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**AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)**

FACULTY OF ENGINEERING

Course name: Data Communication

Course code: COE 3201

Section: H

Semester: Spring 2023-24

Group-04

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Experiment No : 06

Experiment name: **Study of Digital to Analog Conversion using MATLAB**

Submission date: April 26th, 2024

**Performance Task for Lab Report:**

1. For bit steam x= [1 0 1 0 1 1 1 0]; write a MATLAB code to generate ASK, BFSK, and BPSK modulated signal following the table 1-3. Then, Plot the modulated signals using subplot.

**Table-1**

Sine wave amplitude for ASK:

|  |  |
| --- | --- |
| **Bit** | **Amplitude (volts)** |
| 0 | 10 |
| 1 | 0 |

**Table-2**

Sine wave frequency for BFSK:

|  |  |
| --- | --- |
| **Bit** | **Frequency (Hz)** |
| 0 | 4 |
| 1 | 8 |

**Table-3**

Sine wave phase shift for BPKS

|  |  |
| --- | --- |
| **Bit** | **Phase shift (degree)** |
| 0 | 180 |
| 1 | 0 |

**ANSWER OF QUESTION 1:**

|  |  |
| --- | --- |
| MATLAB Code | Output Figure |
| ff = 10;  f=4;  f2=8;      x=[1 0 1 0 1 1 1 0]; % input signal x    %nx=size(x,2); %length of the input signal (8)    nx=length(x); %nx=8    i=1;  while i<nx+1 % i<9 while loop start run till i=8 to catch each element in x  t = i:0.001:i+1; %represent the time domain for each sin signal    if x(i)==0  ask=sin(2\*pi\*ff\*t); % to represent 1 bit  fsk=sin(2\*pi\*f\*t); % low frequency to represent 1 bit, f=5 Hz  psk=sin(2\*pi\*f\*t + pi); % 0 degree phase shift for psk signal to represent 1 bit    else %signal element will be 0 bit  ask=0; %making almplitude 0 to represent 0 bit  fsk=sin(2\*pi\*f2\*t); %higher frequency to represent 0 bit, f2=10 Hz  psk=sin(2\*pi\*f\*t); % 180 degree phase shift to represent 0 bit  end    subplot(3,1,1);  plot(t,ask);  hold on;  grid on;  axis([1 10 -1 1]); % define the range of the x- and y axis    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 | OUTPUT SCREENSHOT OF QUESTION 1 |

1. For bit steam x= [00 10 01 11]; write a MATLAB code to generate QPSK modulated signal using two different BPSK following table 4-5. Then, plot the modulated signal using subplot.

**Table-4:** For BPSK-1 (in odd position of bit stream x)

|  |  |
| --- | --- |
| **Bit** | **Phase shift (degree)** |
| 0 | 180 |
| 1 | 0 |

**Table-5:** For BPSK-2 (in even position of bit stream x)

|  |  |
| --- | --- |
| **Bit** | **Phase shift (degree)** |
| 0 | 270 |
| 1 | 90 |

|  |  |
| --- | --- |
| MATLAB Code | Output Figure |
| f=5;    x=[00 10 01 11] % input signal ;    x1=[0 1 0 1]; % first bit stream  x2=[0 0 1 1]; % second bit stream    %nx=size(x1,2);    nx=length(x1);    i=1; % array element    while i<nx+1 % while loop condition  t = i:0.001:i+1; % define the domain t for each sin waveform    if x1(i)==1 % checking if array element bit is 1 in x1 signal  psk1=sin(2\*pi\*f\*t); % 0 degree phase shift if bit is 1 in x1  else  psk1=sin(2\*pi\*f\*t+pi); % 180 degree phase shift if bit is 0 in x1  end    if x2(i)==1  psk2=sin(2\*pi\*f\*t+pi/2); % 90 degree phase shift if bit is 1 in x2  else  psk2=sin(2\*pi\*f\*t+pi+pi/2); % 270 degree phase shift if bit is 0 in x2  end    QPSK = psk1+psk2; % addition of psk1 and psk2 to obtain QPSK signal    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;  axis([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 | OUTPUT SCREENSHOT OF QUESTION 2 |