AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

Faculty of Engineerings

Lab Report

GROUP 01

Assignment Title:	Lab Report			
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Course Title:	Data Communication			
Course Code:			Section:	H
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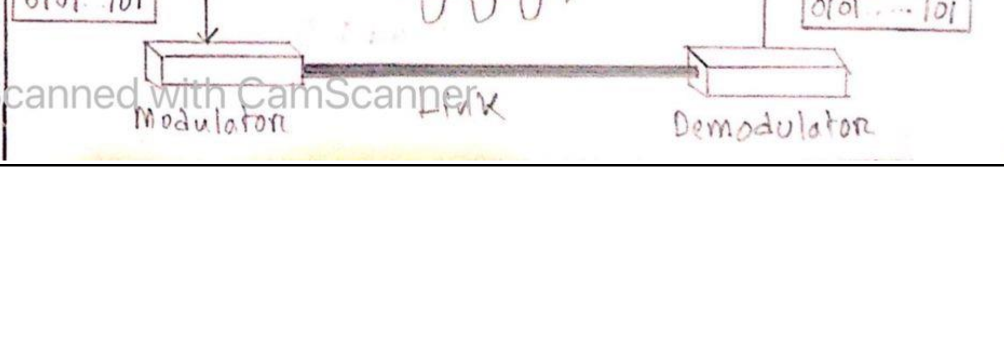
Title: Study of Digital to Analog Conversion Using MATLAB.

Abstract: This experiment is designed to-

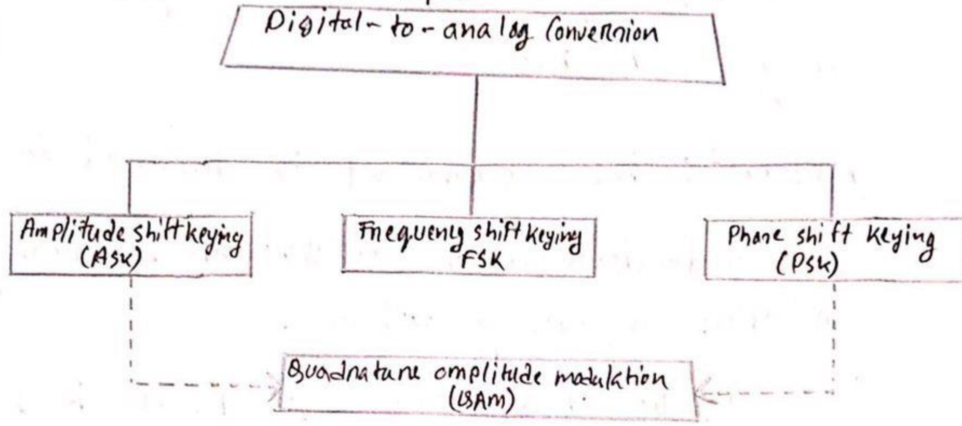
1. To understand the use of MATLAB for solving communication engineering problems.
2. To develop understanding of Digital to Analog Conversion using MATLAB.

Introduction: I. DIGITAL TO ANALOG CONVERSION:

Digital to analog conversion is the process of changing one of the characteristics of an analog signal based on the information in digital data flow figure bellow shows the relationship between the digital information, the digital to analog modulation process, and the resultant analog signal.

