LAB #08

Analysis of Amplitude Modulated and Demodulated Signal using MATLAB.

Provide .m file with detailed comments.

Fall 2023

CSE-402L Digital Signal Processing Lab

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Section: C

"On my honor, as a student of the University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work"

Submitted to:

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(13 Dec 2023)

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Q.1 Define Amplitude Modulation:
Ans: Amplitude Modulation, often called AM, is a type of modulation where the amplitude of the carrier wave varies in proportion to the modulating data or the signal

Q.2 Define Amplitude Demodulation:
Ans: Amplitude Demodulation, often referred to as demodulation, is the process of extracting the original information-carrying signal from a modulated carrier wave. It's the reverse process of modulation

Q.3 List three reasons, why we implement Amplitude Modulation in Communication Systems
Ans:

1. **Transmission of Low-Frequency Signals**: Low-frequency signals present many difficulties in transmission due to their high wavelengths. The height of the antenna required is also very large, and the power radiated by this antenna is very less. Therefore, signals vanish after some distance. Amplitude Modulation helps to deal with these issues
2. **Minimize Power Loss**: Amplitude Modulation allows us to transmit information signals over long distances while minimizing power loss
3. **Simultaneous Transmission**: It enables the simultaneous transmission of multiple signals without interference2. This is particularly useful in broadcasting where multiple signals need to be transmitted at the same time.

Q.4 Define Modulation Index
Ans: Modulation index is a measure of extent of modulation done on a carrier signal. In Amplitude modulation, it is defined as the ratio of the amplitude of modulating signal to that of the carrier signal.

Q.5 Input Modulation Index from 0 to 1.4, the increment step

should be 0.2. Observe/analyze and comment about the output observed.

Ans: Whenever we increases the modulation index the demodulated Signal become more and more similar to the modulating Signal

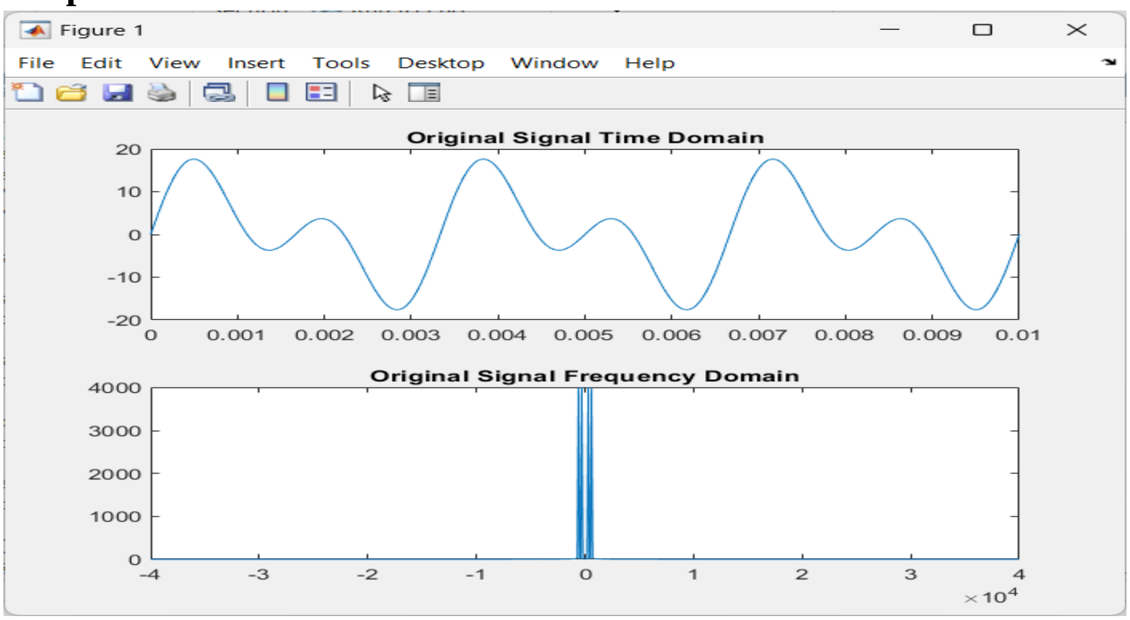
And when we decreases the modulation index the demodulated Signal deform it shape and did not look like the modulating signal

