

Experiment 06

Title: Study of Amplitude Modulator and Demodulator using Simulink.

Abstract:

This experiment is designed to-

- 1.To understand the use of Simulink for AM modulation.
- 2.To develop understanding of AM demodulation.

INTRODUCTION:

Amplitude modulation (AM) is a one of the conventional techniques 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

Analysing 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:

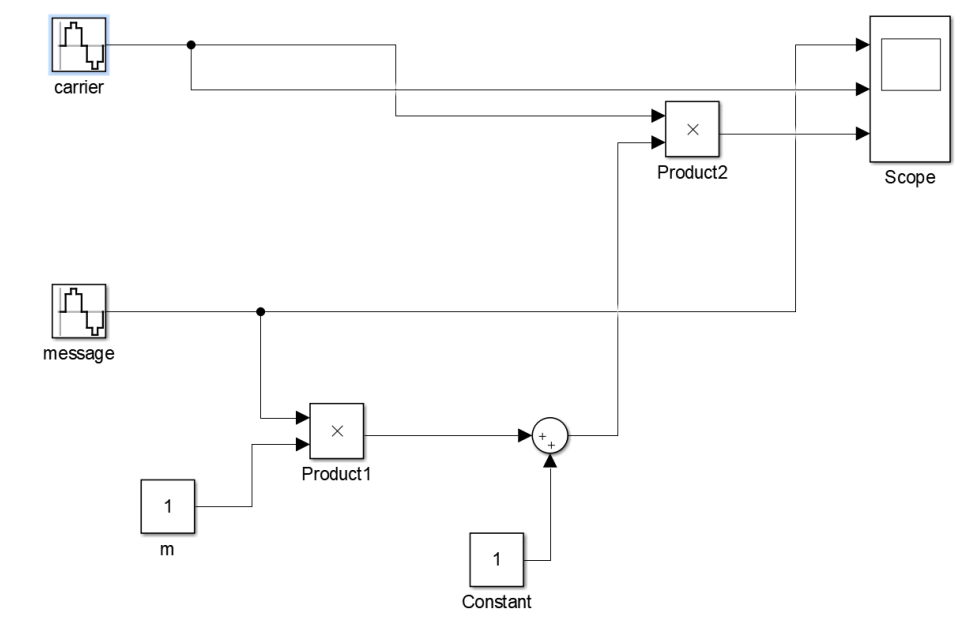


Fig: AM Generation using Simulink – Block Diagram

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

Output Waveforms:

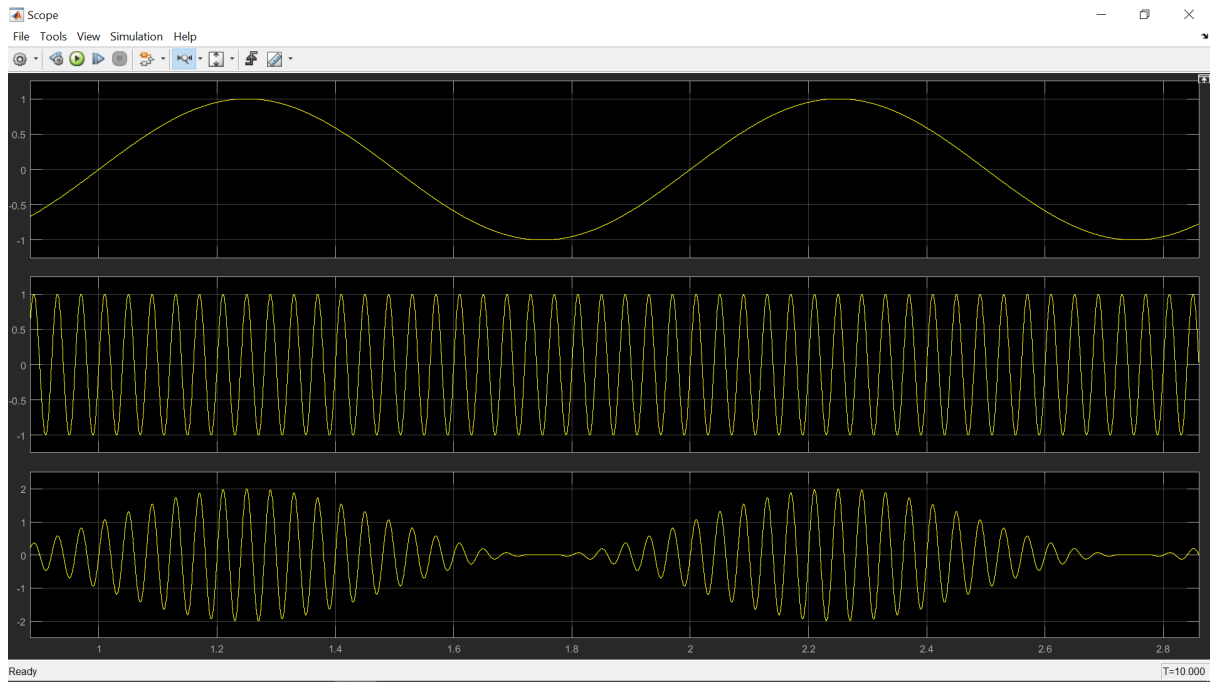
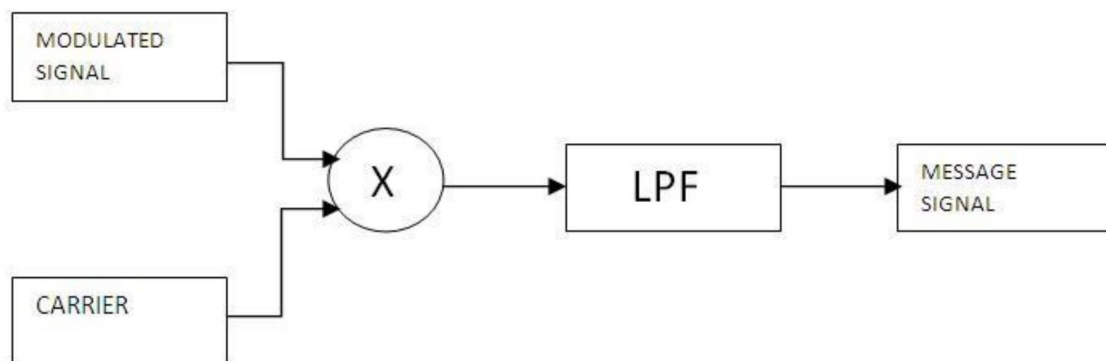


Fig: AM Generation using Simulink – Message Signal, Carrier, Modulated Signal respectively.

PERFORMANCE TASK:

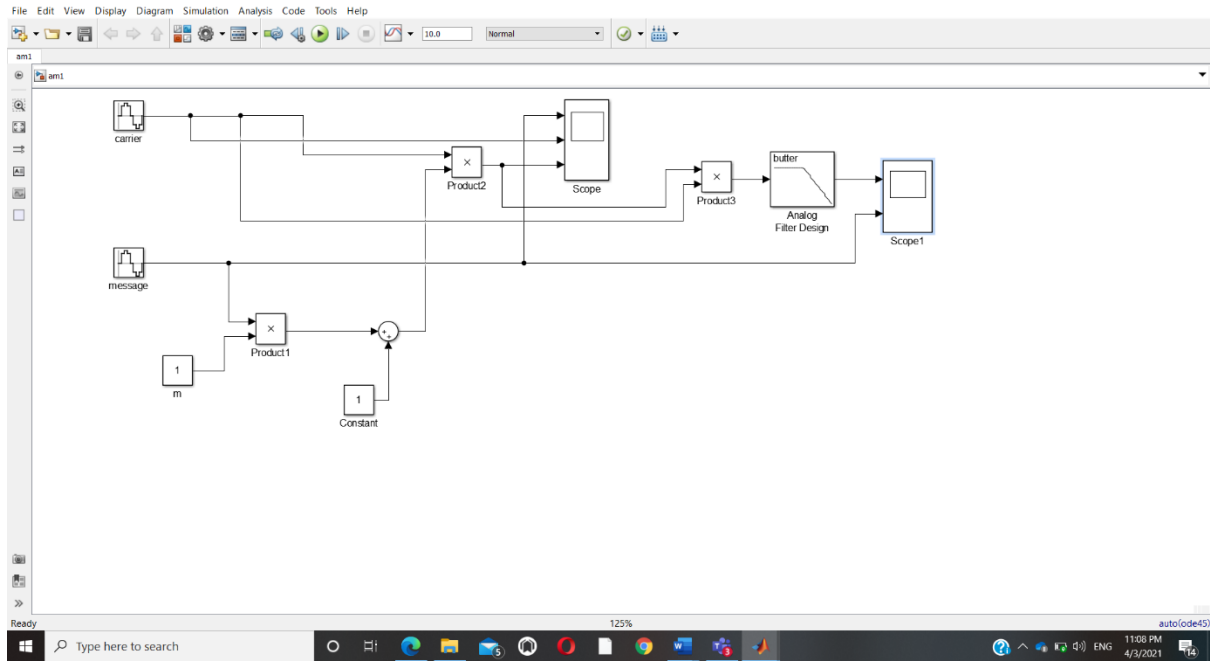
Performing demodulation according to the following diagram (general)



