# MODULATION TECHNIQUES

Name: Amit Singh

Reg.No: 14BEC1110

**Frequency Modulation and demodulation**

clc

clear all

close all

fm=10;

fc=100;

fs=1000;

am=1;

ac=1;

Ts=1/fs;

n=0:1/fs:10\*1/fm;

b=5;

kf=b\*fm/am;

fmod=ac\*cos((2\*pi\*fc\*n)+b\*sin(2\*pi\*fm\*n))

m=am\*cos(2\*pi\*fm\*n)

c=ac\*cos(2\*pi\*fc\*n)

subplot(3,1,1)

plot(m);

title('Message Signal')

xlabel('t');

ylabel('m(t)');

subplot(3,1,2)

plot(n,fmod);

title('FM modulated Signal')

xlabel('t');

ylabel('XFM(t)');

ffunctionmod=fmmod(m,fc,fs,kf\*am)

subplot(3,1,3)

plot(n,ffunctionmod);

title('FM modulated Signal using function')

xlabel('t');

ylabel('XFM(t)');

figure

%4 different values of b

b1=5;

b2=.5;

b3=1;

b4=2.5;

fmod1=ac\*cos((2\*pi\*fc\*n)+b1\*sin(2\*pi\*fm\*n))

fmod2=ac\*cos((2\*pi\*fc\*n)+b2\*sin(2\*pi\*fm\*n))

fmod3=ac\*cos((2\*pi\*fc\*n)+b3\*sin(2\*pi\*fm\*n))

fmod4=ac\*cos((2\*pi\*fc\*n)+b4\*sin(2\*pi\*fm\*n))

subplot(4,1,1)

plot(n,fmod1);

title('FM modulated Signal with B=5')

xlabel('t');

ylabel('XFM(t)');

subplot(4,1,2)

plot(n,fmod2);

title('Modulated signal with b=0.5')

xlabel('t');

ylabel('XFM(t)');

subplot(4,1,3)

plot(n,fmod3);

title('FM modulated Signal with B=1')

xlabel('t');

ylabel('XFM(t)');

subplot(4,1,4)

plot(n,fmod4);

title('FM modulated Signal with B=2.5')

xlabel('t');

ylabel('XFM(t)');

figure

%using fft

z=length(fmod);

nz=nextpow2(z);

nfft=2^nz;

fx=fft(fmod,nfft);

fy=fftshift(fx);

fvals=(-nfft/2:nfft/2-1)/nfft;

subplot(3,1,1)

plot(fs\*fvals,abs(fy))

title('Absolute FM modulated Signal')

xlabel('F');

ylabel('|XFM(F)|');

subplot(3,1,2)

z1=length(m);

nz1=nextpow2(z1);

nfft1=2^nz1;

fx1=fft(m,nfft1);

fy1=fftshift(fx1);

fvals1=(-nfft1/2:nfft1/2-1)/nfft1;

plot(fs\*fvals1,abs(fy1))

title('Absolute value of Message signal')

xlabel('F');

ylabel('m(F)');

subplot(3,1,3)

z2=length(c);

nz2=nextpow2(z2);

nfft2=2^nz2;

fx2=fft(c,nfft2);

fy2=fftshift(fx2);

fvals2=(-nfft2/2:nfft2/2-1)/nfft2;

plot(fs\*fvals2,abs(fy2))

title('Absolute value of carrier Signal')

xlabel('F');

ylabel('c(F)');

figure

%demod

fmm=fmdemod(fmod,fc,fs,kf\*am)

subplot(3,1,1)

plot(n,fmod)

title('FM modulated Signal')

xlabel('t');

ylabel('XFM(t)');

subplot(3,1,2)

plot(n,fmm)

title('Demodulated Signal')

xlabel('t');

ylabel('m(t)');

subplot(3,1,3)

plot(n,m)

title('Message Signal')

xlabel('t');

ylabel('m(t)');

figure

%usingint

syms n1

m1=am\*cos(2\*pi\*fm\*n1)

s(n1)=ac\*cos(2\*pi\*((fc\*n1)+kf\*int(m1,n1,0,n1)))

t=0:1/fs:1;

subplot(2,1,1)

plot(t,s(t));

subplot(2,1,2)

plot(t,fmmod);







