PROBLEM STATEMENT

- In a frequency modulation the frequency of the carrier is modulated by the modulating signal. Given a modulating signal and carrier signal as 3Cos(2000*pi*t) and 10 Sin(20000*pi*t) respectively and modulation Index as 10, plot the modulating signal and the frequency modulated wave in the time domain.

GIVEN:

- modulating signal - 3Cos(2000*pi*t)
- carrier signal - 10 Sin(20000*pi*t)
- Modulating index – 10

TO DO:

- plot the modulating signal and the frequency modulated wave in the time domain.

CALCULATION

Given :

$m(t) = 3\cos(2000\pi t)$ $\therefore A_m = 3$, $f_m = 1000$

$c(t) = 10\sin(20000\pi t)$ $\therefore A_c = 10$, $f_c = 10000$

$$s(t) = 10\sin\left[2\pi.10000t + 2\pi.k_f\int 3\cos(2\pi.1000t)\,dt\right]$$

$$= 10\sin\left[2\pi.10000t + 2\pi.k_f.3.\frac{1}{2\pi\times1000}\sin(2\pi\times1000t)\right]$$

$$= 10\sin\left[2\pi.10000t + \frac{3.k_f}{1000}*\sin(2\pi\times1000t)\right]$$

$$\therefore s(t) = A_c\sin\left[2\pi f_c t + \frac{A_m\times k_f}{f_m}\sin(2\pi f_m t)\right]$$

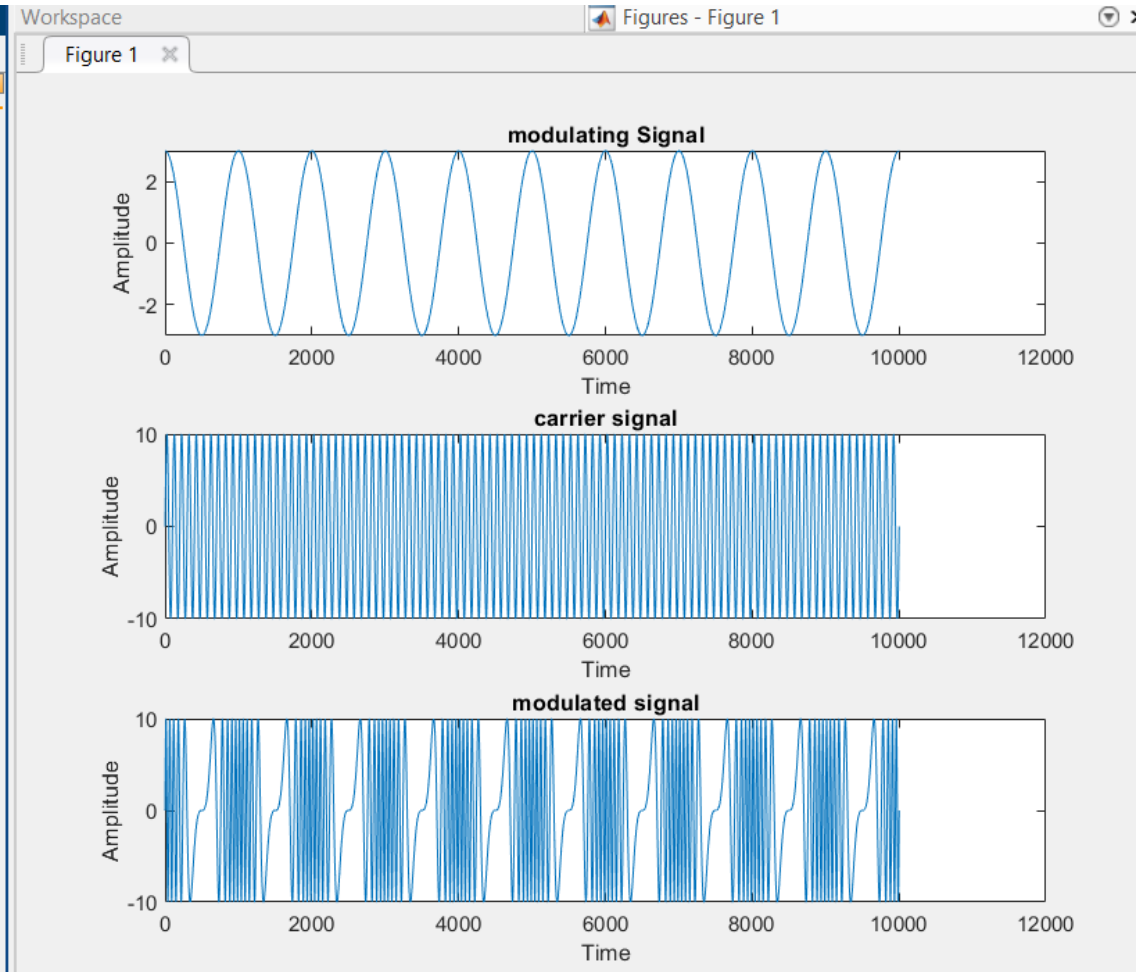
$$\therefore \beta\,(\text{modulating index}) = \frac{A_m\times k_f}{f_m} = 10.$$

MATLAB CODE AND OUTPUT

Editor - C:\Users\nandh\Downloads\comm.m

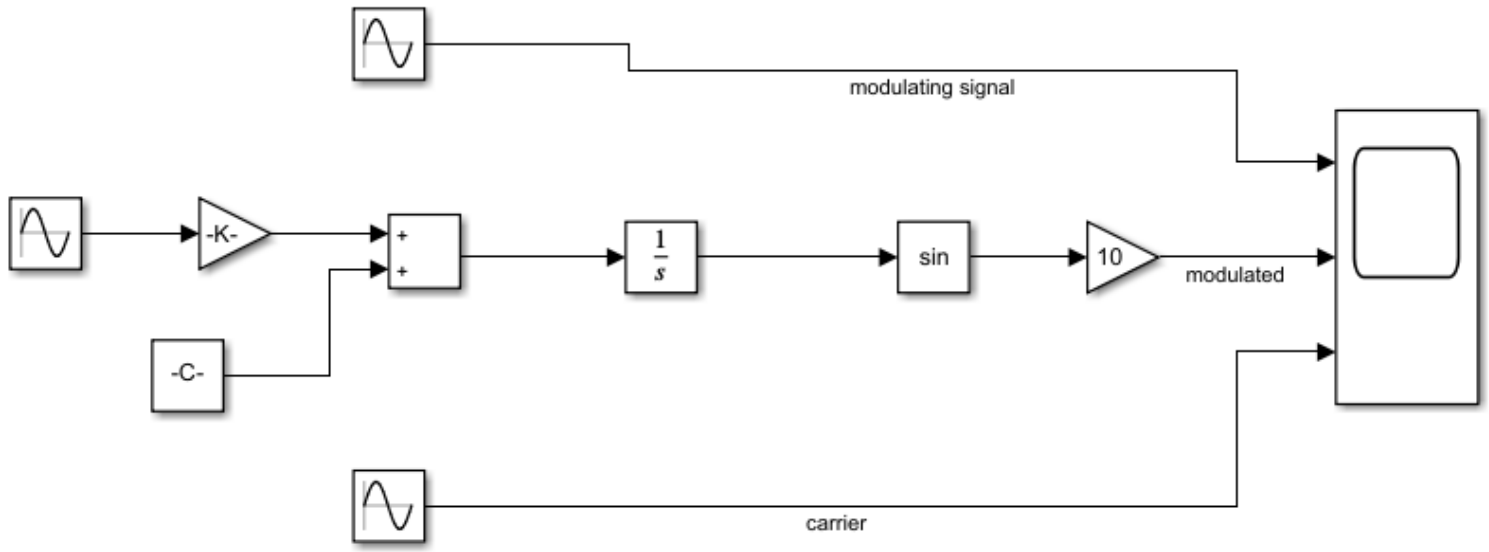
comm.m | cvx_setup.m

```
clc;clear all;
fm=1000;
fc=10000;
Am=3;
Ac=10;
b=10; %modulation index
t=0:0.000001:0.01; % just increased the time by 10times

ms=3*cos(2*fm*pi*t); %modulating
cs=10*sin(2*fc*pi*t); %carrier
modulated=Ac*sin(2*pi*fc*t + b*sin(2*pi*fm*t));%modulated

subplot(3,1,1)
plot(ms);
title('modulating Signal')
xlabel('Time');
ylabel('Amplitude')
subplot(3,1,2)
plot(cs);
title('carrier signal')
xlabel('Time');
ylabel('Amplitude')
subplot(3,1,3)
plot(modulated);
title('modulated signal')
xlabel('Time');
ylabel('Amplitude')
```

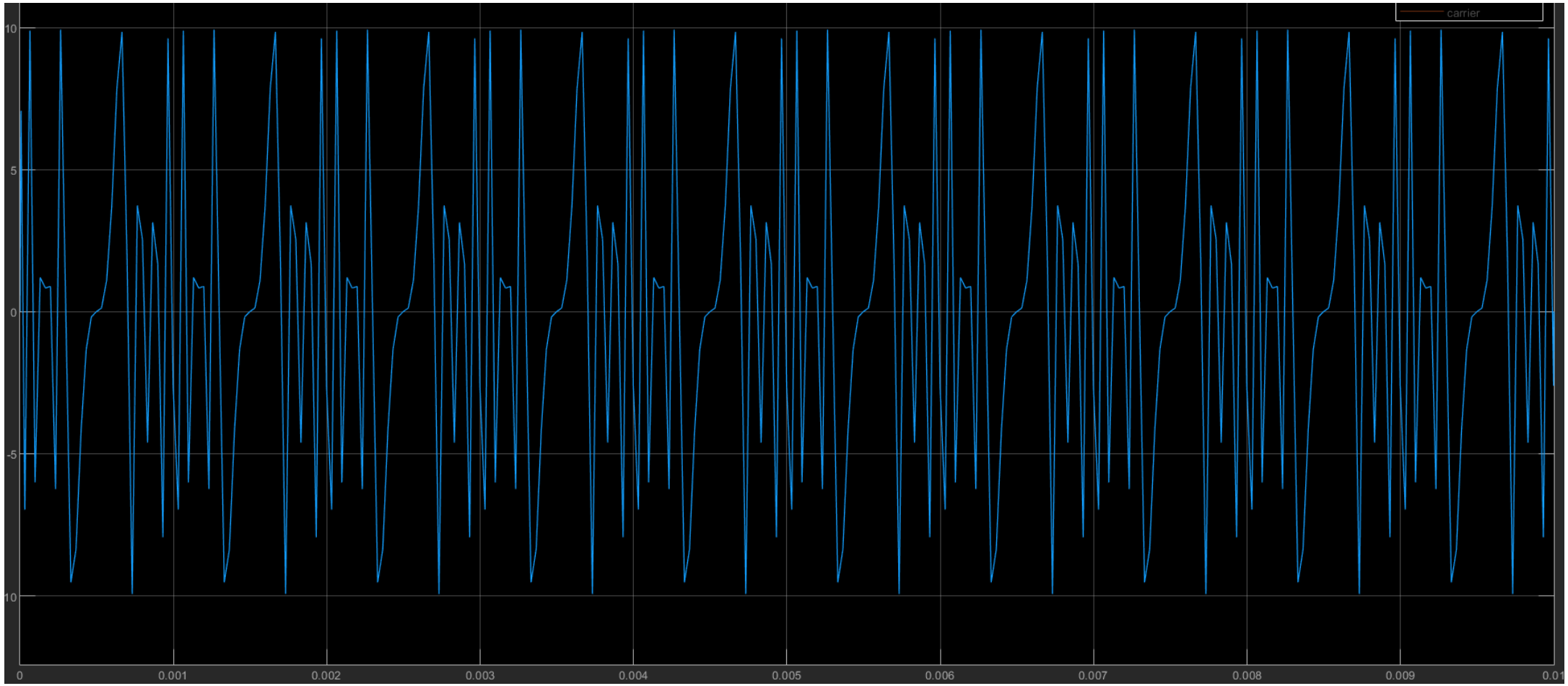


Command Window

SIMULINK



SIMULINK OUTPUT



THANK YOU