



American International University-Bangladesh (AIUB)

Department of Computer Engineering

COE 3201: Data Communication Laboratory

Lab Report 7

**Title: Study of Frequency Modulation and Demodulation using Simulink
(MATLAB)**

Supervised By

SADMAN SHAHRIAR ALAM

Submitted By

Name	ID
RIFAH SANZIDA	22-47154-1

Group Members

Name	ID
MD. JOBAER HOSSAIN	22-47116-1
MD SAMIN YEASAR	22-47139-1
SHAYAN ABRAR	22-47156-1

Abstract:

This experiment is designed to-

1. To understand the use of Simulink for solving communication engineering problems.
2. To develop understanding of Frequency Modulation and Demodulation using Simulink.

Theory:

To learn this, and experiment properly one should first go through the below concepts for a better understanding. In terms of message signal transmission using carrier waves, Frequency Modulation (FM) is one of the conventional techniques. The amplitude or strength of the high-frequency carrier wave is modified in accordance with the frequency of the message signal.

The angle-modulated signal described in the time domain:

$$s(t) = A \cos[2\pi f_c t + \theta(t)] = \operatorname{Re}\{A \exp(j\phi(t))\}$$

The modulated signal $s(t)$ is: $ds(t)/dt = -A \sin[2\pi f_c t + 2\pi K_f \int m(\lambda) d\lambda] \sin(2\pi f_c t + 2\pi K_f \int m(\lambda) d\lambda)$

The differentiated signal is both amplitude and frequency modulated, the envelope

$A \cos[2\pi f_c t + 2\pi K_f \int m(\lambda) d\lambda]$ is linearly related to message signal (amplitude component) and

$\sin(2\pi f_c t + 2\pi K_f \int m(\lambda) d\lambda)$ is a high-frequency component. Therefore, (t) can be recovered by an envelope detection of $d(t)/dt$.

Frequency modulation :

