



Faculty of Engineering and Technology
Electrical and Computer Engineering Department
ENEE4113
Communications Lab

PreLab No.1

Normal Amplitude Modulation and Demodulation

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Section: 5.

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Block Simulation (using Matlab Simulink):

- **Normal Amplitude Modulation**

Firstly, the block diagram of the amplitude modulation using Simulink was built as shown in the following figure:

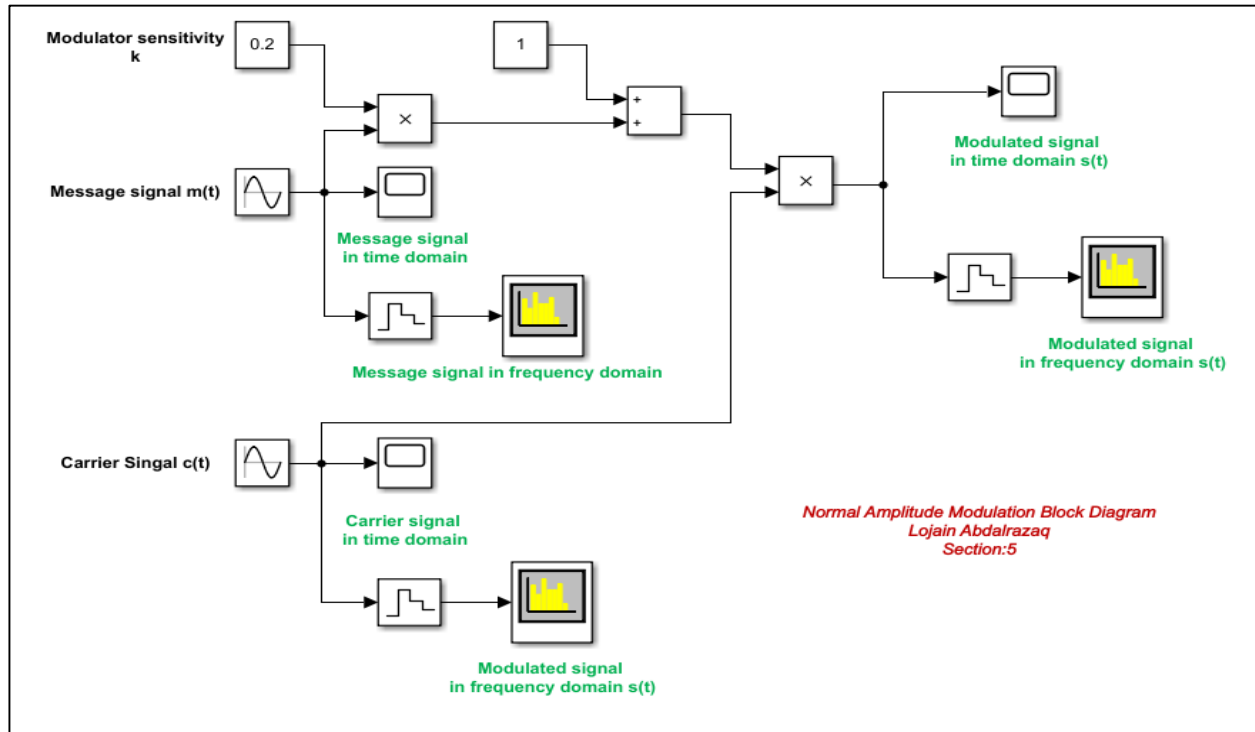


Figure 1 Normal Amplitude Modulation Block Diagram using Simulink.

The input message signal $m(t)$ in time and frequency domain:

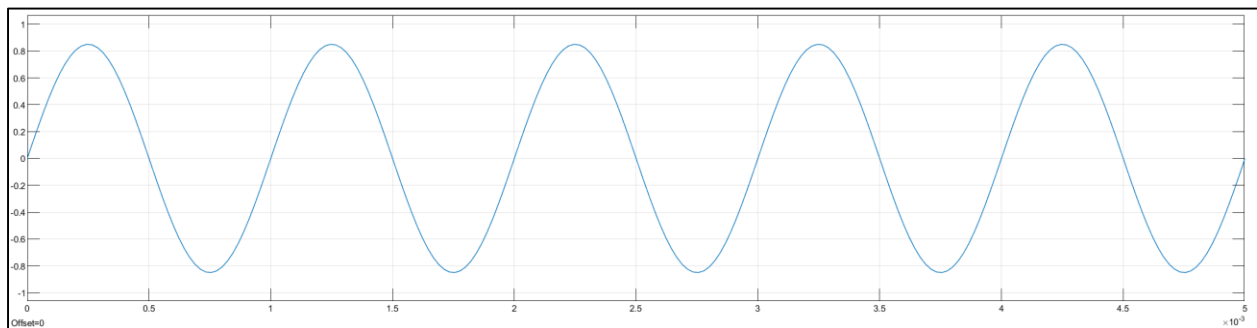


Figure 2 Input message signal $m(t)$ in time domain.

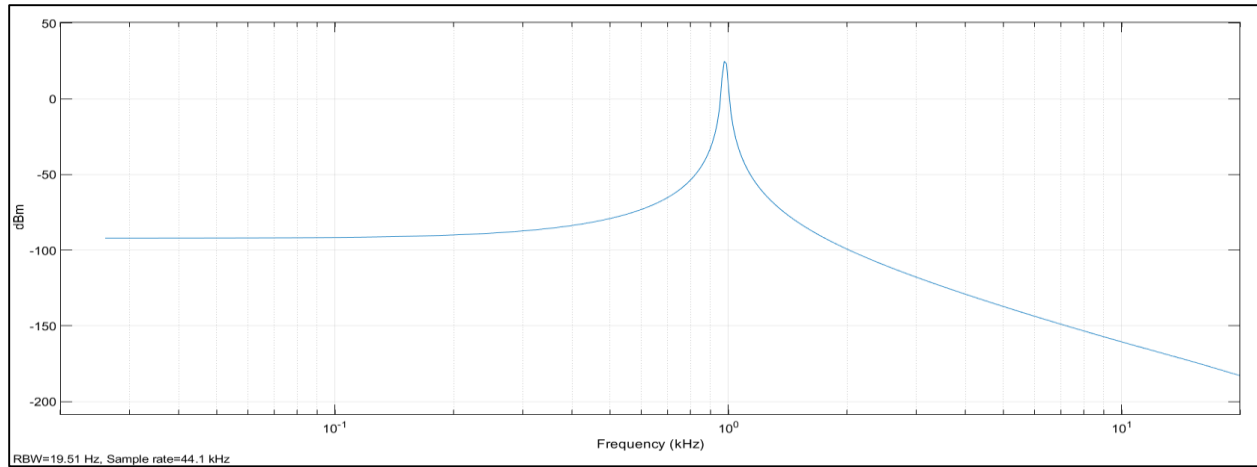


Figure 3 Input message signal $m(t)$ in frequency domain.

While the carrier signal $c(t)$ in time and frequency domain as the following:

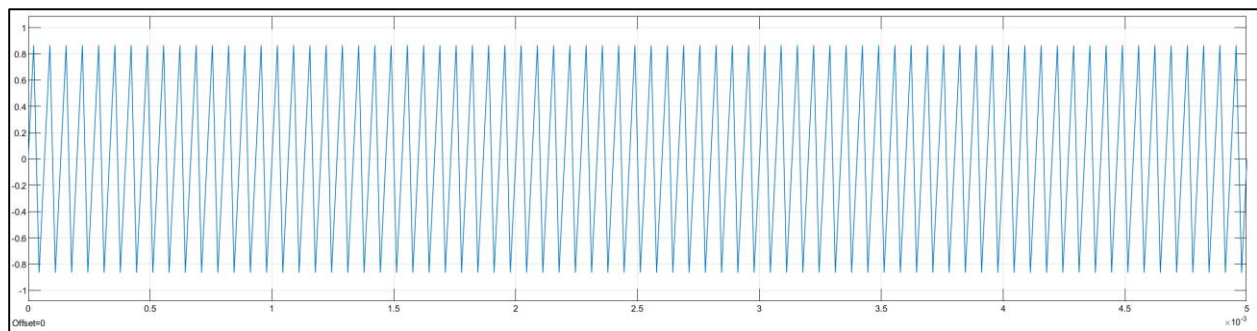


Figure 5 Input carrier signal $c(t)$ in time domain..

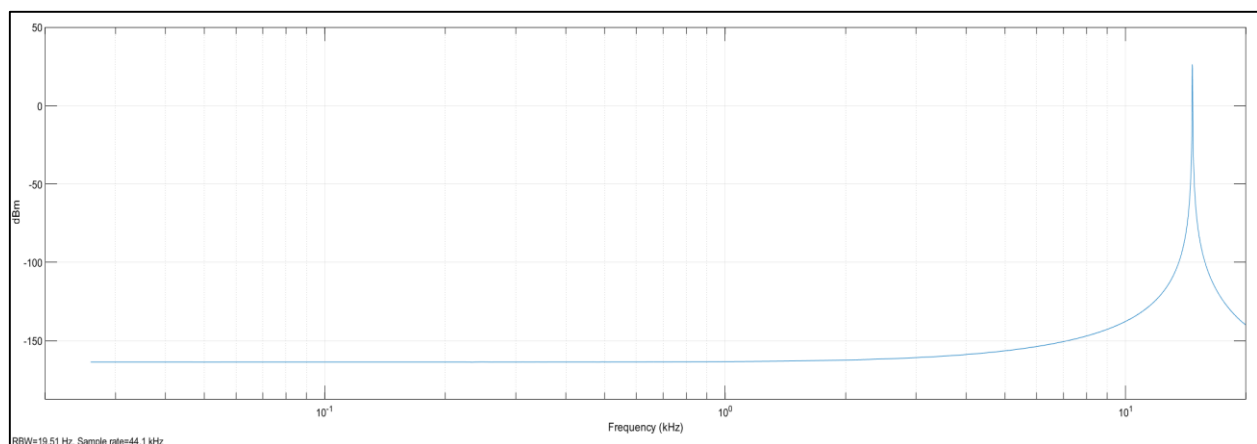


Figure 4 Input carrier signal $c(t)$ in frequency domain.

✓ *When Modulation index $< 1(M=0.2)$:*

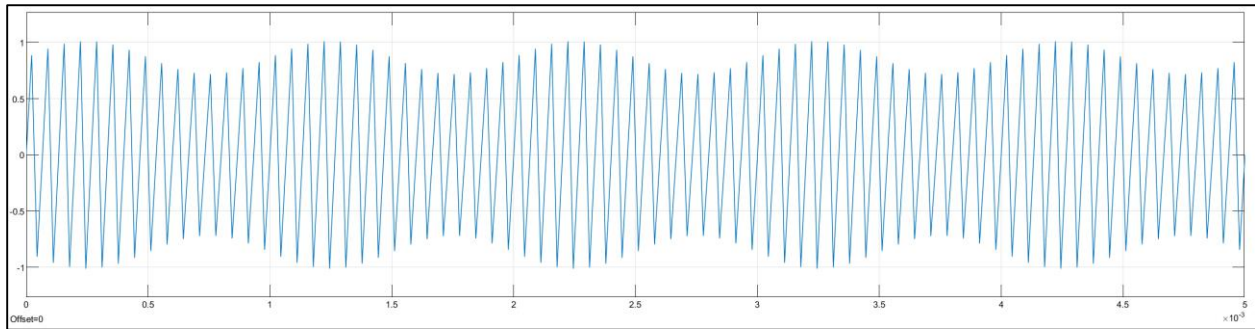


Figure 6 Modulated signal when $s(t)$ when $M=0.2$ in time domain.

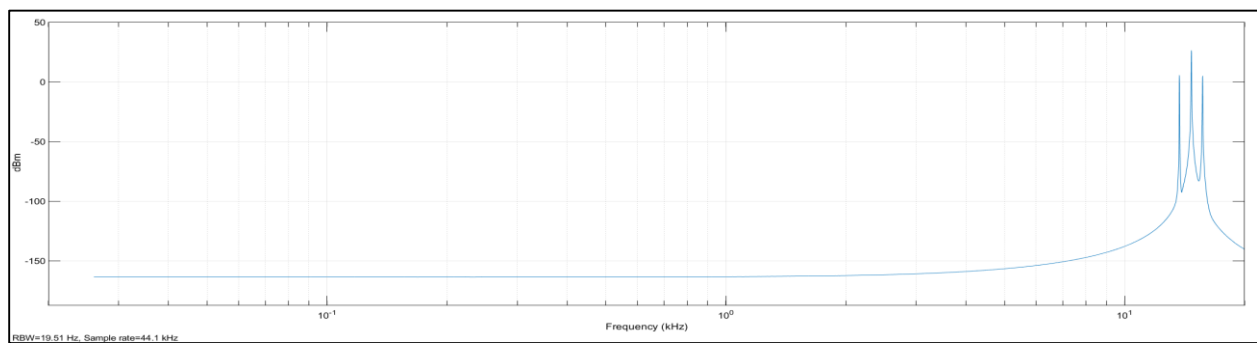


Figure 7 Modulated signal $s(t)$ when $M=0.2$ in frequency domain.

✓ *When Modulation index $= 1(M=1)$:*

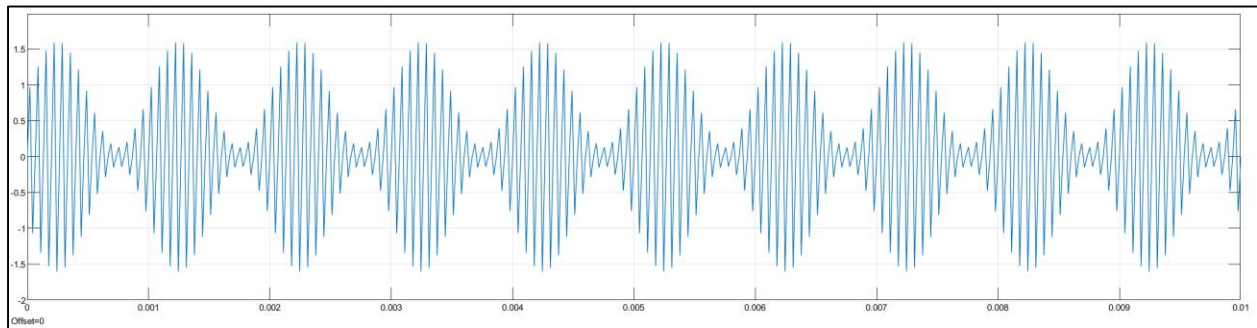


Figure 9 Modulated signal $s(t)$ when $M=1$ in time domain.

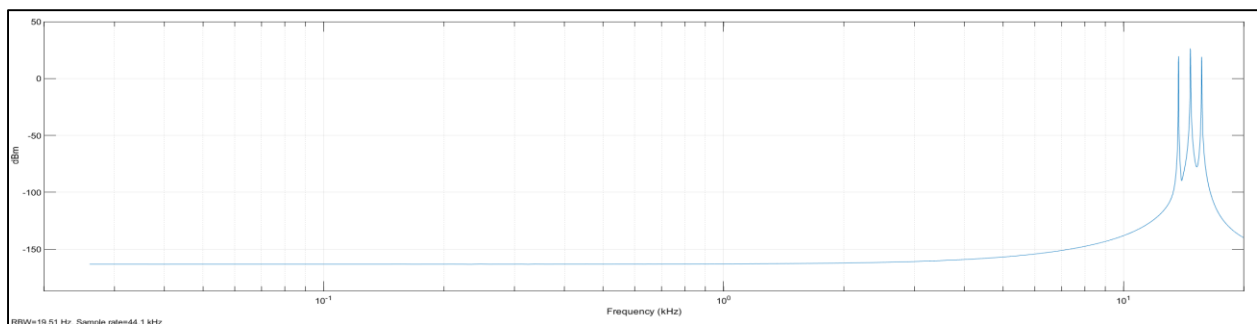


Figure 8 Modulated signal $s(t)$ when $M=1$ in frequency domain.

✓ *When Modulation index $> 1(M=3)$:*

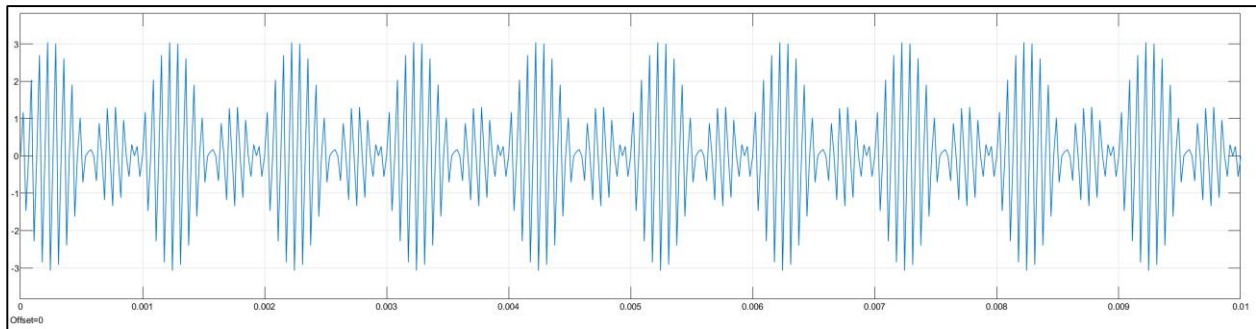


Figure 10 Modulated signal $s(t)$ when $M=3$ in time domain.

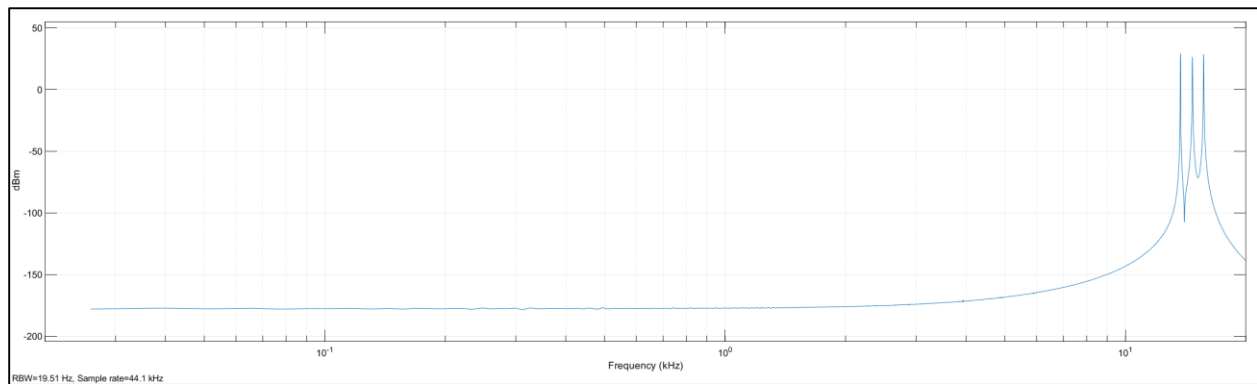


Figure 11 Modulated signal $s(t)$ when $M=3$ in frequency domain.

• Normal Amplitude Demodulation Using Coherent Method

Using Coherent Method:

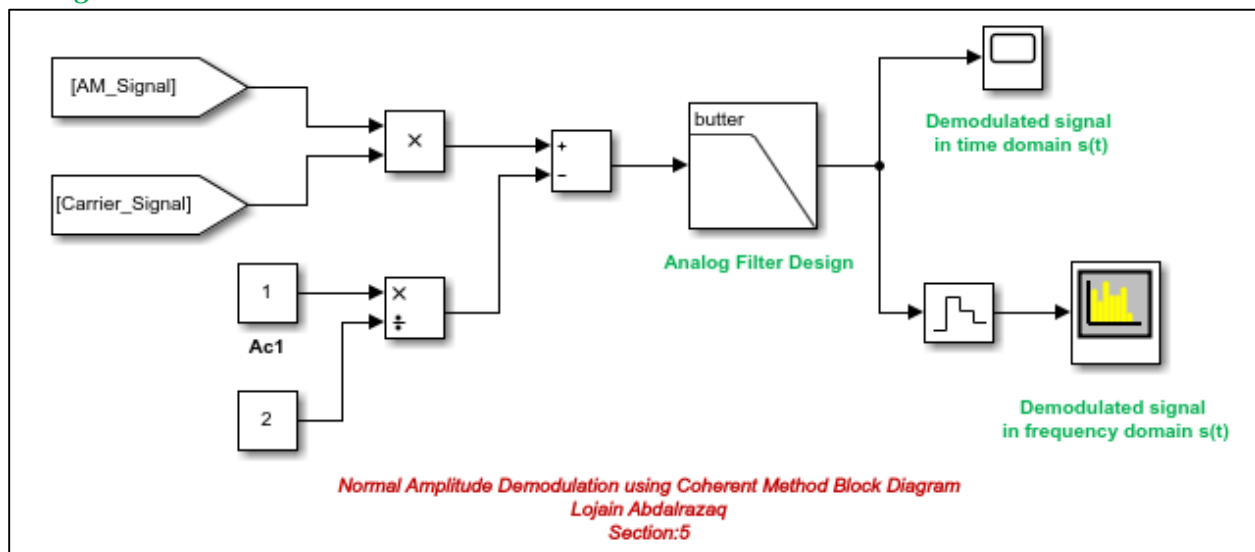


Figure 12 Demodulation using Coherent Method Block Diagram.

✓ **When Modulation index < 1 ($M=0.2$):**

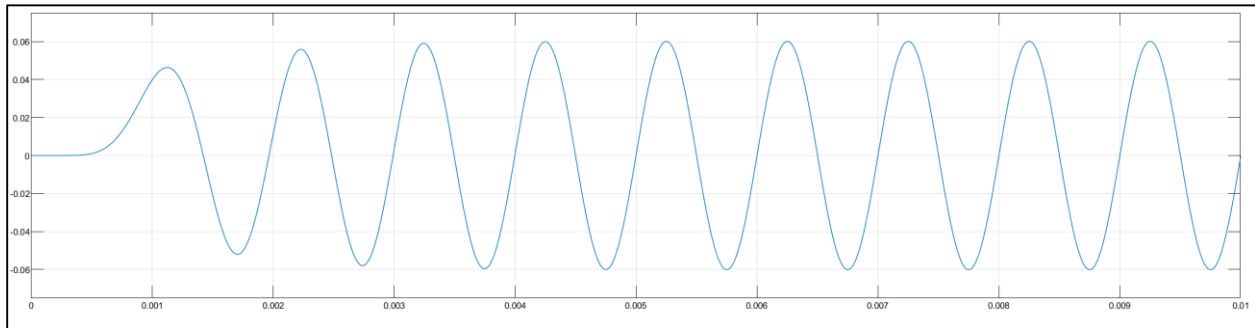


Figure 13 Demodulated signal using coherent method when $M=0.2$ in time domain.

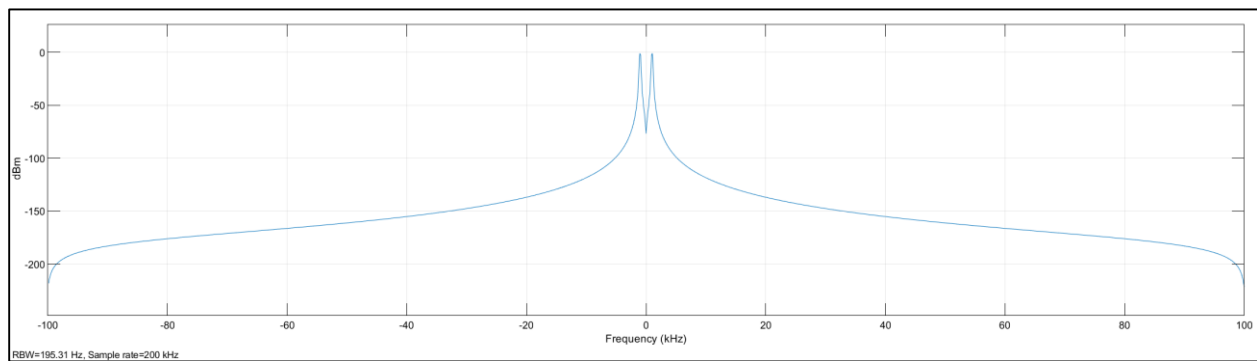


Figure 14 Demodulated signal using coherent method when $M=0.2$ in frequency domain.

✓ **When Modulation index $= 1$ ($M=1$):**

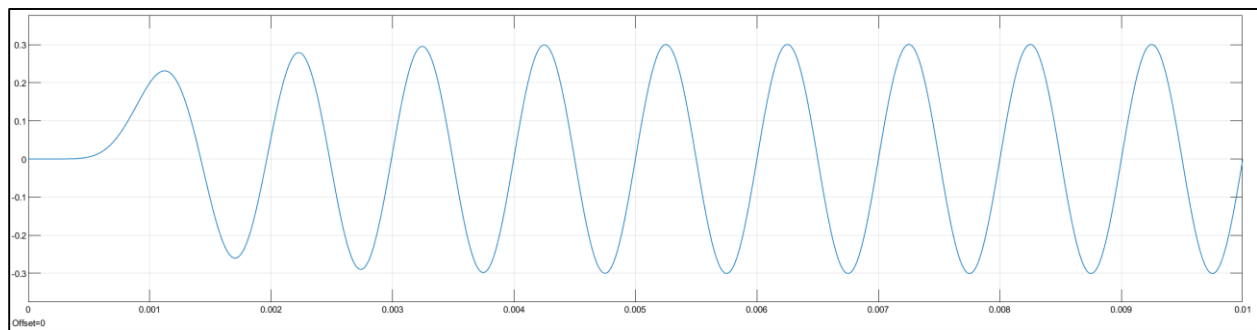


Figure 15 Demodulated signal using coherent method when $M=1$ in time domain.

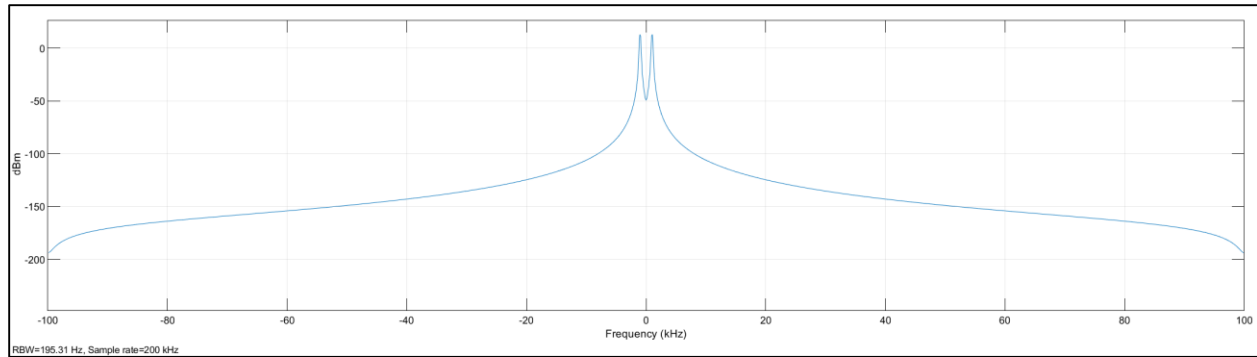


Figure 16 Demodulated signal using coherent method when $M=1$ in frequency domain.

✓ When Modulation index $> 1 (M=3)$:

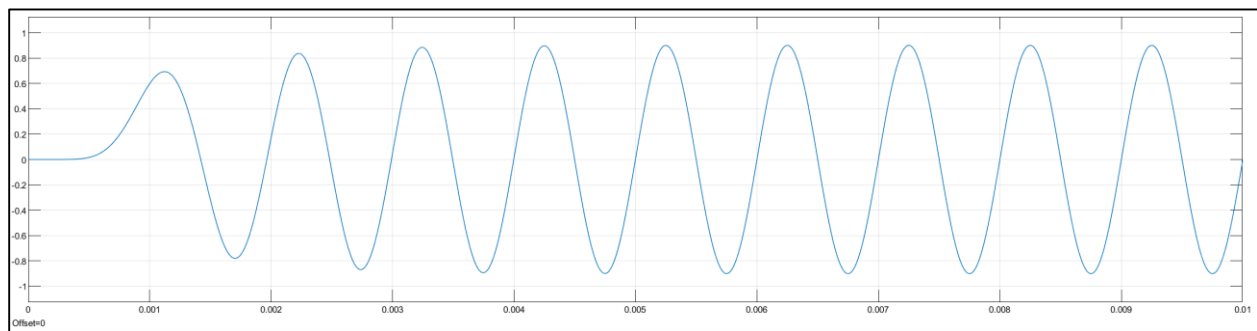


Figure 17 Demodulated signal using coherent method when $M=3$ in time domain.

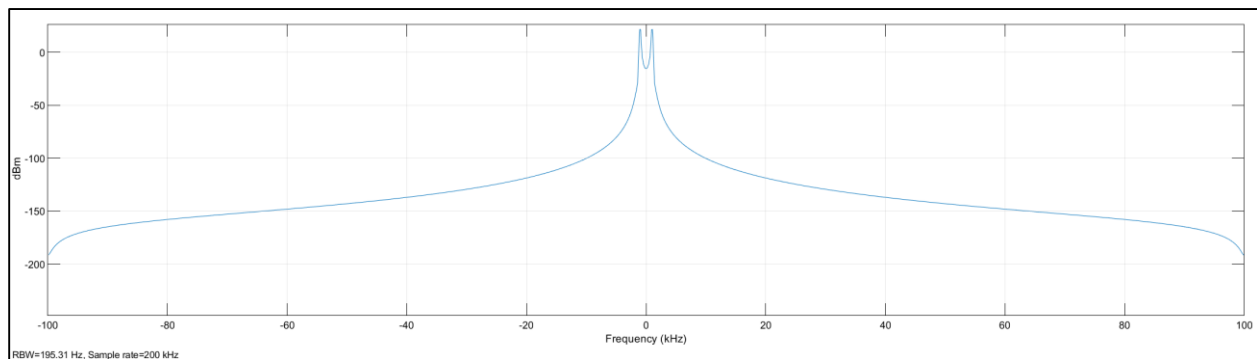


Figure 18 Demodulated signal using coherent method when $M=3$ in frequency domain.

• Normal Amplitude Demodulation Using Envelop Method

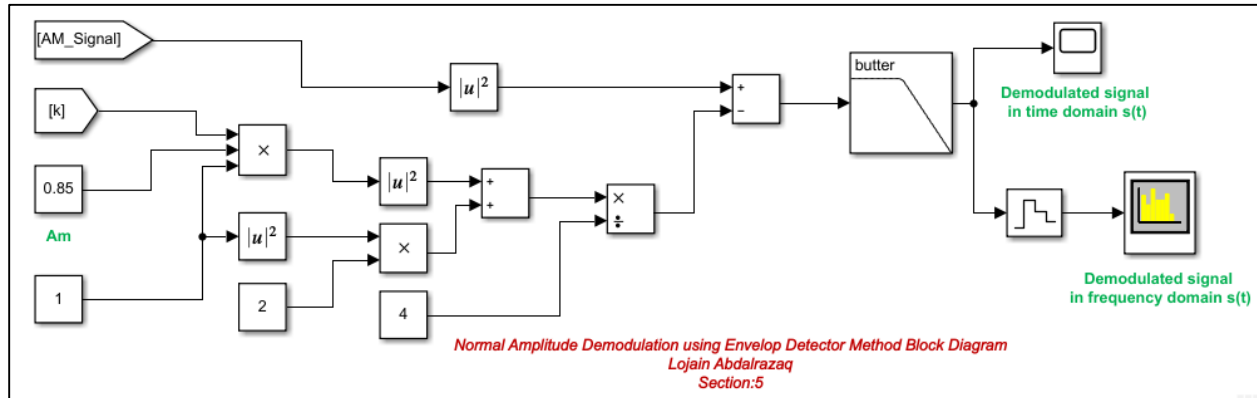


Figure 19 Demodulation using Envelop Detector Method Block Diagram.

✓ **Modulation index < 1(M=0.2):**

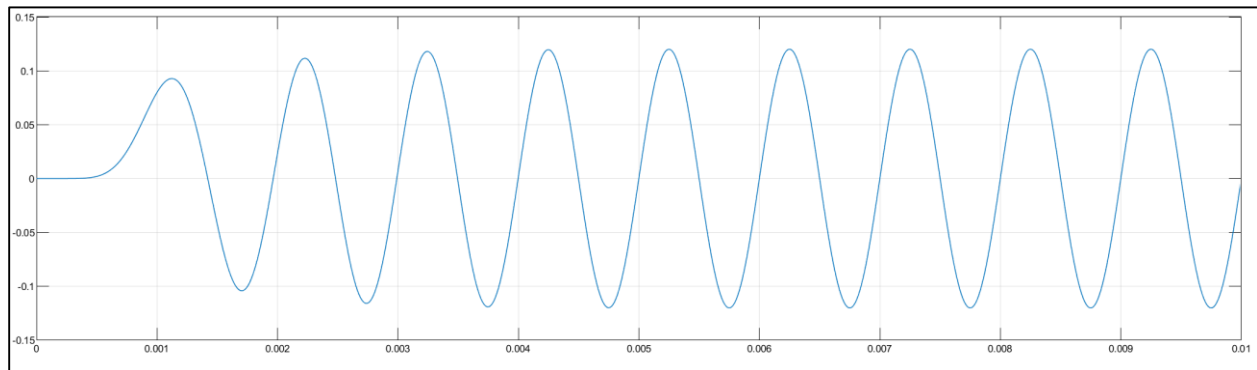


Figure 20 Demodulated signal using envelop detector method when $M=0.2$ in time domain.