NAZIA AKHTER BUSHRA

ID:19-39943-1

Block Diagram:



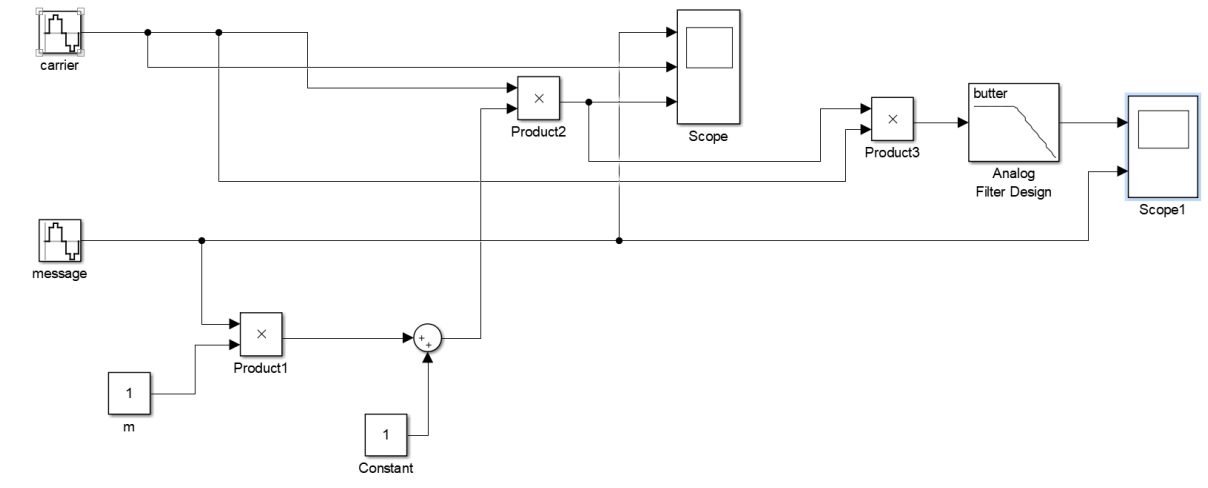
Output Waveform:



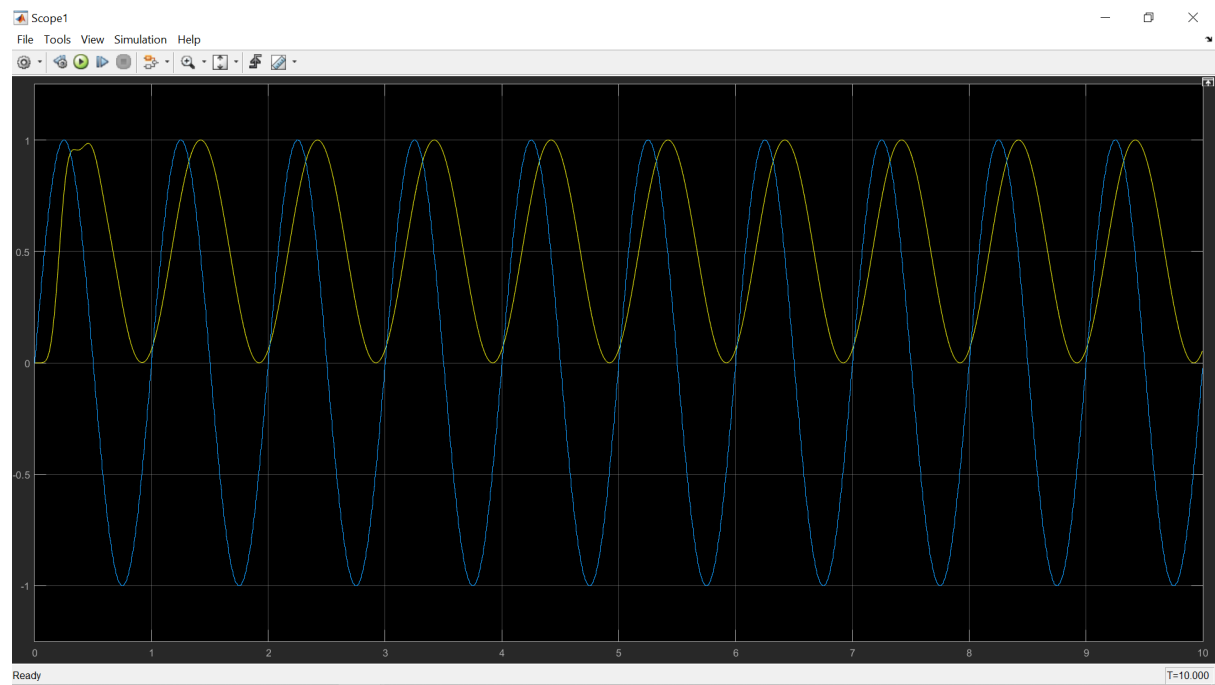
Iffat Ibnun Idris

ID: 19-39878-1

Block Diagram:



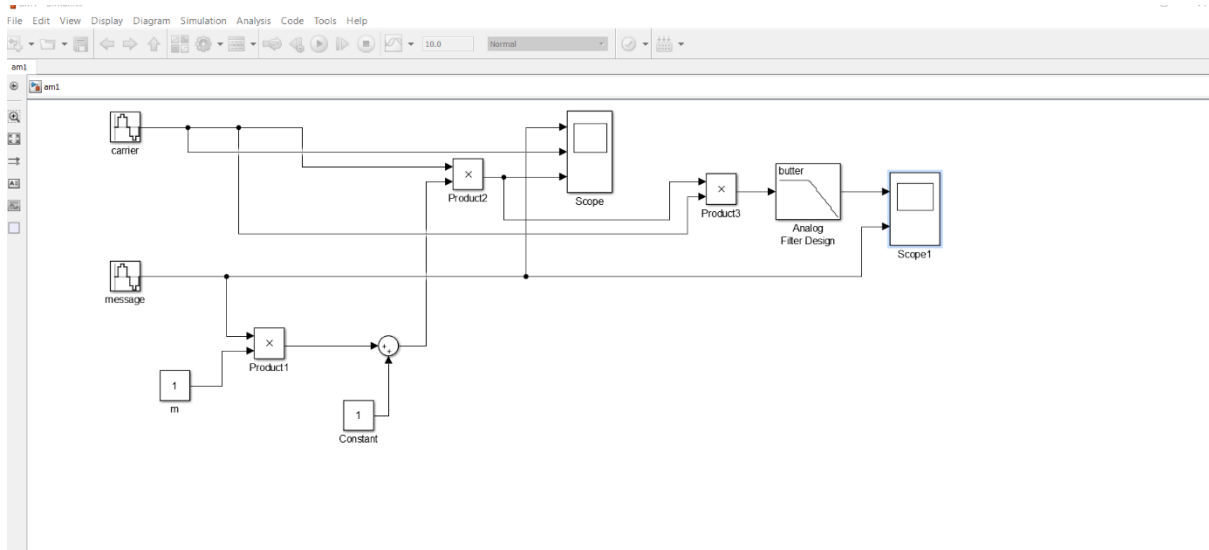
Output Waveform:



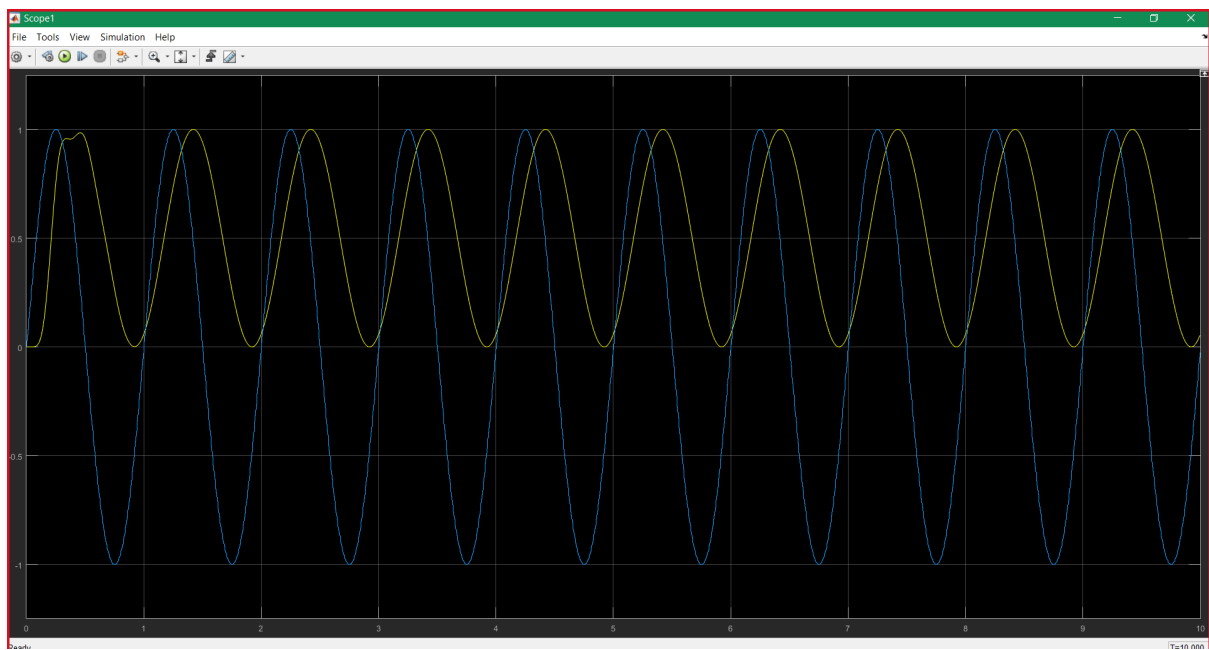
Shahadat Hossain Pranta

ID: 19-40000-1

Block Diagram:



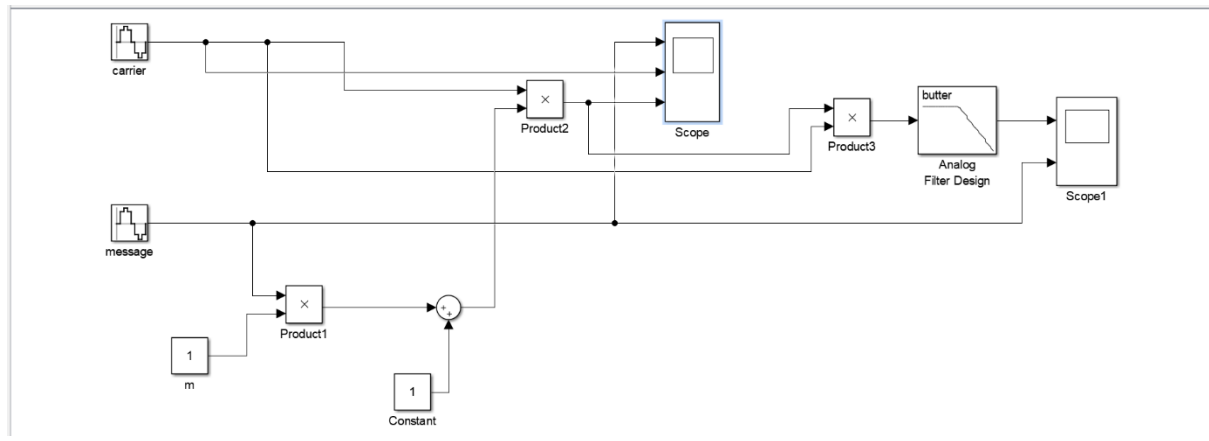
Output Waveform:



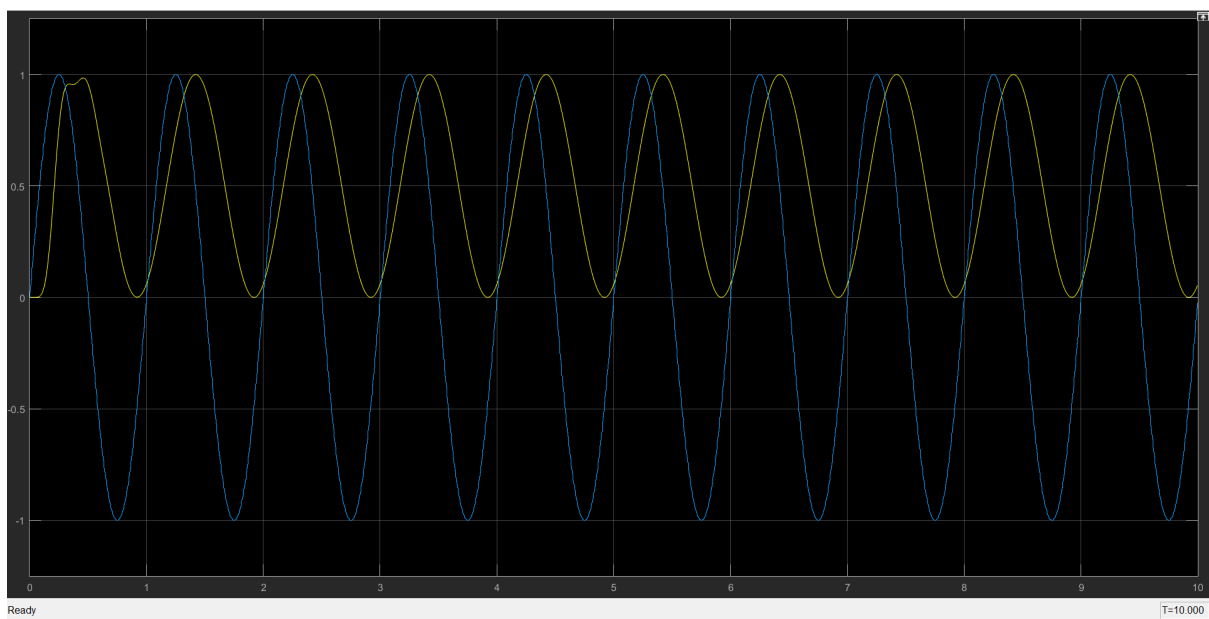
Ethika Biswas

ID: 19-39772-1

Block Diagram:



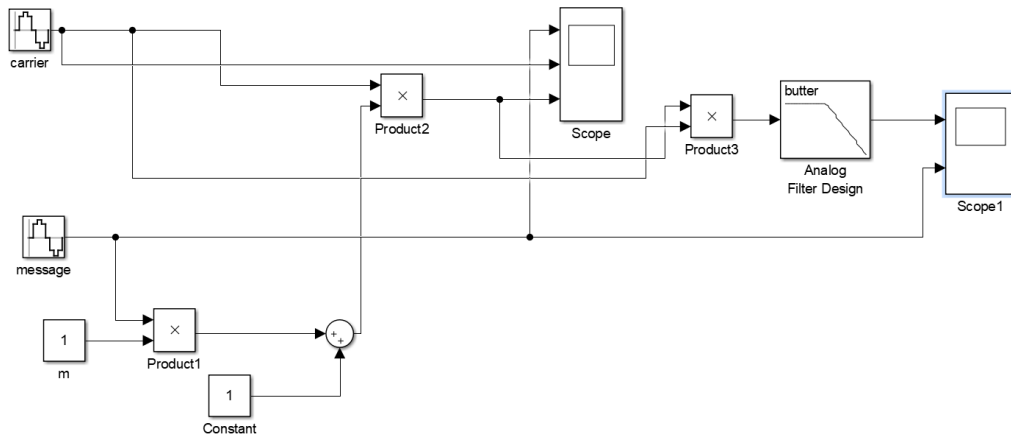
Output Waveform:



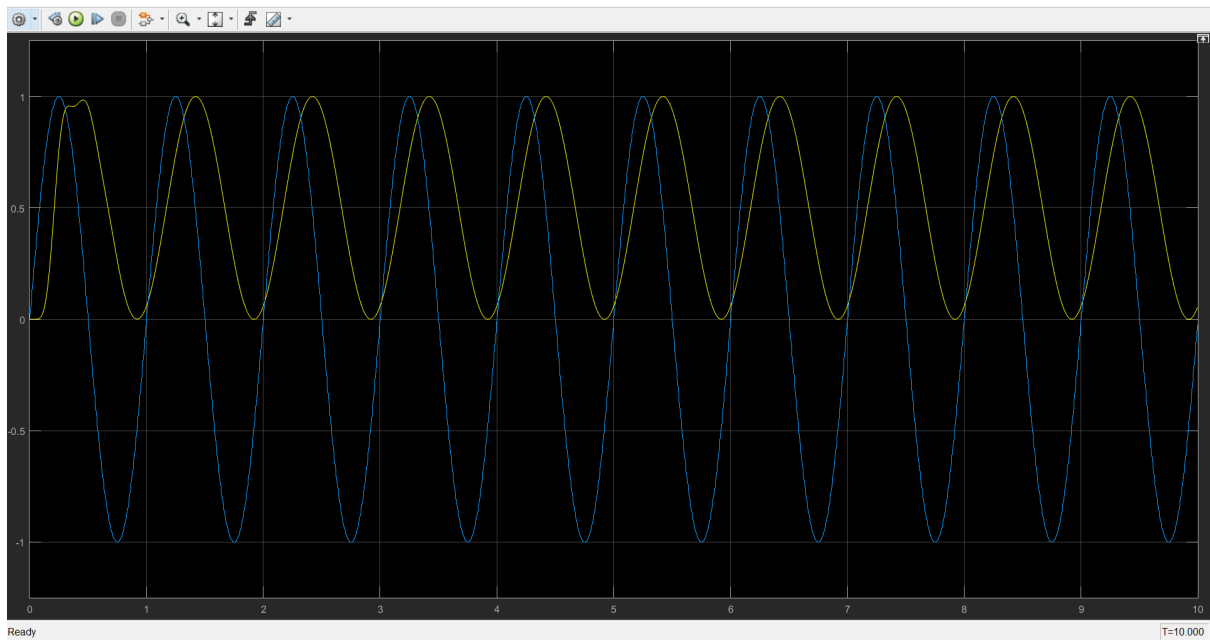
Mohammad Bony Israil

ID: 19-39873-1

Block Diagram:



Output Waveform:



DISCUSSION AND CONCLUSION:

The goal of this experiment was to understand the use of Simulink for AM modulation and to develop understanding of AM demodulation. The performance task given by faculty was done using Simulink. The experiment was successful as we got the expected results. We have faced some difficulties as Simulink was new for us. We had problems implementing the blocks. But with the help of our faculty, we could overcome those problems and got a success.