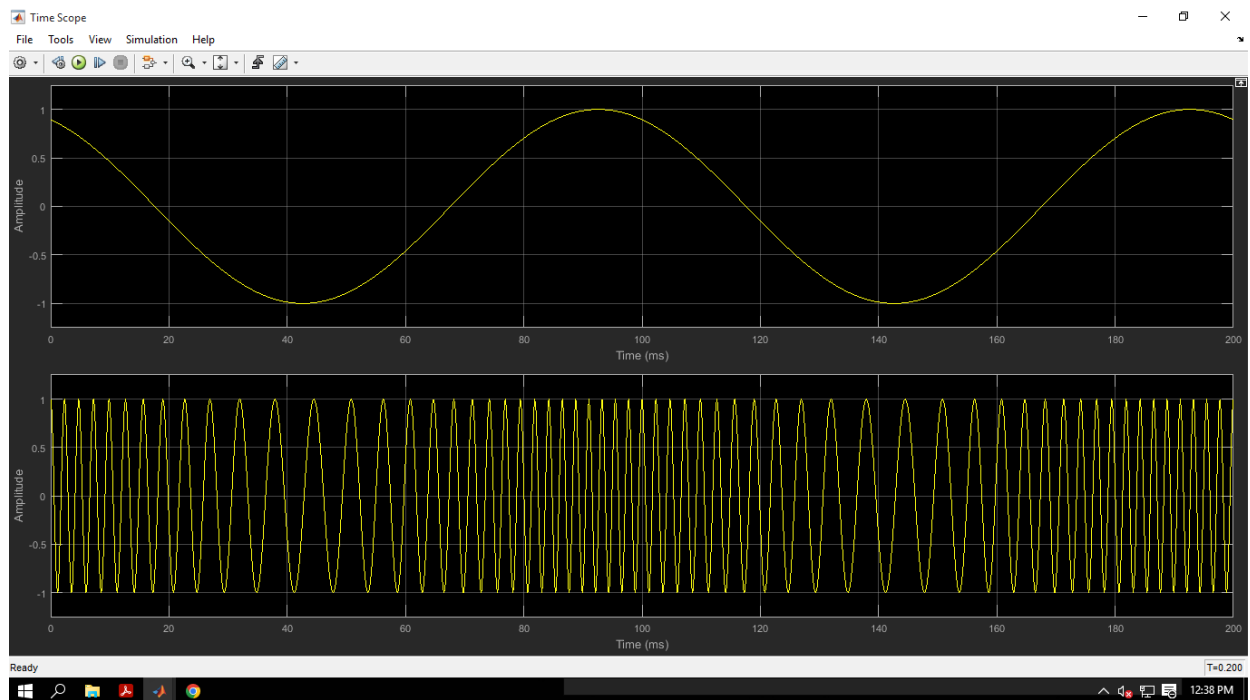
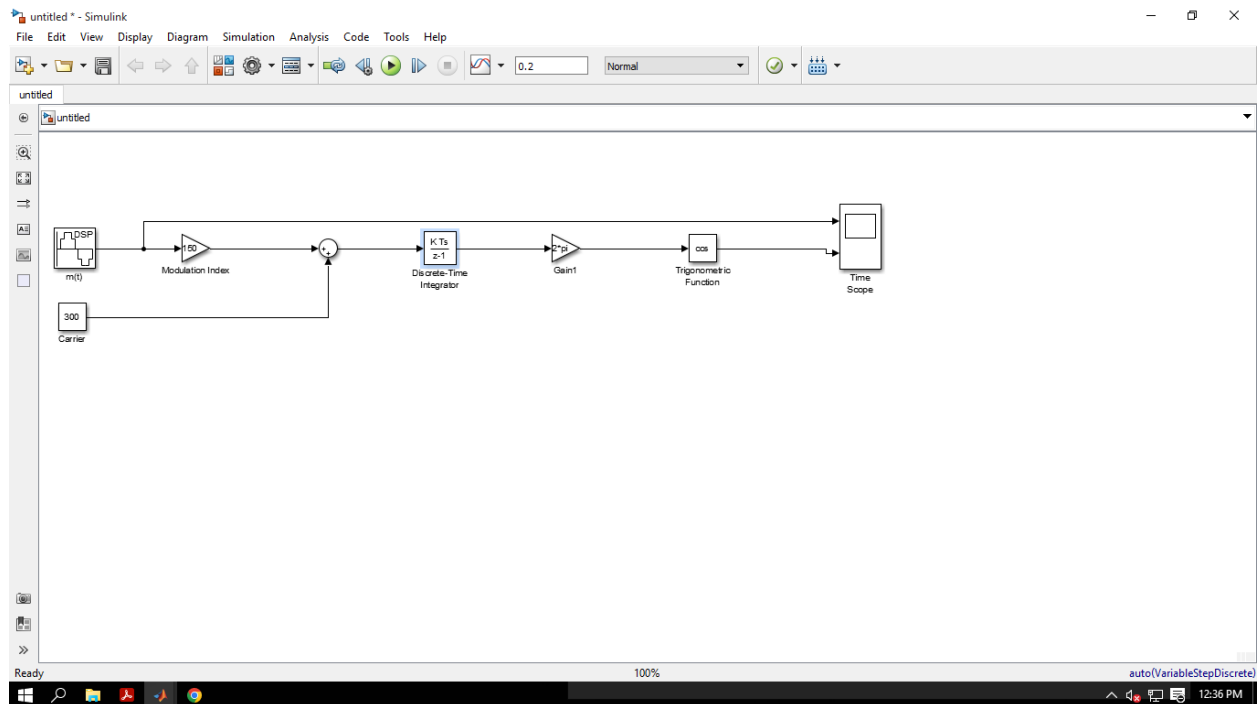


Figure: FM modulation

Frequency modulation and demodulation:

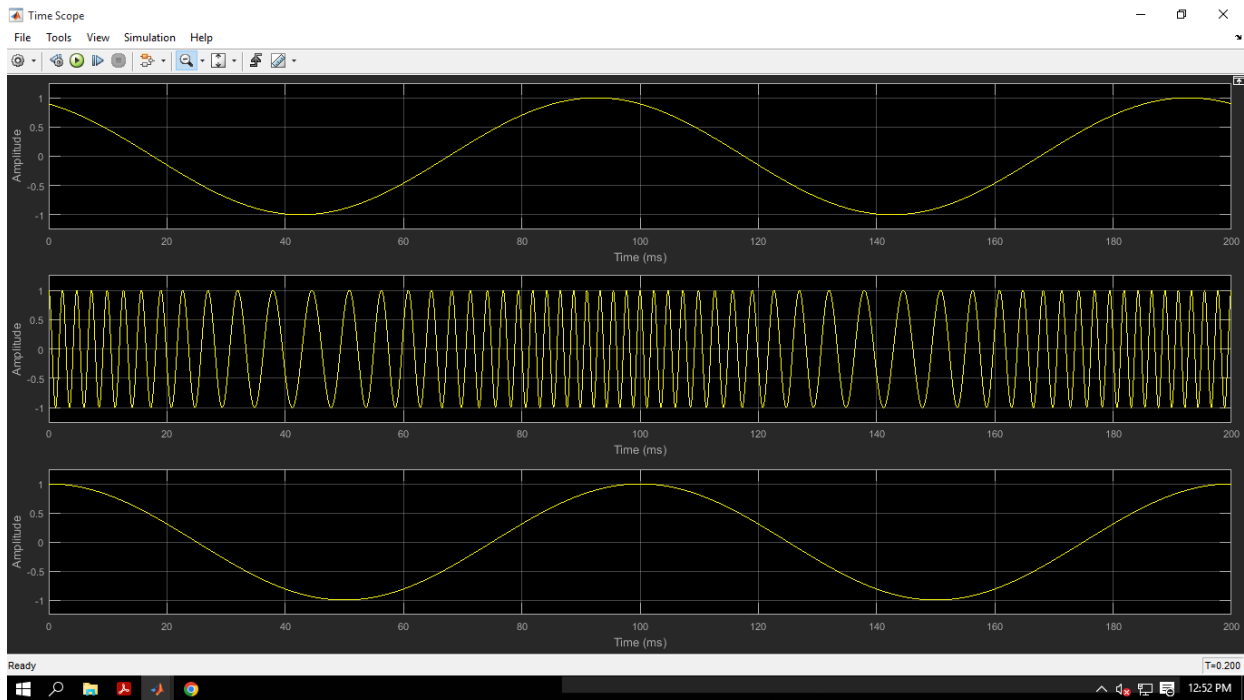
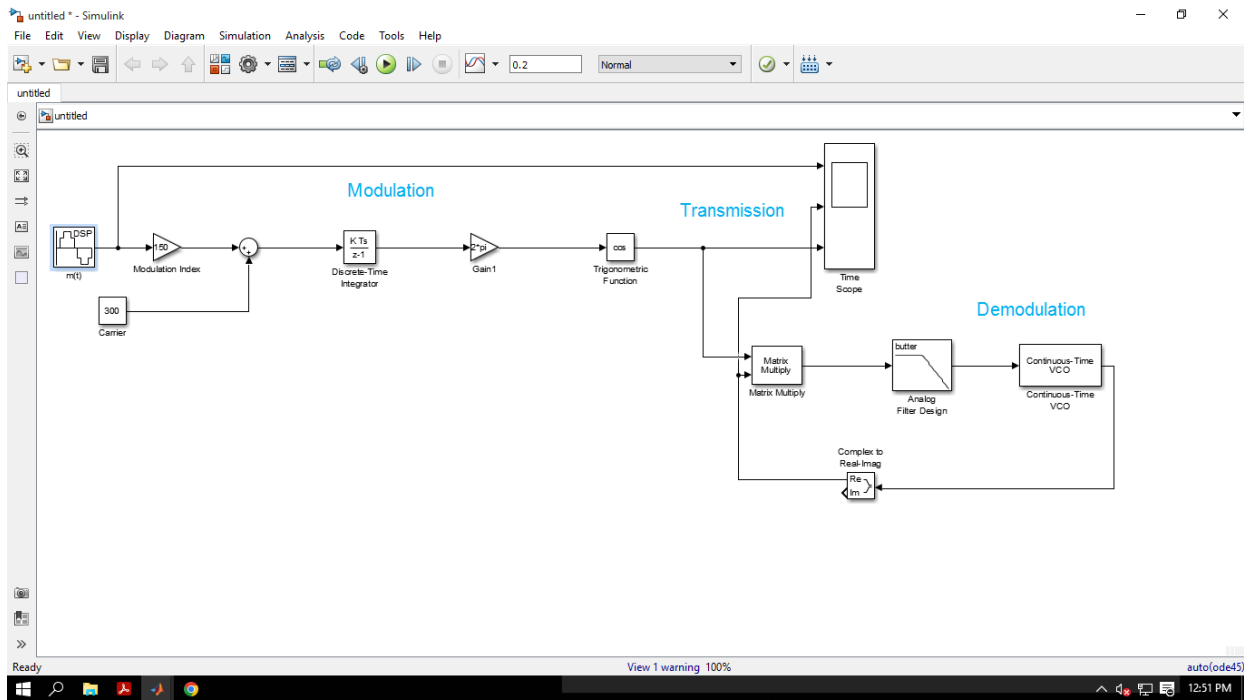


Figure: FM modulation and demodulation

Discussion and Conclusion:

The desired result was obtained after successfully completing the lab work. Each segment answered as required. But the proper result didn't come on the first try. By changing, function values correct result is obtained gradually. Simulink environment, commands, and syntax are now a clear concept after completing the experiment. From now FM Modulation problems can be solved effectively.

References:

- [1] M. P. Fitz, Fundamentals of Communications Systems, pp. 7.1-7.7, 2007, McGraw-Hill
- [2] MathWorks®, Voltage Controlled Oscillator.