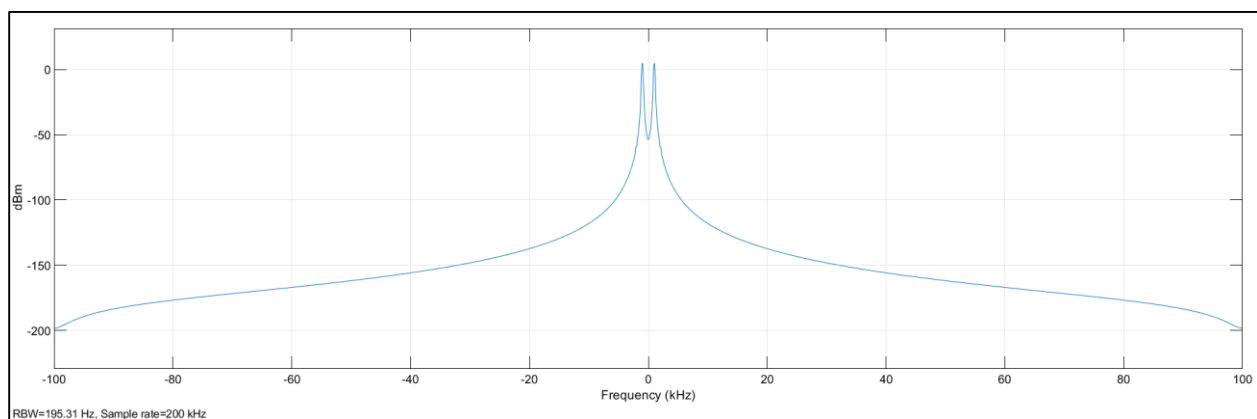


Figure 21 Demodulated signal using envelop detector method when $M=0.2$ in frequency domain.

✓ **Modulation index = 1(M=1):**

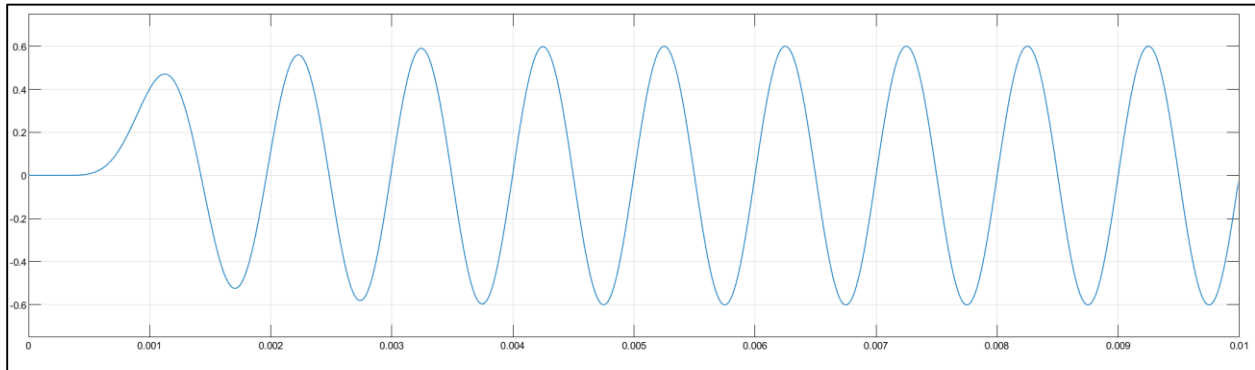


Figure 23 Demodulated signal using envelop detector method when $M=1$ in time domain.

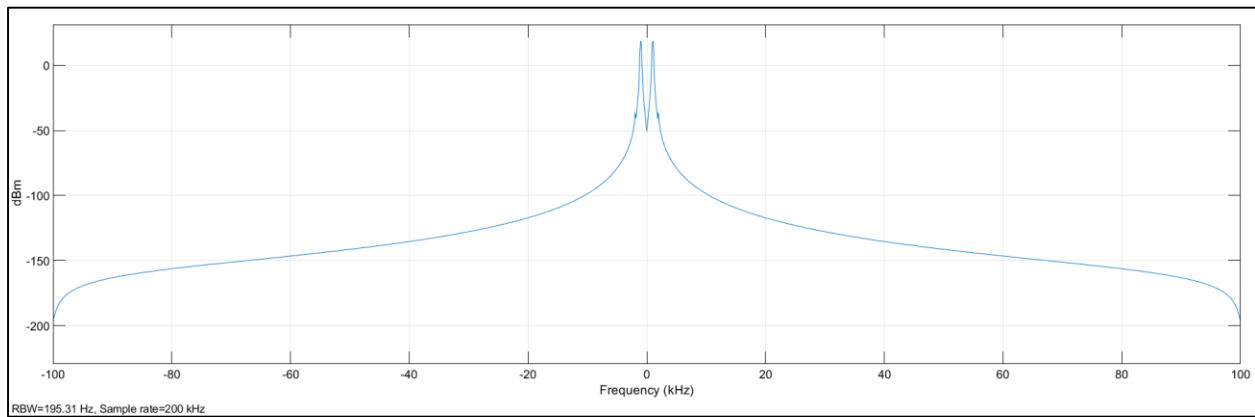


Figure 22 Demodulated signal using envelop detector method when $M=1$ in frequency domain.