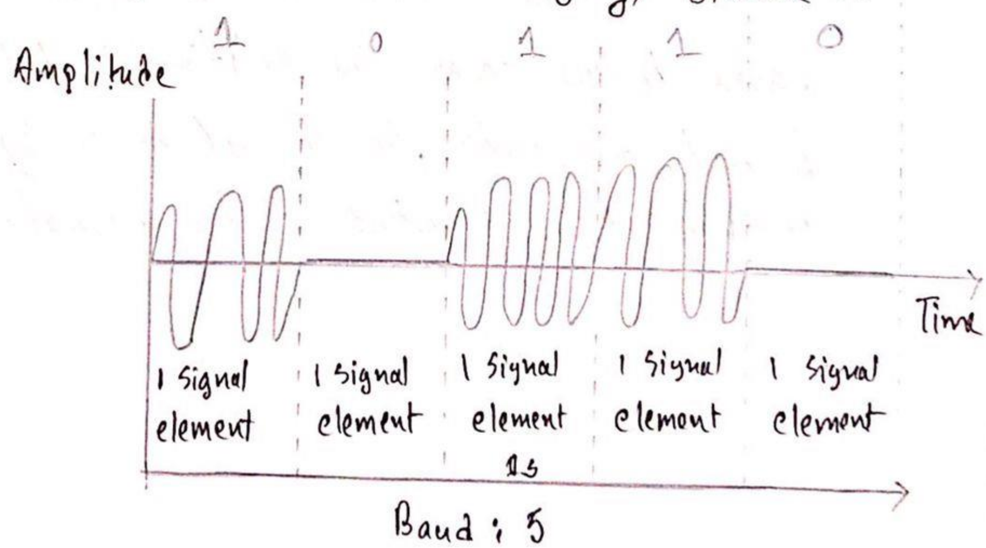


II. TYPES OF DIGITAL TO ANALOG CONVERSION :

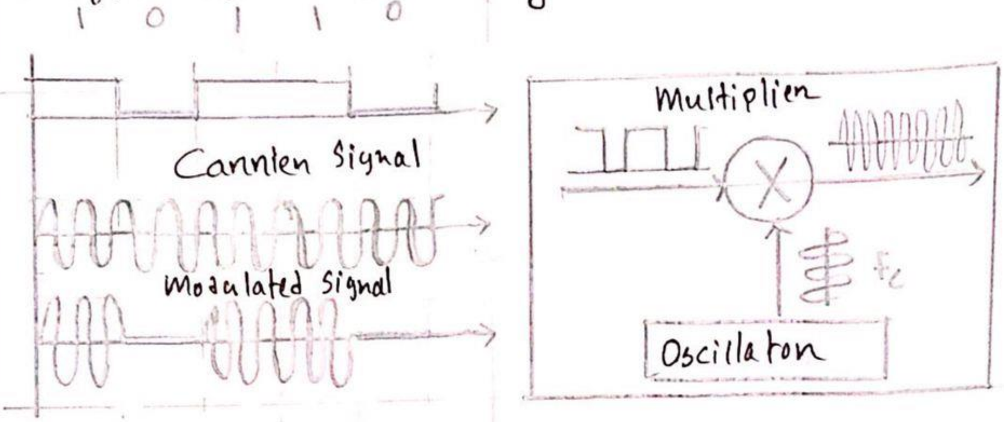


ASK: In amplitude shift keying, the amplitude of the carrier signal is varied to create signal elements. Both frequency and phase remain constant while the amplitude changes.

Binary amplitude shift keying, Bitrate : 5

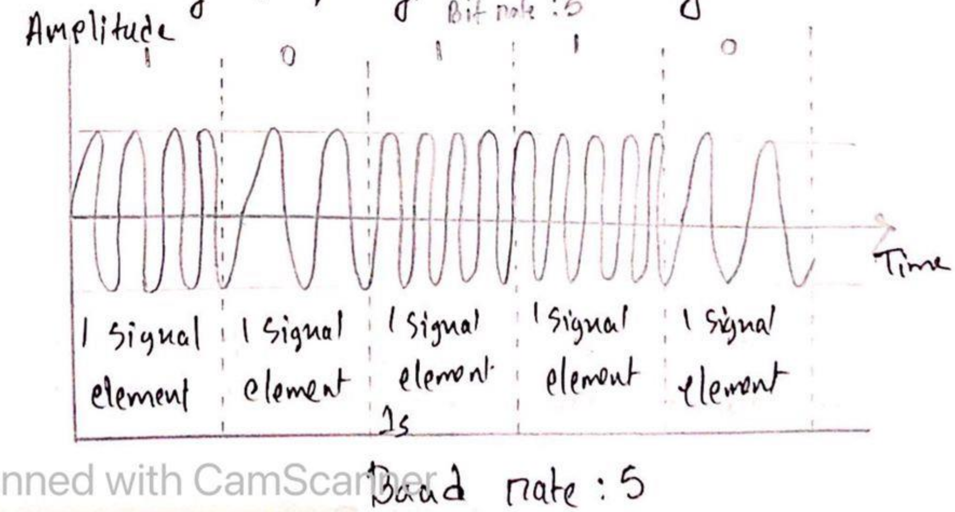


Implementation of binary ASK:



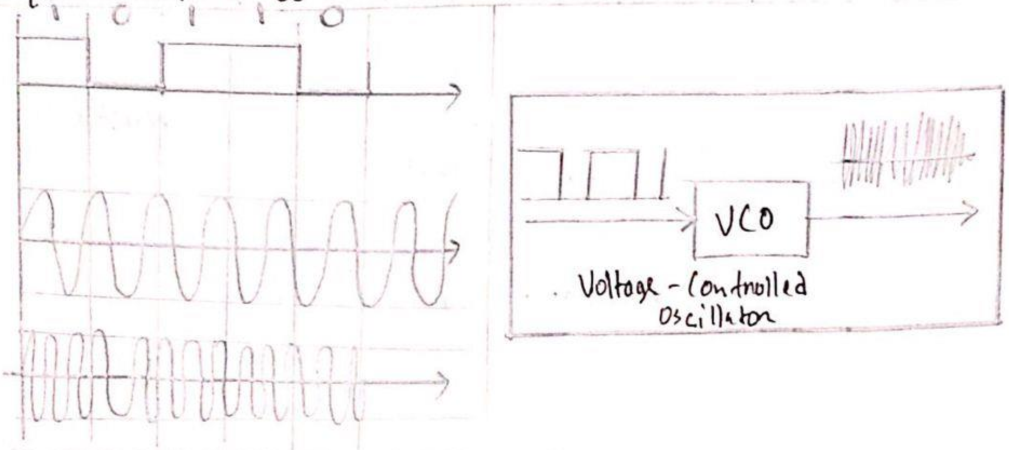
FSK: In frequency shift keying, the frequency of the carrier signal is varied to represent data the frequency of the modulated signal is constant for the duration of one signal element, but changes for the next signal element if the data element changes. Both peak amplitude and phase remain constant for all signal elements.

Binary frequency shift keying

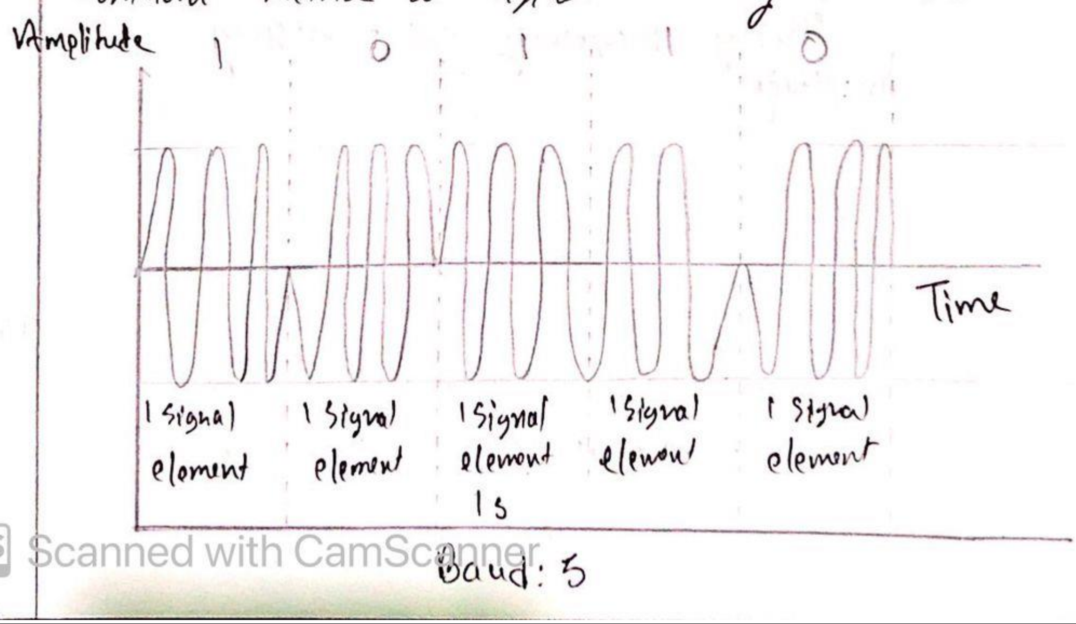


Baud rate : 5

Implementation of BFSK:

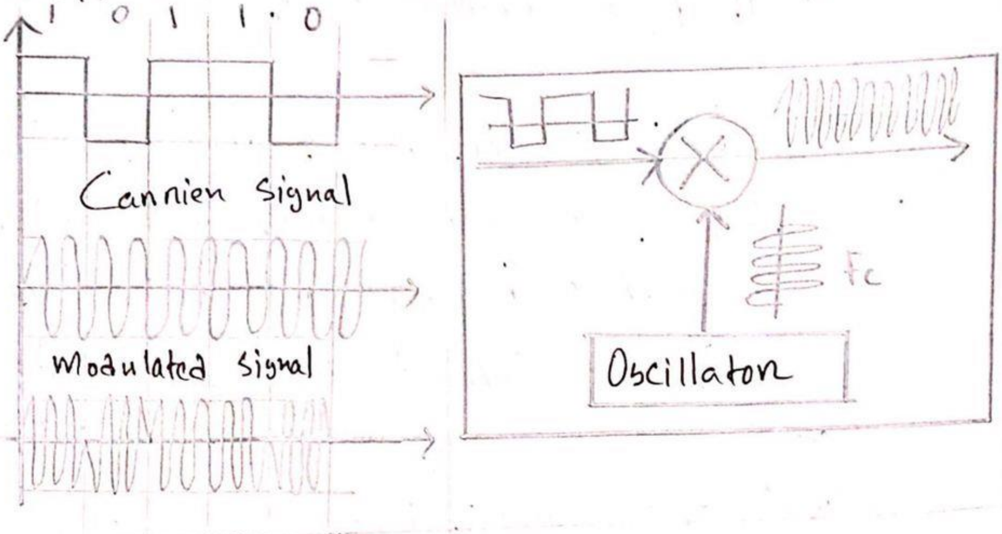


<u>PSK</u>: In phase shift keying, the phase of the carrier is varied to represent two or more different signal elements. Both peak amplitude and frequency remain constant as the phase changes. Today, PSK is more common than ASK or FSK. However, we will see shortly that QAM, which combines ASK and PSK, is the dominant method of digital to analog modulation.



Baud: 5

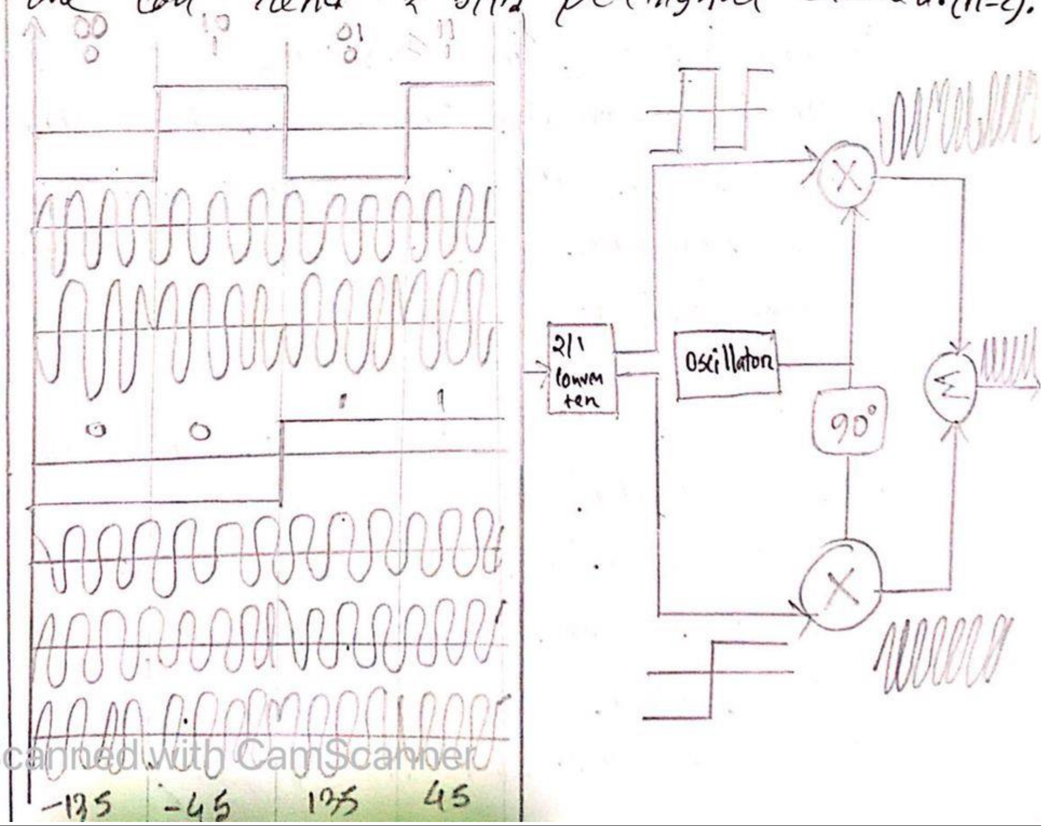
Implementation of BPSK.



