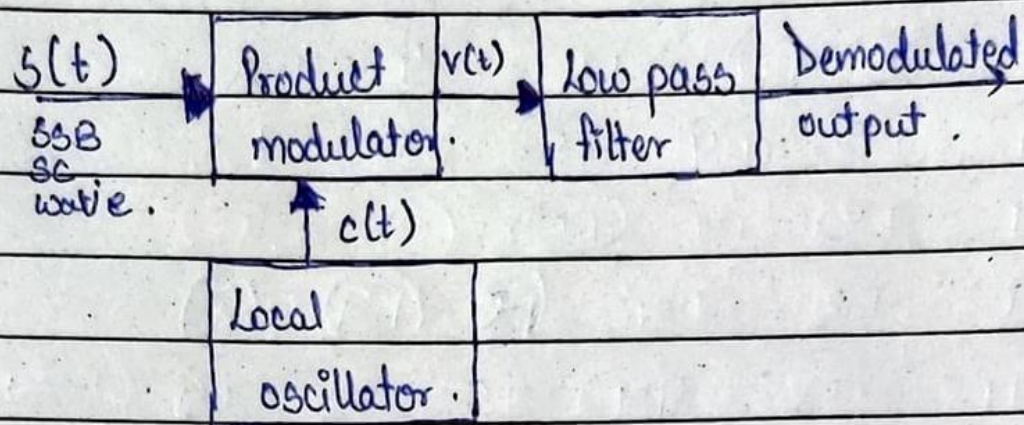
Frequency Discrimination Method:



Phase Discrimination Method:



SSB-SC Demodulator:



MATLAB CODE:

Matlab Code SSB-SC Modulation and Demodulation:

```
clc;
Am=1; %Baseband signal amplitude
fm= 200; %Baseband signal frequency
fc= 600; %carrier frequency
N= 1024;
fs= 2048; %sample frequency
ts= 1/fs; %Sample time
t= (0:N-1)/fs; %Time axis

m= Am*cos(2*pi*fm*t); %Baseband Signal
mh= Am*cos((2*pi*fm*t)-pi/2); %Hilbert transform
subplot(321); %first diagram
plot(t,m,'r');
title('Baseband signal');
xlabel('Time');
ylabel('Amplitude');

c= cos(2*pi*fc*t);
subplot(322);
plot(t,c,'b');
title('cosine signal');
xlabel('time');
ylabel('amplitude');

%Upper Sideband
sbu = m.*cos(2*pi*fc*t)- mh.*sin(2*pi*fc*t);
SBU= 2/N*abs(fft(sbu));
freq= fs*(0: N/2)/N;
subplot(323);
plot(t,sbu,'r');
title('USB');
xlabel('Time');
ylabel('Amplitude');
subplot(325);
plot(freq, SBU(1:N/2+1));
title('Frequency Domain Representation');
xlabel('Frequency(Hz)');
ylabel('Spectral Magnitude');
legend('USB');
grid on;

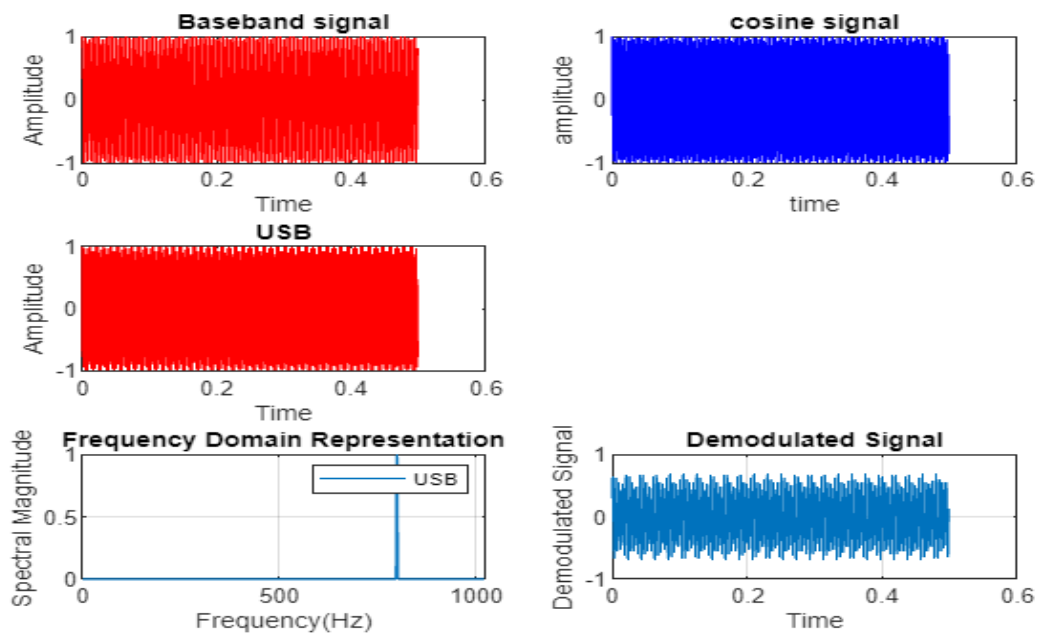
md= sbu.*cos(2*pi*fc*t);
[b,a]= butter(2,0.5);
mf= filter(b,a,md);
```

```

subplot(326);
plot(t,mf);
title('Demodulated Signal');
xlabel('Time');
ylabel('Demodulated Signal');
grid on;

fprintf("Sarwajeet Pratap Singh");
fprintf("Batch: A1");

```



Sarwajeet Pratap Singh
Batch: A1