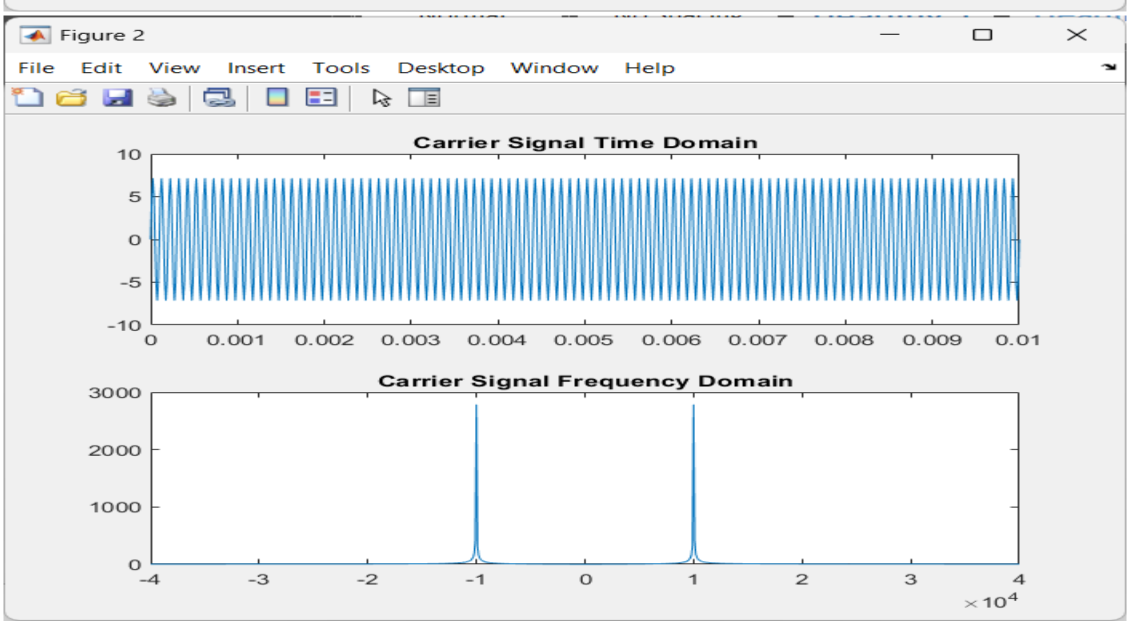
Code:

```
m = 1.4;
fc = 10e3;
fs = 80e3;
t = 0:1/fs:0.01;
Ac = 10/m;

f = linspace(-fs/2,fs/2,length(t));

s = 10*sin(2*pi*300*t)+10*sin(2*pi*600*t);
FS = fftshift(fft(s));

c = Ac*sin(2*pi*fc*t);
FC = fftshift(fft(c));

y = ammod(s, fc, fs, 0, Ac);
FY = fftshift(fft(y));

z = amdemod(y, fc, fs, 0, Ac);
FZ = fftshift(fft(z));

subplot(2,1,1);
plot(t,s);
title("Original Signal Time Domain");
subplot(2,1,2);
plot(f,abs(FS));
title("Original Signal Frequency Domain");
figure;

subplot(2,1,1);
plot(t,c);
title("Carrier Signal Time Domain");
subplot(2,1,2);
plot(f,abs(FC));
title("Carrier Signal Frequency Domain");
figure;

subplot(2,1,1);
plot(t,y);
title("Modulated Signal Time Domain");
subplot(2,1,2);
```

```
plot(f,abs(FY));
title("Modulated Signal Frequency Domain");
figure;

subplot(2,1,1);
plot(t,z);
title("Demodulated Signal Time Domain");
subplot(2,1,2);
plot(f,abs(FZ));
title("Demodulated Signal Frequency Domain");
```

Output:





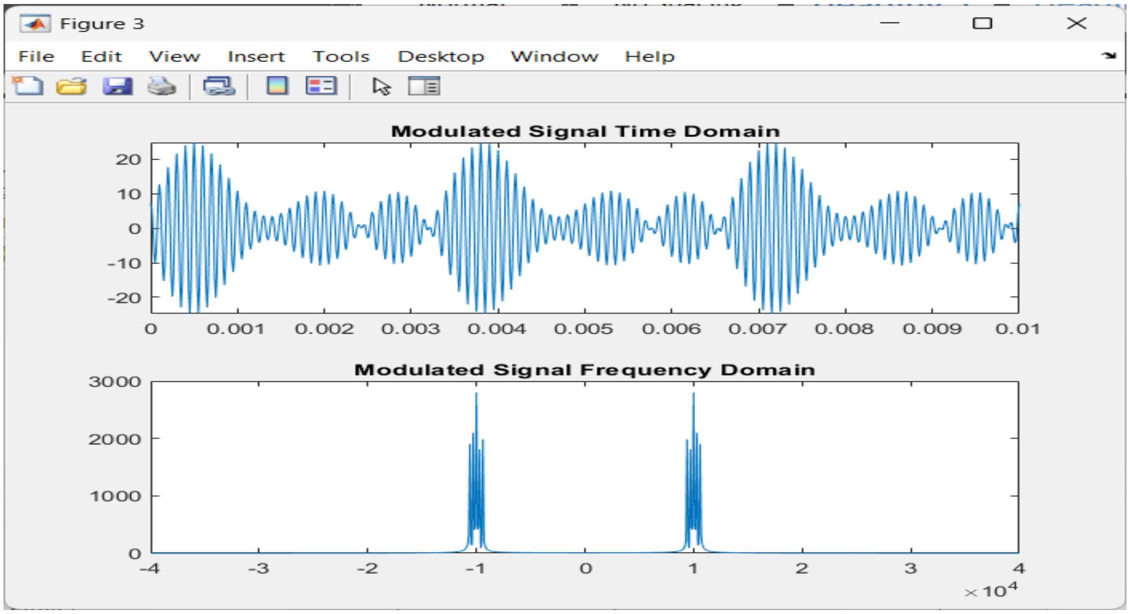


Figure 3
File Edit View Insert Tools Desktop Window Help
Modulated Signal Time Domain
Modulated Signal Frequency Domain
$\times 10^4$

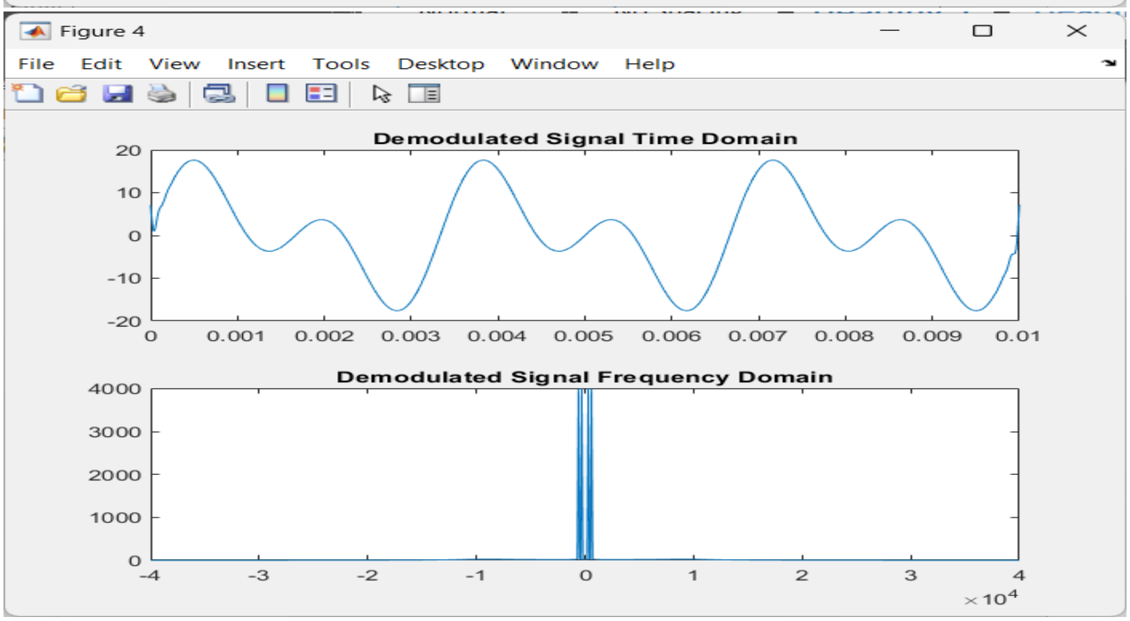


Figure 4
File Edit View Insert Tools Desktop Window Help
Demodulated Signal Time Domain
Demodulated Signal Frequency Domain
$\times 10^4$