QPSK: The simplicity of BPSK enticed designers to use 2 bits at a time in each signal element thereby decreasing the baud rate and eventually the required bandwidth. The scheme is called quadrature PSK or QPSK because it uses two separate BPSK modulation: one is in-phase, the other quadrature (out-of-phase).

The incoming bits are first passed through a serial-to-parallel conversion that sends one bit to one modulator and next bit to the other modulator. if the duration of each bit in the incoming signal is T, the duration of each BPSK signal has one-half the frequency of the original signal. figure bellow shows the idea.

The two composite signals created by each multiplier are sine waves with the same frequency, but different phases. When they are added, the result is another sine wave, with one of four possible phases: 45°, -45° 135° and -135°. There are four kinds of signal elements in the output signal ($L=4$), so we can send 2 bits per signal element ($n=2$).



Solution:

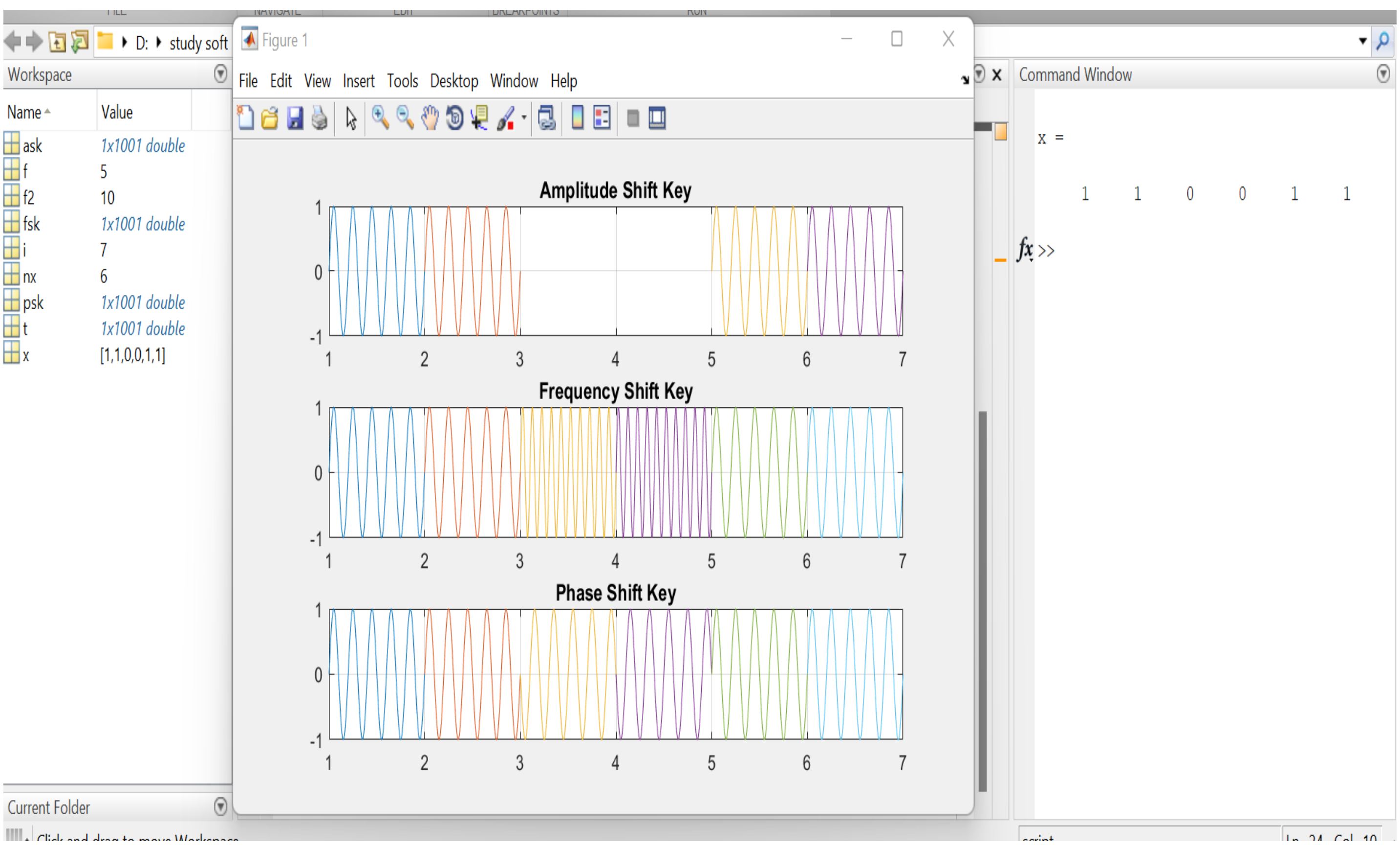
CODE:

A:

```
%Group Number 1
%Given Value 51

close all;
clc;
f=5;
f2=10;
x=[1 1 0 0 1 1] % input signal ;
nx=size(x,2);
i=1;
while i<nx+1
 t = i:0.001:i+1;
 if x(i)==1
 ask=sin(2*pi*f*t);
 fsk=sin(2*pi*f*t);
 psk=sin(2*pi*f*t);
 else
 ask=0;
 fsk=sin(2*pi*f2*t);
 psk=sin(2*pi*f*t+pi);
 end
 subplot(3,1,1);
 plot(t,ask);
 hold on;
 grid on;
 %axis([1 10 -1 1]);
title('Amplitude Shift Key')
 subplot(3,1,2);
 plot(t,fsk);
```

```
 hold on;
 grid on;
 %axis([1 10 -1 1]);
title('Frequency Shift Key')
 subplot(3,1,3);
 plot(t,psk);
 hold on;
 grid on;
 %axis([1 10 -1 1]);
title('Phase Shift Key')
 i=i+1;
end
```



B:

```
%Group Number 1
%Given Value 51

close all;
clc;
f=10;
x=[11 00 11] % input signal ;
x1=[1 0 1];
x2=[1 0 1];
nx=size(x1,2);
i=1;
while i<nx+1
 t = i:0.001:i+1;
 if x1(i)==1
 psk1=sin(2*pi*f*t);
 else
 psk1=sin(2*pi*f*t+pi);
 end

 if x2(i)==1
 psk2=sin(2*pi*f*t+pi/2);
 else
 psk2=sin(2*pi*f*t+pi+pi/2);
 end

 QPSK = psk1+psk2;

 subplot(3,1,1);
 plot(t,psk1);
 hold on;
 grid on;
 %axis([1 4 -1 1]);
 title('PSK1')

 subplot(3,1,2);
```

```
 plot(t,psk2);
 hold on;
 grid on;
 %xis([1 4 -1 1]);
 title('PSK2')
 subplot(3,1,3);
 plot(t,QPSK);
 hold on;
 grid on;
 %axis([1 4 -2 2]);
 title('QPSK')
 i=i+1;
end
```