AMERICAN INTERNATIONAL UNIVERSITY BANGLADESH

Faculty of Science and Technology

Laboratory Report Cover Sheet

Students must complete all details except the faculty use part

Please submit all reports to your subject supervisor or the office of the concerned faculty.

Laboratory Title: Study of Amplitude Modulator and Demodulator using Simulink

Experiment Number: 7 Due Date: 23.07.22 Semester: Summer

Subject Code: EEE__Subject Name: DATA COMMUNICATION Section: H

Course Instructor: ABRAR FAHIM LIAF Degree Program: B.Sc in CSE

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Title: Study of Amplitude Modulator and Demodulator using Simulink

Abstract:

This experiment is designed to understand the use of Simulink for AM modulation and to develop understanding of AM demodulation.

Introduction:

Amplitude modulation is a process by which the wave signal is transmitted by modulating the amplitude of the signal. It is often called AM and is commonly used in transmitting a piece of information through a radio carrier wave. Amplitude modulation is mostly used in the form of electronic communication. It 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. In amplitude modulation, the amplitude or strength of the radio frequency oscillations is varied. For example, in AM radio communication, a continuous wave radio-frequency signal has its amplitude modulated by an audio waveform before transmission. The frequency and phase of the carrier remain the same; only the amplitude changes to follow variations in the information. An increase in the amplitude of the modulating signal causes the amplitude of the carrier to increase. An increase or a decrease in the amplitude of the modulating signal causes a corresponding increase or decrease in both the positive and the negative peaks of the carrier amplitude.

Here,

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

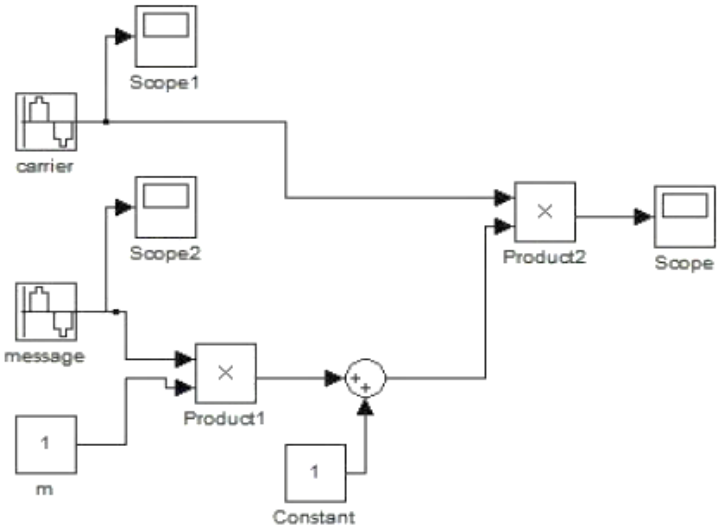

Figure1: AM Generation using Simulink – Block

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

- Carrier Signal frequency = 2*pi*25 and sampling time=1/5000
- Message Signal frequency = 2*pi and sampling time=1/5000
- Amplitudes of both signals are 1

Results:

Output Waveforms

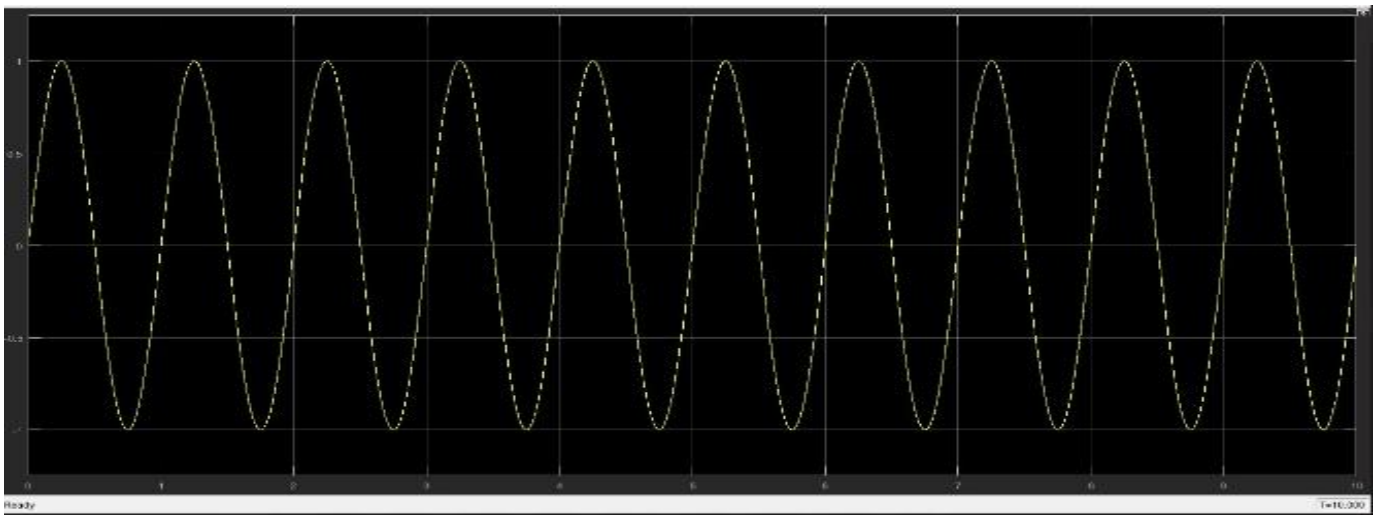

Figure2.1: AM Generation using Simulink – Message

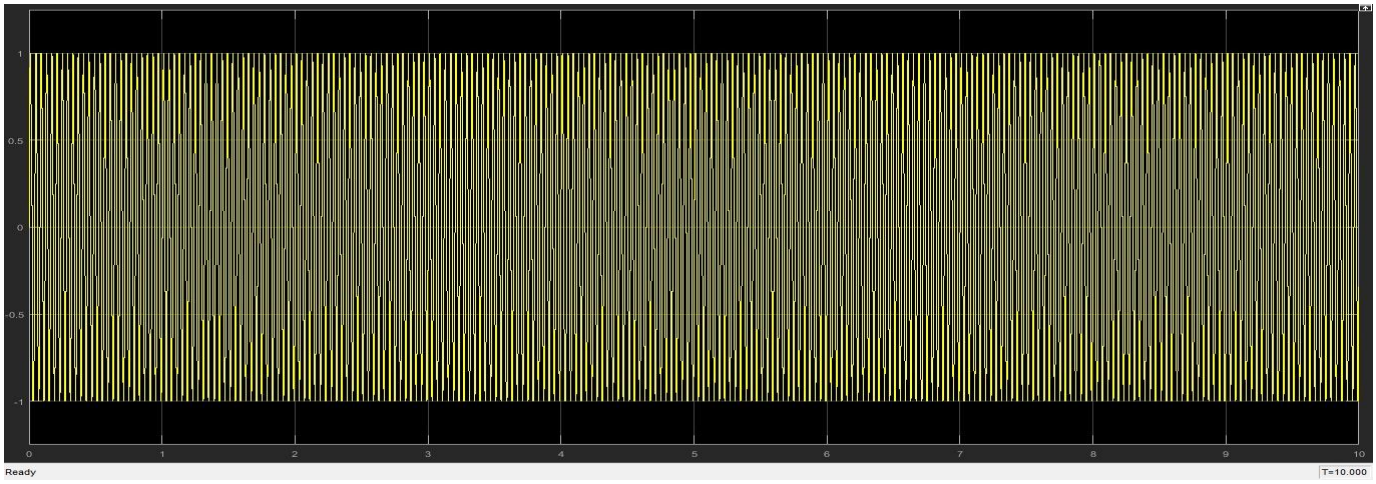

