Frequency Modulated Signal:

Let, modulating voltage be given by,

$$v_m = V_m \text{ Cos } \omega_m t$$

Let, the carrier voltage is given by,

$$v_c = V_c \, Sin(\omega_c t + \theta)$$

So, the frequency modulated wave is given by,

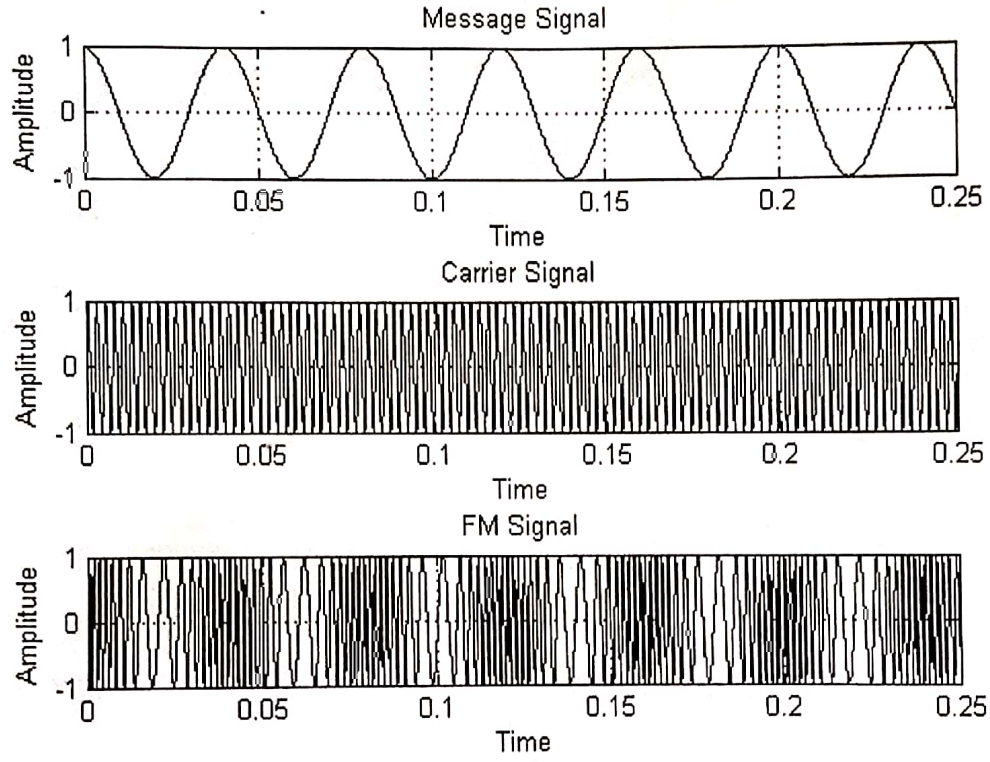
$s(t) = A_c \, Sin[2\pi f_c t + \frac{K_f}{f_m} A_m \, Sin(2\pi f_m t)]$ ---------- eq^n3.44 from G.K. Mithal

Code in Matlab:

```
clc;
clear all;
close all;

fm=25;
B=10;
t=0:0.0001:0.25;
m=cos(2*pi*fm*t);
subplot(3,1,1);
plot(t,m);
xlabel('Time');
ylabel('Amplitude');
title('Message Signal');
grid on;

fc=400;
c=sin(2*pi*fc*t);
subplot(3,1,2);
plot(t,c);
xlabel('Time');
ylabel('Amplitude');
title('Carrier Signal');
grid on;

y=sin(2*pi*fc*t+(B.*sin(2*pi*fm*t)));
subplot(3,1,3);
plot(t,y);
xlabel('Time');
ylabel('Amplitude');
title('FM Signal');
```

grid on;

Output:



Frequency Demodulation

Matlab Code:

```
%The frequency modulation(FM)waveform in time and frequency domain.
%fm=35HZ,fc=500HZ,Am=1V,Ac=1V,B=10
fs=10000;
Ac=1;
Am=1;
fm=35;
fc=500;
B=10;
t=(0:.1*fs)/fs;
wc=2*pi*fc;
wm=2*pi*fm;
m_t=Am*cos(wm*t);
subplot(5,1,1);
plot(t,m_t);
title('Modulating or Message signal(fm=35Hz)');
c_t=Ac*cos(wc*t);
subplot(5,1,2);
plot(t,c_t);
title('Carrier signal(fm=500Hz)');
s_t=Ac*cos((wc*t)+B*sin(wm*t));
subplot(5,1,3);
plot(t,s_t);
title('Modulated signal');
d=demod(s_t,fc,fs,'fm');
subplot(5,1,4);
plot(t,d);
title('demodulated signal');
```

SIMULATION RESULT: