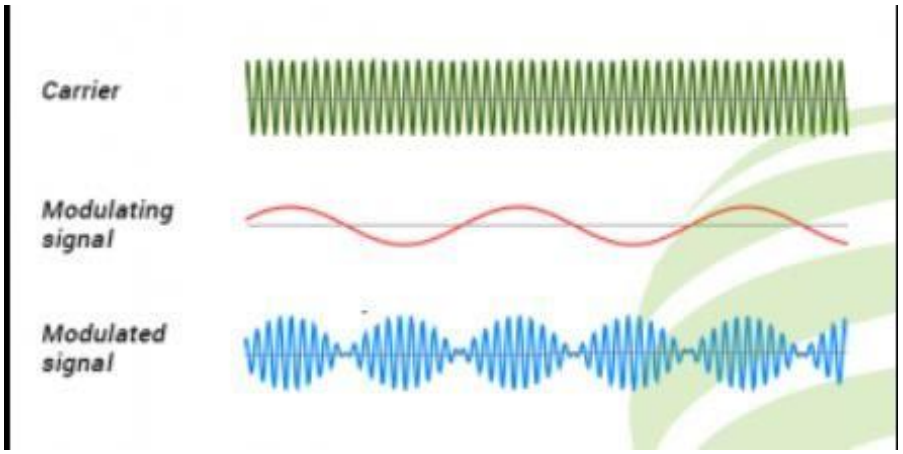
MODULATION

It is the process of superimposing the message or the modulating signal with a high frequency carrier signal. Sending signals using a long antenna is not a practical option. The length of the antenna is directly proportional to the wavelength. Wavelength is inversely proportional to the frequency. So, by increasing the frequency we can decrease the wavelength and thus decrease the antenna length. This is why we use a high frequency carrier wave. At the receiver's end the wave is demodulated and the message is extracted.



MODULATION INDEX:

It is the ratio of Amplitude of modulating signal to Amplitude of carrier signal.

m = Am / Ac

Where, m = Modulating Index

Am = Amplitude of modulating signal

Ac = Amplitude of Carrier signal

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.

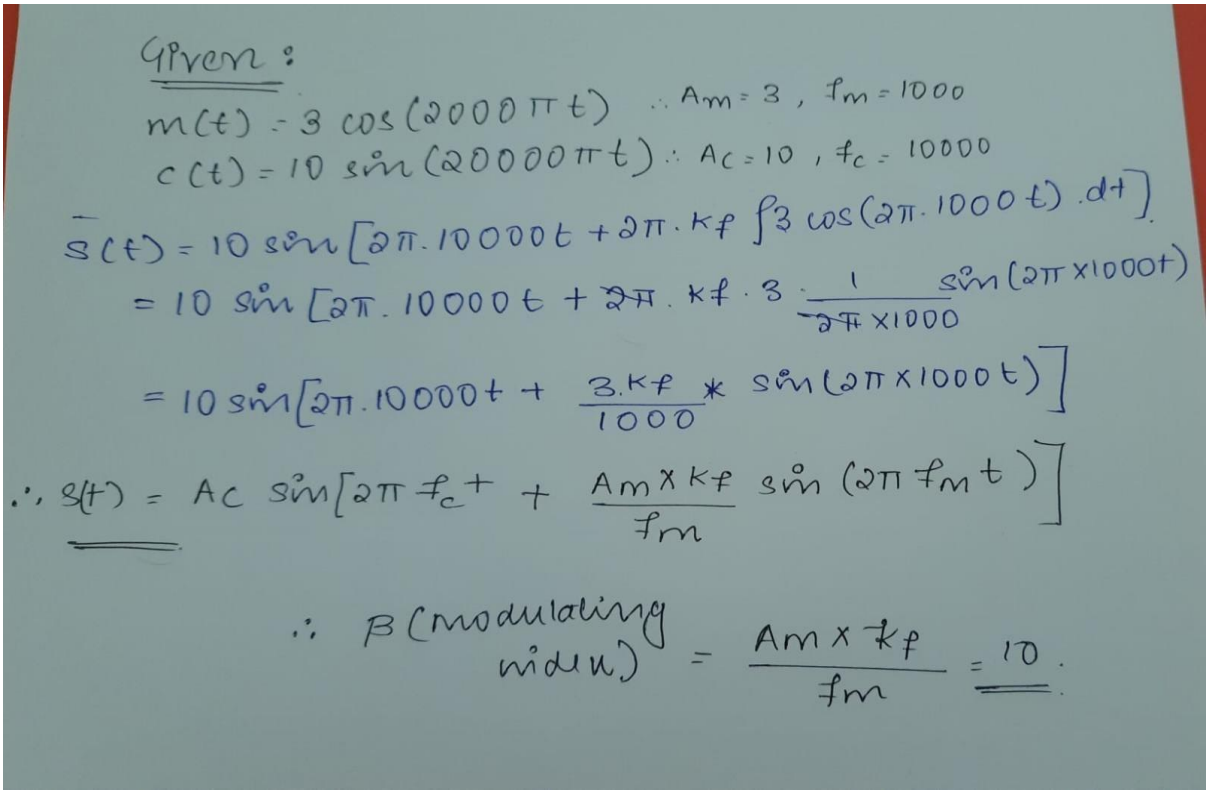
GIVEN:

- 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.

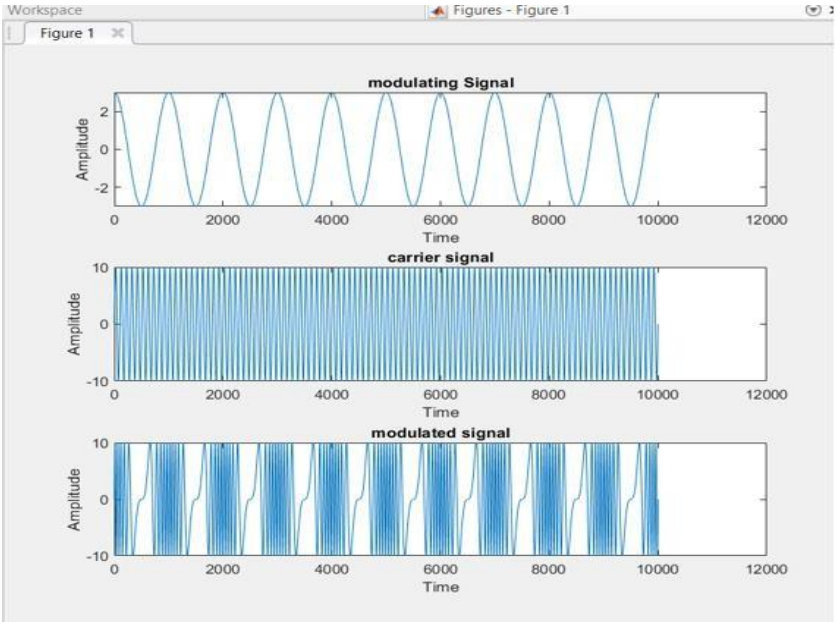
CALCULATION



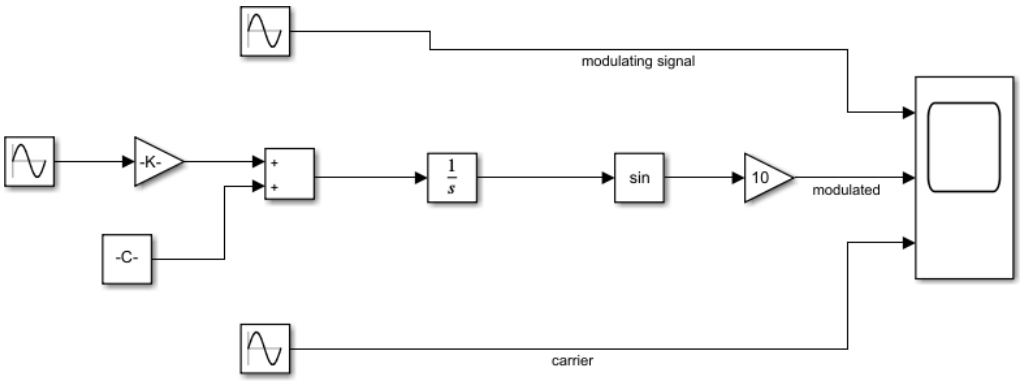
MATLAB CODE

```
clc;clear all;
fm=1000;
fc=10000;
Am=3;
Ac=10;
b=10; %modulation index
t=0:0.000001:0.01;

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')
```

MATLAB OUTPUT



SIMULINK



SIMULINK OUTPUT