American International University-Bangladesh

Course name: Data Communication

Course code: COE 3201

Section: H

Semester: Spring 2023-24

Name: Most. Sayma Khatun

ID: 22-47035-1

Instructor name: Dr. Muhammad Morshed Alam

Experiment no:02

Experiment name: Study of signal frequency, spectrum, bandwidth, bit rate, quantization using MATLAB

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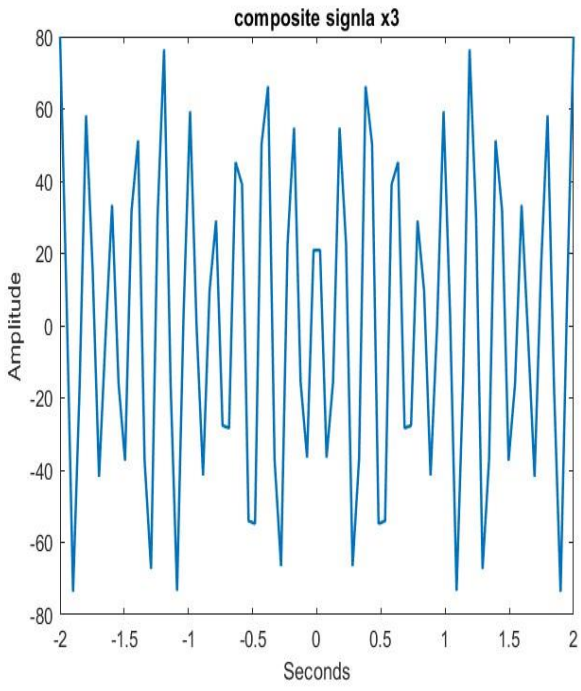
Write the code in MATLAB.	Output of the code/Figure:
Problem-A ID = 22-47035-1 C = 4, F = 3 f1 = C * 100 = 4 * 100 = 400 f2 = F * 100 = 3 * 100 = 300 A1 = GD = 57 A2 = AF = 23 t = linspace(-2, + 2, 80); % 80 samples x1 = A1 * cos(2 * pi * f1 * t); %First Signal x2 = A2 * cos(2 * pi * f2 * t); % Second Signal	
Problem-B %ID = 22-47035-1,C = 4, F = 3, F1 = C * 100 = 4 * 100 = 400,F2 = F * 100 = 3 * 100 = 300,A1 = GD = 57,A2 = AF = 23 t = linspace(-2, + 2, 80); % 80 samples f1 = 400; %Frequency signal 1 f2 = 300; %Frequency signal 2 A1 = 57; %Amplitude signal 1 A2 = 23; % Amplitude signal 2 x1 = A1*cos(2*pi*f1*t);	

```
x2 = A2*cos(2*pi*f2*t);
x3 = x1 + x2; %signal x3

plot(t,x3,'LineWidth',1.5)
xlabel('Seconds')
ylabel('Amplitude')
title('composite signla x3')
```

Problem-C

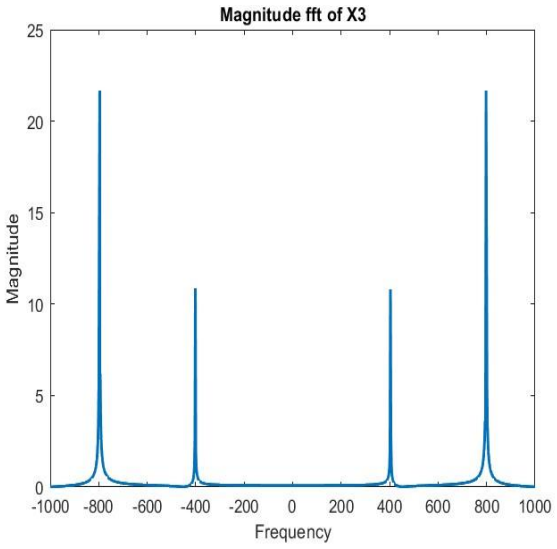
```
%ID = 22-47035-1,C = 4, F = 3, F1 =
C * 100 = 4 * 100 = 400,F2 = F * 100
= 3 * 100 = 300,A1 = GD = 57,A2 = AF
= 23

fs = 2000; % Sampling frequency
t = linspace(-2, 2, 1000); % 20
samples
f1 = 400; % Frequency  signal1
f2 = 300; % Frequency signal2

A1 = 57; % Amplitude signal1
A2 = 23; % Amplitude signal2

x1 = A1 * cos(2 * pi * f1 * t); %
First Signal
x2 = A2 * cos(2 * pi * f2 * t); %
Second Signal
x3 = x1 + x2; % Composite signal x3
fx3 = fft(x3);

fx3 = fftshift(fx3) / length(x3);%
Frequency vector
f = fs/2 * linspace(-1, 1,
length(x3));
plot(f, abs(fx3), 'LineWidth', 1.5)
title('Magnitude fft of X3')
xlabel('Frequency')
ylabel('Magnitude');
bandwidth = obw(x3,fs)
```



Problem-D

```
%ID = 22-47035-1,C = 4, F = 3, F1 =
C * 100 = 4 * 100 = 400,F2 = F * 100
= 3 * 100 = 300,A1 = GD = 57,A2 = AF
= 23

fs = 2000; % Sampling frequency
t = [0:1/fs:0.1];
fs = 1000; % Sampling frequency
t = linspace(-3, +3, 400);
f1 = 400; % Frequency signal1
f2 = 300; % Frequency signal2
A1 = 57; % Amplitude signal1
A2 = 23; % Amplitude signal2
x1 = A1 * cos(2 * pi * f1 * t); %
First Signal
x2 = A2 * cos(2 * pi * f2 * t); %
Second Signal
x3 = x1 + x2; % signal x3
partition = [-2.5, -1.5, 0.0, 0.5,
1.5];
codebook = [-3:2];
[index, quants] = quantiz(x3,
partition, codebook); % Quantize.
figure
plot(t, x3, '*', t, quants, '.')

legend('Original signal', 'Quantized
signal');
```