Frequency Modulation ( FM )

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# Variables

clc;

clear;

Vm=2;

Vc=5;

fm=10; % message frequency

fc=500; % carrier frequency

fs=10\*fc; % sampling frequency

mf=20;

endpoint=5;

t=0:1/fs:endpoint; %% Time series index

l=length(t);

i=(-l/2:1:l/2-1).\*2/10; %% frequency series index

% kf=10; % Sensitivity factor

% Frequency Deviation = mf\*fm

fd=mf/fm;

%Message Signal

f0=figure;

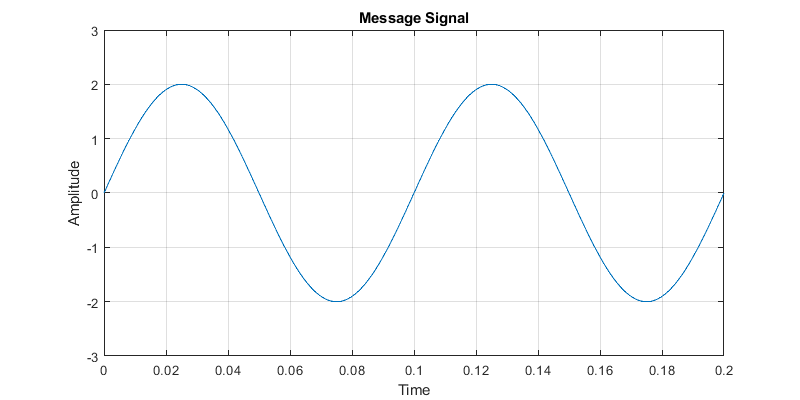
v\_m=Vm\*sin(2\*pi\*fm\*t);

plot(t,v\_m);

title("Message Signal");

xlabel('Time');

ylabel('Amplitude');



# FM Signal

v\_fm=Vc\*cos(2\*pi\*fc\*t+mf\*sin(2\*pi\*fm\*t));

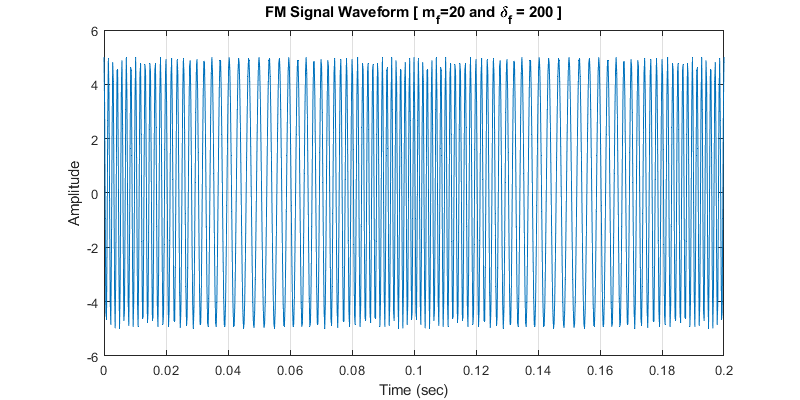
f1=figure;

plot(t,v\_fm);

title(['FM Signal Waveform [ m\_{f}=',num2str(mf),' and \delta\_{f} = ',num2str(mf\*fm),' ]']);

xlabel('Time (sec)');

ylabel('Amplitude');



# Modulation Index = 0.5

% Deflection Coefficient =5 Hz :

mf=0.5;

fm=10;

v\_fm=Vc\*cos(2\*pi\*fc\*t+mf\*sin(2\*pi\*fm\*t));

spec\_fm=abs(fftshift(fft(v\_fm)));

figure(1);

subplot(1,2,1);

plot(i,spec\_fm);

title(['m\_{f}=',num2str(mf),' and \delta\_{f} = ',num2str(mf\*fm),' Hz']);

xlabel('Frequency (Hertz)');

ylabel('Magnitude');

% Deflection Coefficient =12.5 Hz :

mf=0.5;

fm=25;

v\_fm=Vc\*cos(2\*pi\*fc\*t+mf\*sin(2\*pi\*fm\*t));

spec\_fm=abs(fftshift(fft(v\_fm)));

figure(1);