Figure2.2: AM Generation using Simulink – Carrier

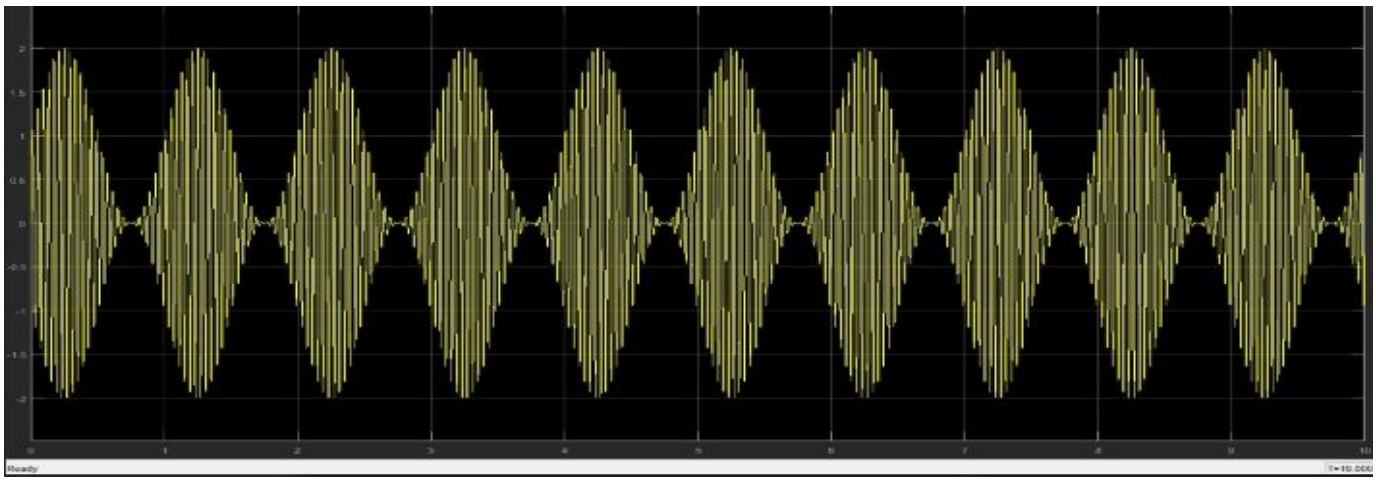

Figure2.3: AM Generation using Simulink – Modulated

Performance Task:

