```
clc;
clear all;
close all;

t=0:0.001:1; %creating values for x axis
Am=1/2;     %amplitude of message signal
Ac=1;       %amplitude of carrier signal
fm=5;       %frequency of modulating signal
fc=500;      %frequency of carrier signal

%message signal
ym=Am*sin(2*pi*fm*t);    %message signal
figure(1)
subplot(6,1,1)
plot(t,ym)               %plotting message signal
title('Modulating signal')

%carrier signal
yc=Ac*cos(2*pi*fc*t);     %carrier signal
subplot(6,1,2)
plot(t,yc)                %plotting carrier signal
grid on;
title('Carrier signal')

%Conventional DSB-SC Modulation
y = ym.*yc;        %multiplying message signal with carrier
subplot(6,1,3)
plot(t,y)          %plotting DSB-SC modulated signal
title('Amplitude Modulated DSB-SC Signal')
grid on;

%demodulation of DSB-SC
d=y.*yc;                 %multiplying the modulated signal with cos(2pifct)
[b,a]=butter(5,0.1);      %butterworth filter
d1=filter(b,a,d);        %implementing the filter passing the modulated signal
through filter
subplot(6,1,4)
plot(d1)                   %plotting demodulated signal
title('demodulated Signal')
grid on;

%frequency domain plots

%modulated signal
%Spectrum of modulated signal
N=length(t);
ymf=fftshift(fft(y,N)/N);        %using fft to calculate fourier transform and
fftshift is used to center the fourier transform
f=(-N/2:N/2-1);                  %creating range for x axis
subplot(6,1,5)
plot(f,real(ymf),'b')           %plotting the real part of fourier transform of
modulating signal
hold on;
```

```
plot(f,imag(ymf),'r')          %plotting the imagfinary part of fourier transform↙
of modulating signal
title('frequency modulated signal')

%demodulated signal
%Spectrum of demodulated signal
N=length(t);
ydf=fftshift(fft(d1,N)/N);     %using fft to calculate fourier transform and↙
fftshift is used to center the fourier transform
f=(-N/2:N/2-1);                %creating range for x axis
subplot(6,1,6)
plot(f,real(ydf),'b')         %plotting the real part of fourier transform of↙
modulating signal
hold on;
plot(f,imag(ydf),'r')          %plotting the imagfinary part of fourier transform of↙
modulating signal
title('frequency demodulated signal')
```