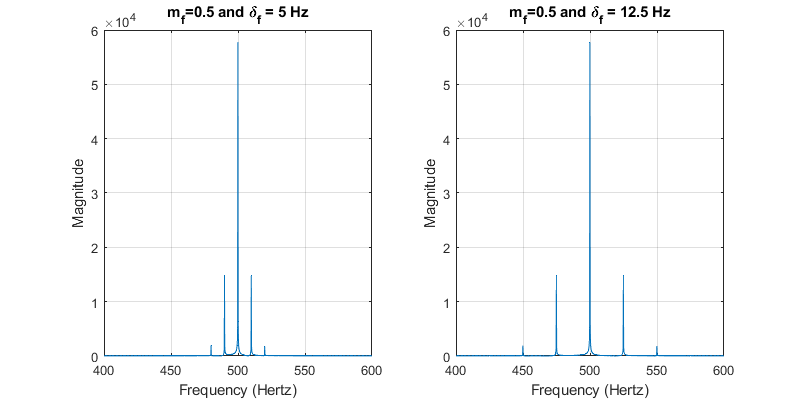
subplot(1,2,2);

plot(i,spec\_fm);

title(['m\_{f}=',num2str(mf),' and \delta\_{f} = ',num2str(mf\*fm),' Hz']);

xlabel('Frequency (Hertz)');

ylabel('Magnitude');



# Modulation Index = 2.5

% Deflection Coefficient =25 Hz :

mf=2.5;

fm=10;

v\_fm=Vc\*cos(2\*pi\*fc\*t+mf\*sin(2\*pi\*fm\*t));

spec\_fm=abs(fftshift(fft(v\_fm)));

figure(2);

subplot(1,2,1);

plot(i,spec\_fm);

title(['m\_{f}=',num2str(mf),' and \delta\_{f} = ',num2str(mf\*fm),' Hz']);

xlabel('Frequency (Hertz)');

ylabel('Magnitude');

grid on;

% Deflection Coefficient =62.5 Hz :

fm=25;

v\_fm=Vc\*cos(2\*pi\*fc\*t+mf\*sin(2\*pi\*fm\*t));

spec\_fm=abs(fftshift(fft(v\_fm)));

figure(2);

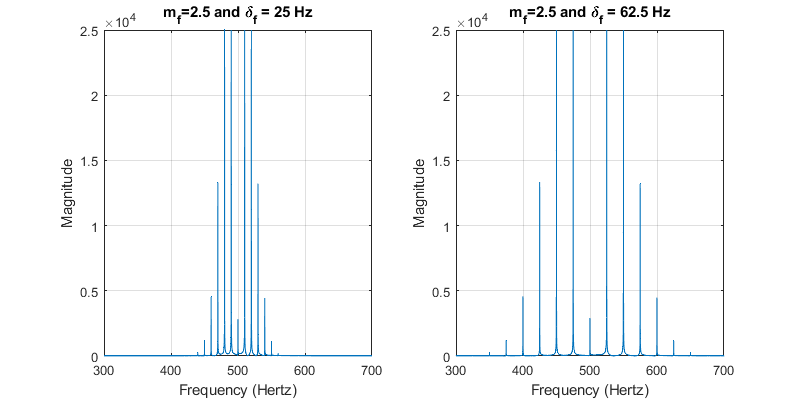
subplot(1,2,2);

plot(i,spec\_fm);

title(['m\_{f}=',num2str(mf),' and \delta\_{f} = ',num2str(mf\*fm),' Hz']);

xlabel('Frequency (Hertz)');

ylabel('Magnitude');



# Modulation Index = 5

% Deflection Coefficient =50 Hz :

mf=5;

fm=10;

v\_fm=Vc\*cos(2\*pi\*fc\*t+mf\*sin(2\*pi\*fm\*t));

spec\_fm=abs(fftshift(fft(v\_fm)));

f3=figure;

subplot(1,2,1);

plot(i,spec\_fm);

title(['m\_{f}=',num2str(mf),' and \delta\_{f} = ',num2str(mf\*fm),' Hz']);

xlabel('Frequency (Hertz)');

ylabel('Magnitude');

% Deflection Coefficient =125 Hz :

mf=5;

fm=25;

v\_fm=Vc\*cos(2\*pi\*fc\*t+mf\*sin(2\*pi\*fm\*t));

spec\_fm=abs(fftshift(fft(v\_fm)));

subplot(1,2,2);

plot(i,spec\_fm);

title(['m\_{f}=',num2str(mf),' and \delta\_{f} = ',num2str(mf\*fm),' Hz']);

xlabel('Frequency (Hertz)');

ylabel('Magnitude');