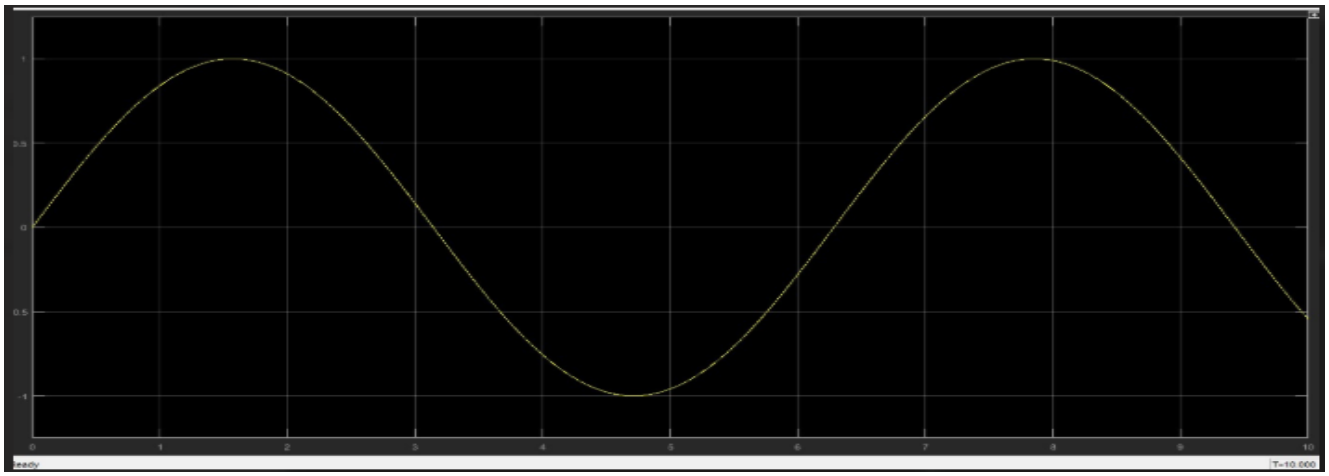

Figure3.1: AM Generation using Simulink – Carrier

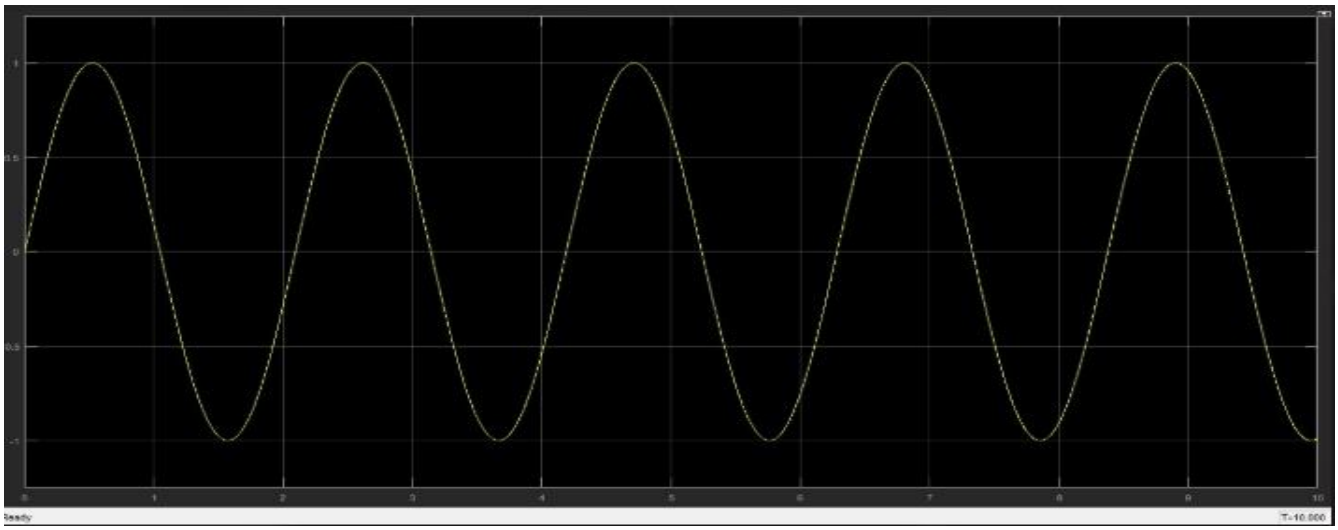

Figure3.2: AM Generation using Simulink – Message

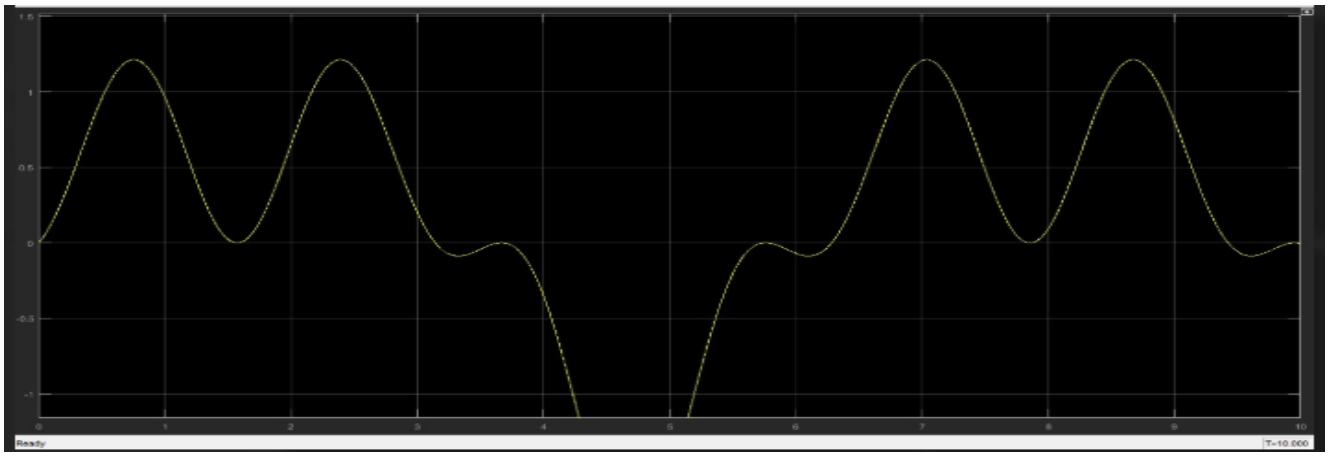

Figure3.3: AM Generation using Simulink – Modulated

Discussion:

In this task, we were facing troubles in founding the blocks at the first. We change the amplitude different times and check the output waves. In the task part we did not find more differences while changing the values of amplitude. But every time whenever we changed the values, we found different waves.

References:

- Prof. Dr.-Ing. Andreas Czylwik, “MATLAB for Communications’’