

Abstract:

It is understood that the use of Simulink for AM modulation by using MATLAB. And it is develop to understood of AM demodulation by using MATLAB.

Theory:

Amplitude modulation (AM) is a one of the conventional technique used to transmit message signals using a carrier wave. The amplitude or strength of the high frequency carrier wave is modified in accordance with amplitude of the message signal.

- Carrier signal (S_c) = $A_c \sin(2\pi f_c t)$
- Message signal (S_m) = $A_m \sin(2\pi f_m t)$ # f_m must be smaller than f_c

When carrier amplitude is altered with respect to message signal,

- Modulated Signal = $(A_c + A_m \sin(2\pi f_m t)) * \sin(2\pi f_c t)$

In terms of modulation index ($m = A_m/A_c$) the equation becomes

- **Modulated signal = $(1 + m \sin(2\pi f_m t)) * A_c \sin(2\pi f_c t)$**

Where,

- A_c = Carrier signal amplitude
- A_m = Message signal amplitude
- f_c = Carrier frequency
- f_m = Message frequency

Generating AM in Simulink:

For generating AM we just have to implement the equation of AM in block level.

Blocks Required:

Analyzing the equation, we need,

1. Carrier Signal Source
2. Message Signal Source
3. Blocks for viewing the signals – Scope
4. Product Block
5. Summer Block
6. Constant Block

We can find these blocks in the following locations of Simulink Library...

Carrier, Message, Constant blocks

- Simulink → Sources → Sine wave
- Simulink → Sources → Constant

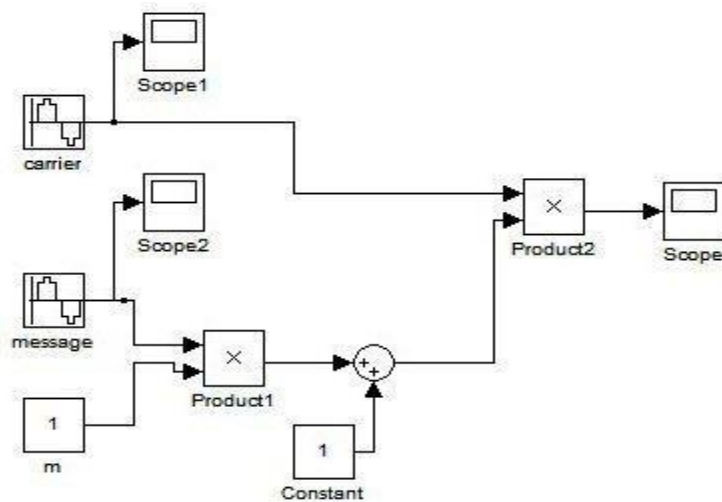
View Block

- Simulink → Sink → Scope

Product and Summer Block

- Simulink → Math Operations → Product
- Simulink → Math Operations → Summer

Block Diagram:

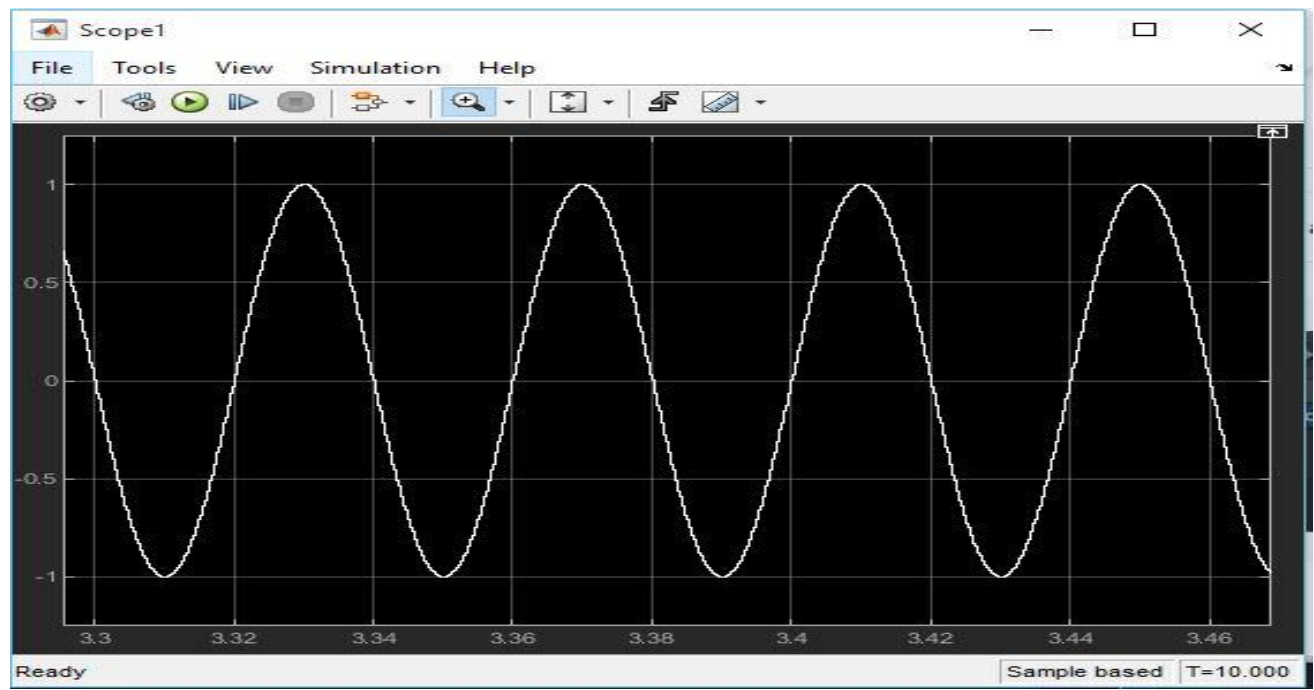


AM Generation using Simulink – Block Diagram

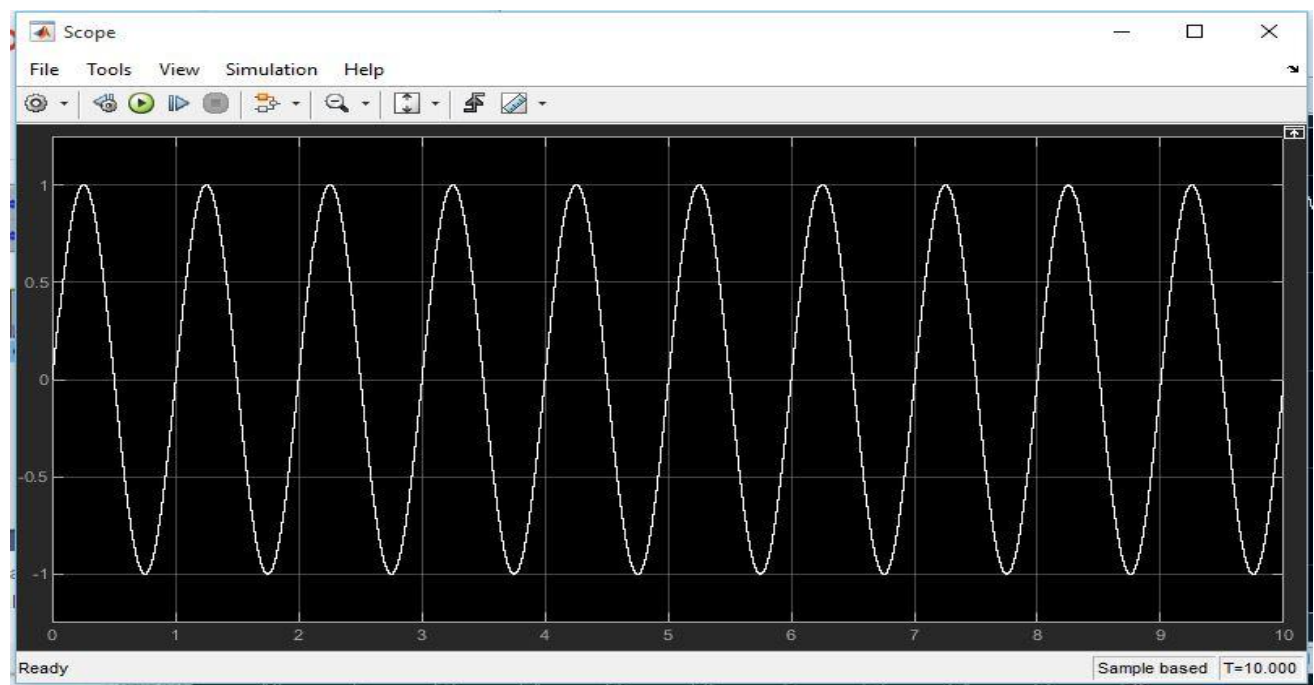
Block parameters can be changed by selecting the block and parameter:

- Carrier Signal frequency = $2\pi \cdot 25$ and sampling time = $1/5000$.
- Message Signal frequency = 2π and sampling time = $1/5000$.
- Amplitudes of both signals are 1.