✓ **Modulation index > 1(M=3):**

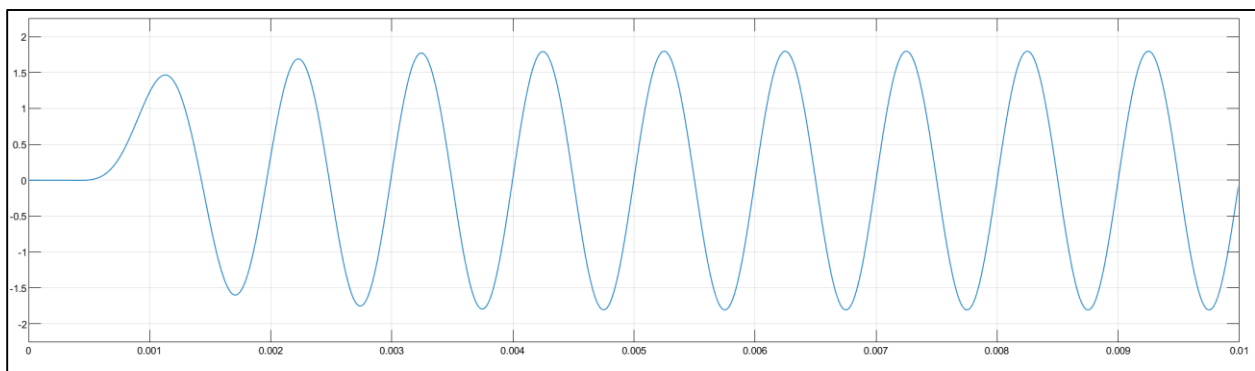


Figure 24 Demodulated signal using envelop detector method when $M=3$ in time domain.

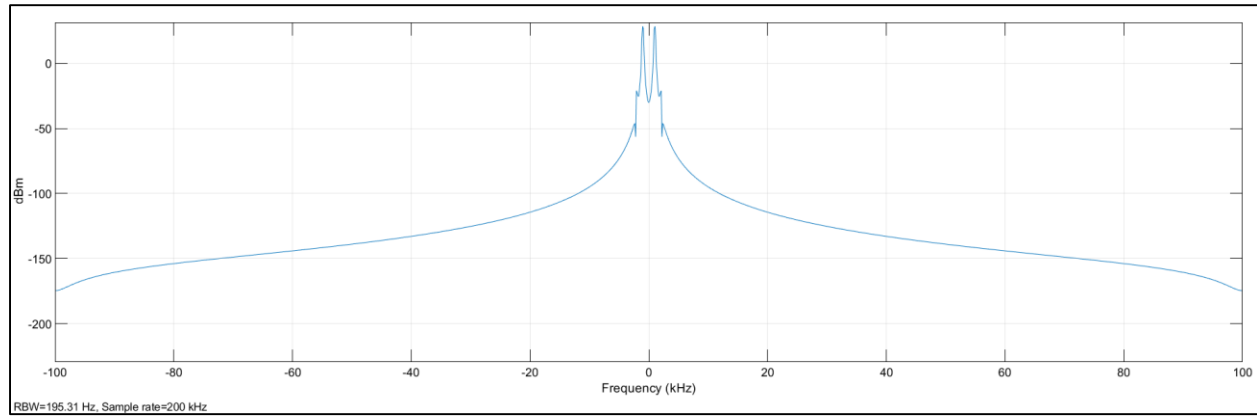


Figure 25 Demodulated signal using envelop detector method when $M=3$ in frequency domain.

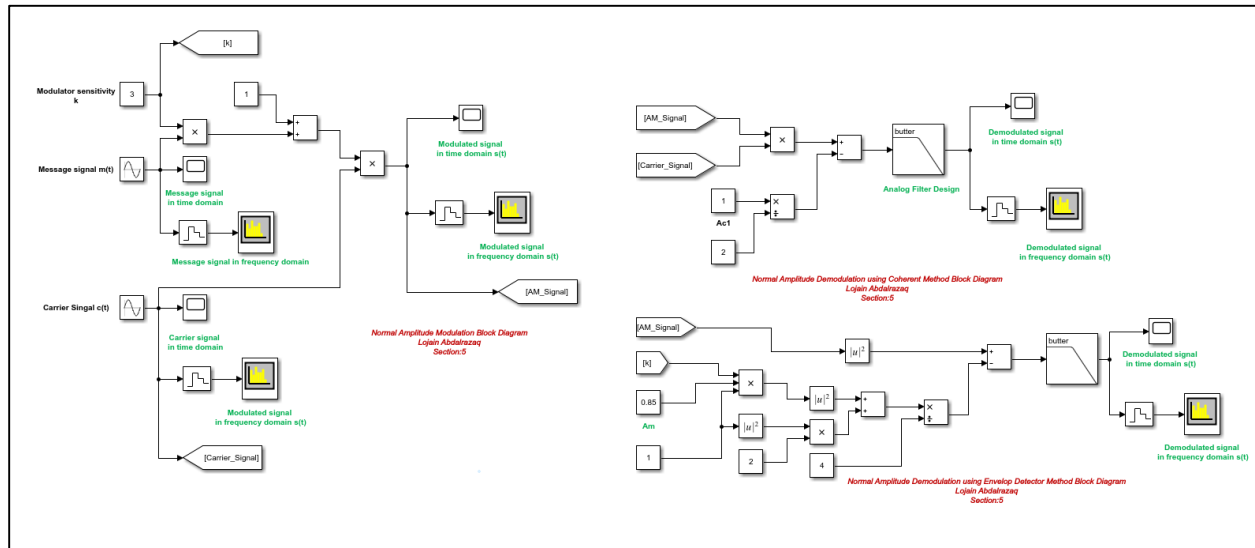


Figure 26 Block Diagram of Modulation and Demodulation using Simulink Software.