AMERICAN INTERNATIONAL UNIVERSITY- BANGLADESH

Laboratory Report

Report Title:	Study of signal frequency, spectrum, bandwidth, bit rate, quantization using MATLAB		
Lab Report No:	02	**Date of Submission:**	08-06-2022
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Semester:	Summer 21-22	**Program:**	BSc. CSE
Course Code:	COE3103	**Course Title:**	Data Communication
Course Instructor:	Afsah Sharmin	**Section:**	B

Problem:

Performance Task for Lab Report: (your ID = AB-CDEFG-H)

**Generate a composite signal using two simple signals as,

$x_1(t) = A_1 \cos(2\pi(C*100)t)$ $\quad\quad$ $x_2(t) = A_2 \cos(2\pi(F*100)t)$

$x_3(t) = x_1(t) + x_2(t)$

(a) Select the value of the amplitudes as follows: let A_1 = GD and A_2 = AF.

(b) Make a plot of x_3 over a range of t that will exhibit approximately 2 cycles. Make sure the plot starts at a negative time so that it will include t = 0, and make sure that you have at least 20 samples per period of the wave.

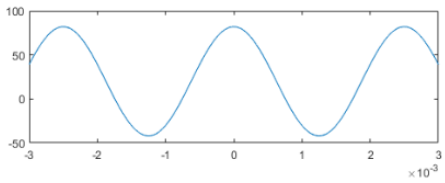
(c) Plot x_3 in frequency domain and calculate its bandwidth.

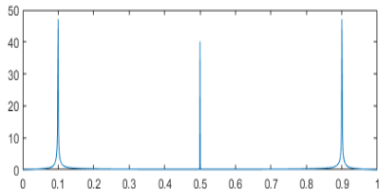
(d) Quantize x_3 in 6 equally distributed levels and provide image for one cycle of the original signal and quantized signal.

Solution:

	MATLAB Code	Output

a	`%AB-CDEFG-H`
	`%20-42406-1`
	`%A1=GD;A2=AF`
	`A1=62`
	`A2=20`
	`C=4`
	`F=0`
		`A1 = 62`
		`A2 = 20`
		`C = 4`
		`F = 0`

b	`fs=30e3;`
	`dur=0.003;`
	`t=-dur:1/fs:dur;`
	`x1=A1*cos(2*pi*C*100*t);`
	`x2=A2*cos(2*pi*F*100*t);`
	`x3=x1+x2;`
	`xlabel('Time(s)');`
	`ylabel('Amplitude');`
	`plot(t,x3);`
		

c	`fs=1000;`
	`t=0:1/fs:1;`
	`x1=A1*cos(2*pi*C*100*t);`
	`x2=A2*cos(2*pi*F*100*t);`
	`x3=x1+x2;`
	`x=fft(x3);`
	`fx3=fftshift(x)/(fs/2);`
	`f=0:1/fs:1;`
	`plot(f,abs(fx3));`
	`bandwith=obw(x,fs);`
		`bandwith = 867.1120`
		 

d	`%Pakage load Communication`
	`fs=30e3;`
	`t=0:1/fs:0.01;`
	`x1=A1*cos(2*pi*C*100*t);`
	`x2=A2*cos(2*pi*F*100*t);`
	`x3=x1+x2;`
	`f=6;`
	`partition=[-65.5,-35,0,35,65.5];`
	`codebook=[-85,-50,-20,20,50,85];`
	`[index,quants]=quantiz(x3,partition,codebook);`
	`plot(t,x3,'*',t,quants,'.');`
	`legend('Original Signal','Quantized Signal')`