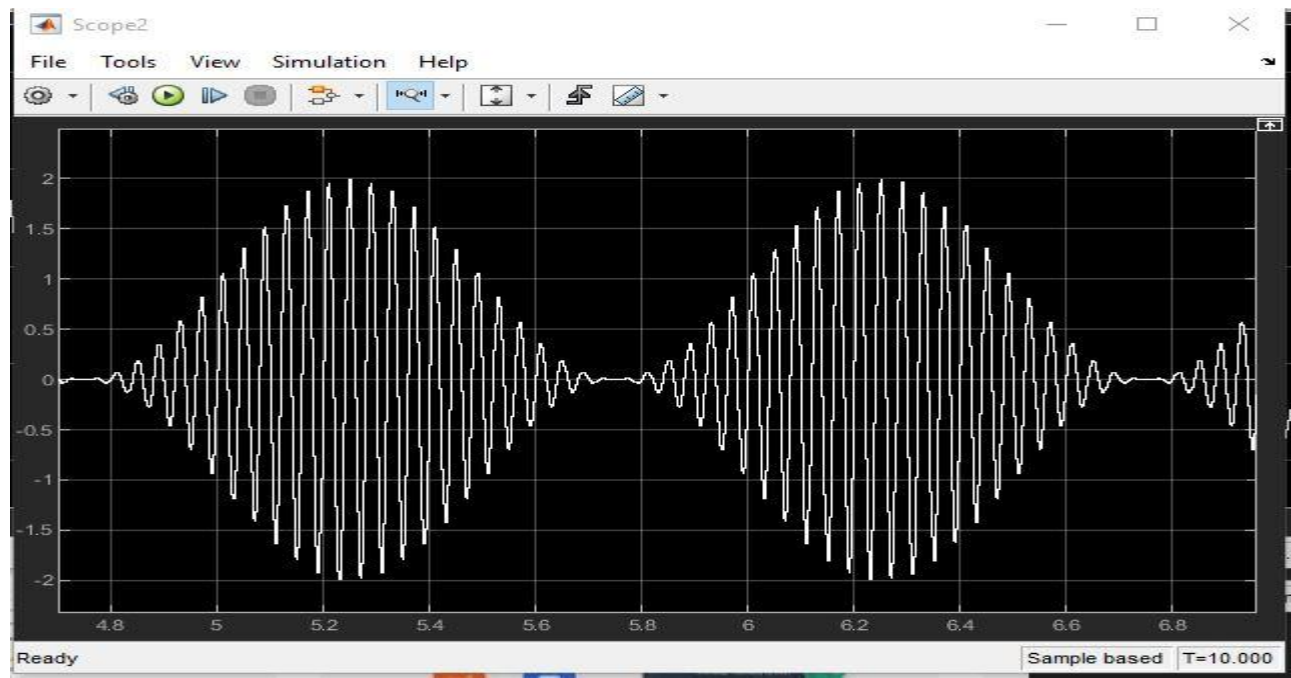
Result:



AM Generation using Simulink – Message Signal



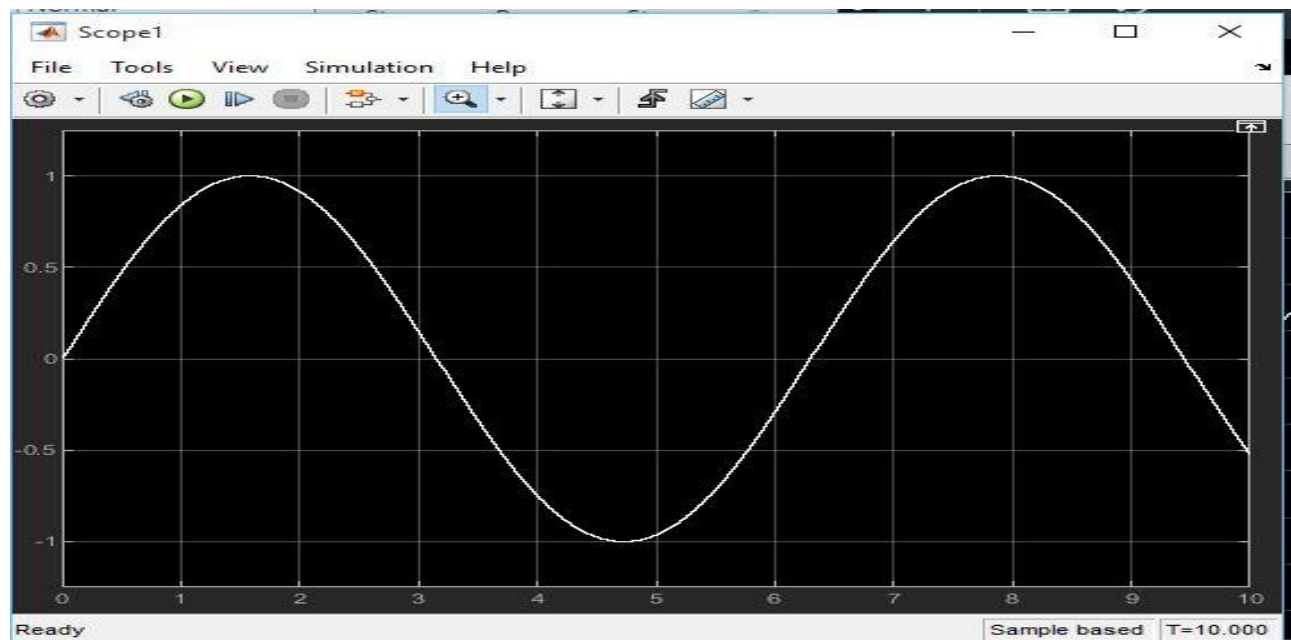
AM Generation using Simulink – Carrier



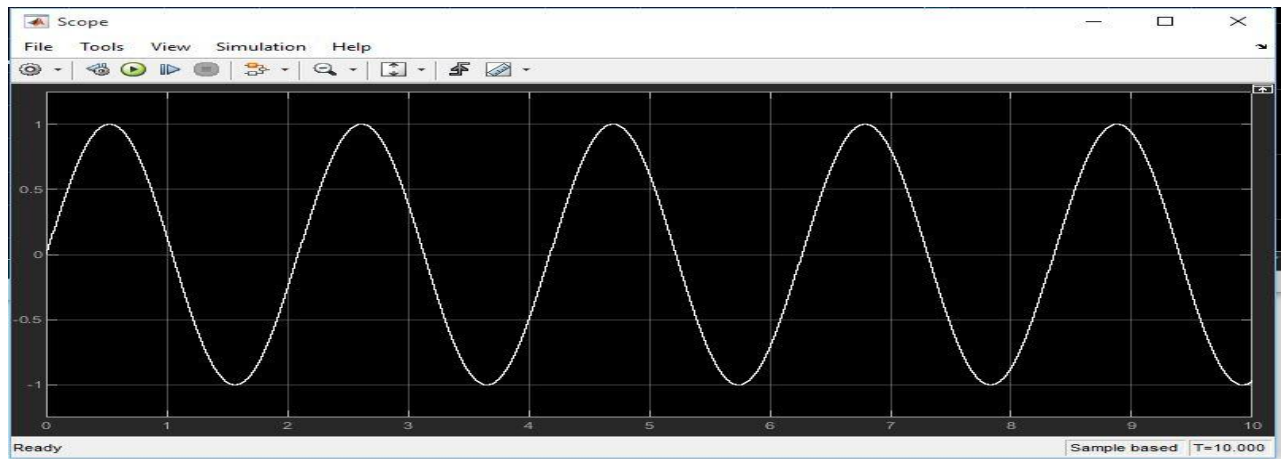
AM Generation using Simulink – Modulated Signal

Performance Task:

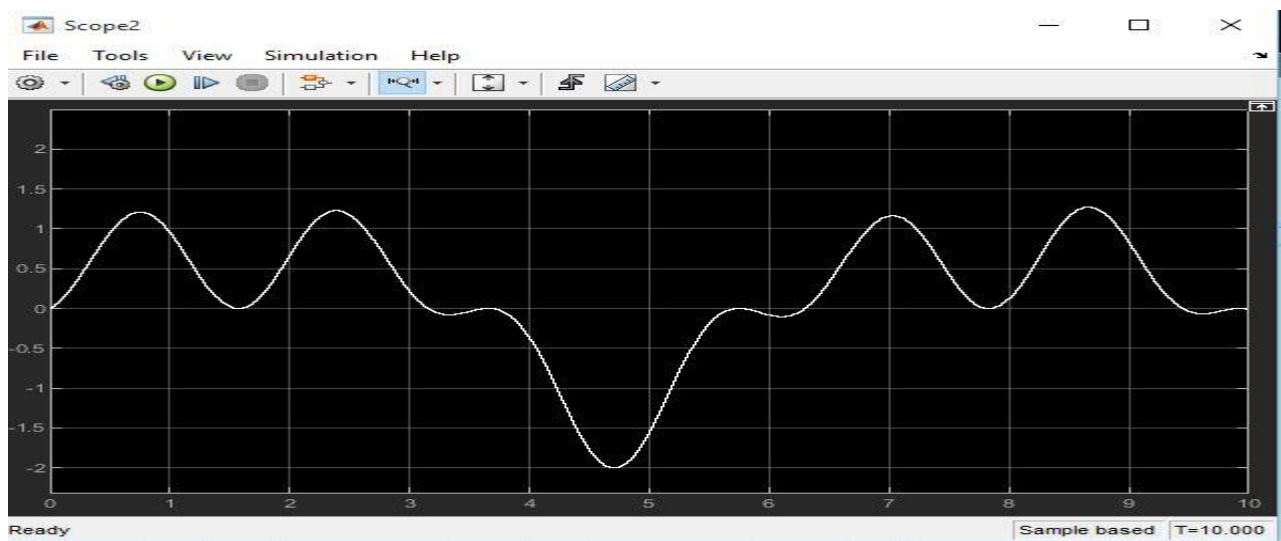
A signal ' $m(t) = (2*\sin(2*\pi*4*t)+3*\cos(2*\pi*6*t))$ '
 carrier signal ' $c(t) = \cos(2*\pi*50*t)$ '



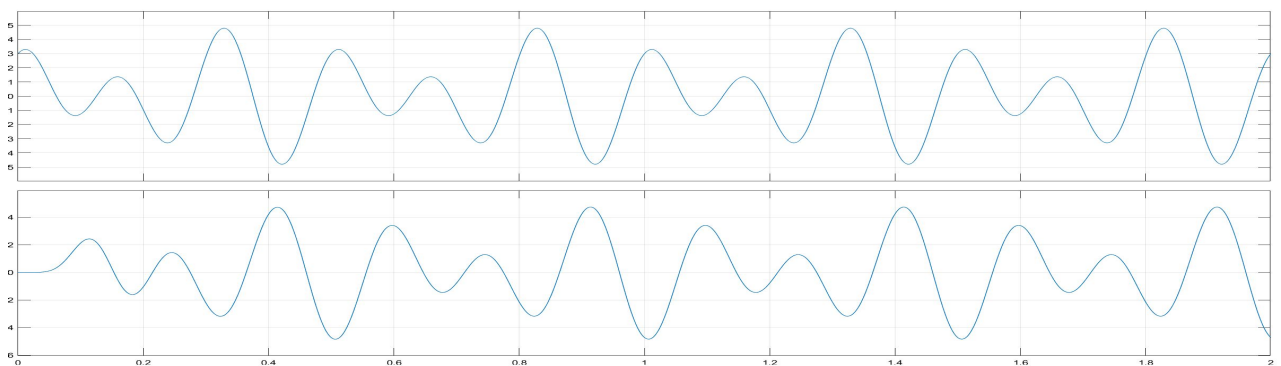
AM Generation using Simulink – Message Signal



AM Generation using Simulink – Carrier



AM Generation using Simulink – Modulated Signal



Demodulated signal

Discussion and conclusion:

In this experiment it is learnt about how to be calculate Amplitude Modulator and Demodulator using Simulink with MATLAB. And we also learnt about AM Generation using Simulink – (Message Signal, Carrier, Modulated Signal with MATLAB.

Reference:

- [1] M. I. “Staff, MATLAB and Simulink Student Version R2012a” Prentice Hall, 2012.
- [2] Prof. Dr.-Ing. Andreas Czylik, “MATLAB for Communications”

