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Section : J

Mid-term Lab Project

Suppose, you want to send three signal (cos or sin wave) through a transmission medium. Each signals are 30 degree shifted from one another. Amplitude of the signals are AMP1, AMP2 and AMP3 correspondingly. Frequency of the signals are FREQ1, FREQ2 and FREQ3 correspondingly.

1. Plot the composite signal in both time and frequency domain in a figure titled **"Input signal"**. In the figure use subplot to show all signals in time domain, composite signal in time and frequency domain. Use valid label in x-axis & y-axis.

2. Quantize the composite signal in 8 equally distributed levels and show only 3 cycle in a new figure titled **"Quantized Signal".** Use valid label in x-axis & y-axis.

3. During the transmission, Signal suffered unwanted noise with amplitude of 0.1 V. Also consider All the signal produced 2nd harmonic with $(\frac{1}{10})^{th}$ of the main signal amplitude. Now calculate Bandwidth with and without impairments, SNR, SINAD, Max. capacity of the signals, No. of level.

4. Show the results in following format:

	Bandwidth with SNR,THD	Bandwidth without SNR,THD	
[	Max Capacity	No. Of Level	]
	SNR	SINAD	

Parameters:

Consider, your ID = **AB-CDEFG-H.**

[please use any random value if assigned value comes out zero]

AMP1 = CD	AMP2 = DE	AMP3= EF
FREQ1= ABC	FREQ2= CDE	FREQ3= EFG

Instructions:

1. Plagiarism is strictly prohibited.
2. Please use MATLAB software to accomplish the project.
3. Submit your assignment before the deadline.
4. Follow the Submission format uploaded in VUES. Keep the cover page.
5. Finally submit it in PDF format.

```
%Id : 17-35453-3
A=1;
B=7;
C=3;
D=5;
E=4;
F=5;
G=3;
H=3;
AMP1=35;
AMP2=54;
AMP3=53;
FREQ1=173;
FREQ2=354;
FREQ3=453;
deg1 = 30*(pi/180);
deg2 = 60*(pi/180);

%Ans of 1 :
FREQs = 4000;
T1 = 0:1/FREQs:0.025;
FREQ5 = 1./T1;
subplot(5,1,1);
X1 = AMP1*cos(2*pi*FREQ1*T1);
plot(T1, X1,'b');
xlabel('Time');
ylabel('Amplitude');
title('Input Signal')
subplot(5,1,2);
X2 = AMP2*cos(2*pi*FREQ2*T1+deg1);
plot(T1, X2, 'r');
xlabel('Time');
ylabel('Amplitude');
subplot(5,1,3);
X3 = AMP3*cos(2*pi*FREQ3*T1+deg2);
plot(T1, X3,'g');
xlabel('Time');
ylabel('Amplitude');
subplot(5,1,4);
X = X1 + X2 + X3;
plot(T1, X,'m');
xlabel('Time');
ylabel('Amplitude');
title('Composite Signal')
subplot(5,1,5);
N = length(X);
Ts = mean(diff(T1));
FT_Signal = fft(X);
FT_Signal = fftshift(FT_Signal) / (FREQs/2);
Fv = FREQs/2*linspace(0, 1, fix(N/2)+1);
Iv = 1:length(Fv);
plot(Fv, abs(FT_Signal(Iv))*2,'r');
xlabel('Frequency');
ylabel('Amplitude');
```

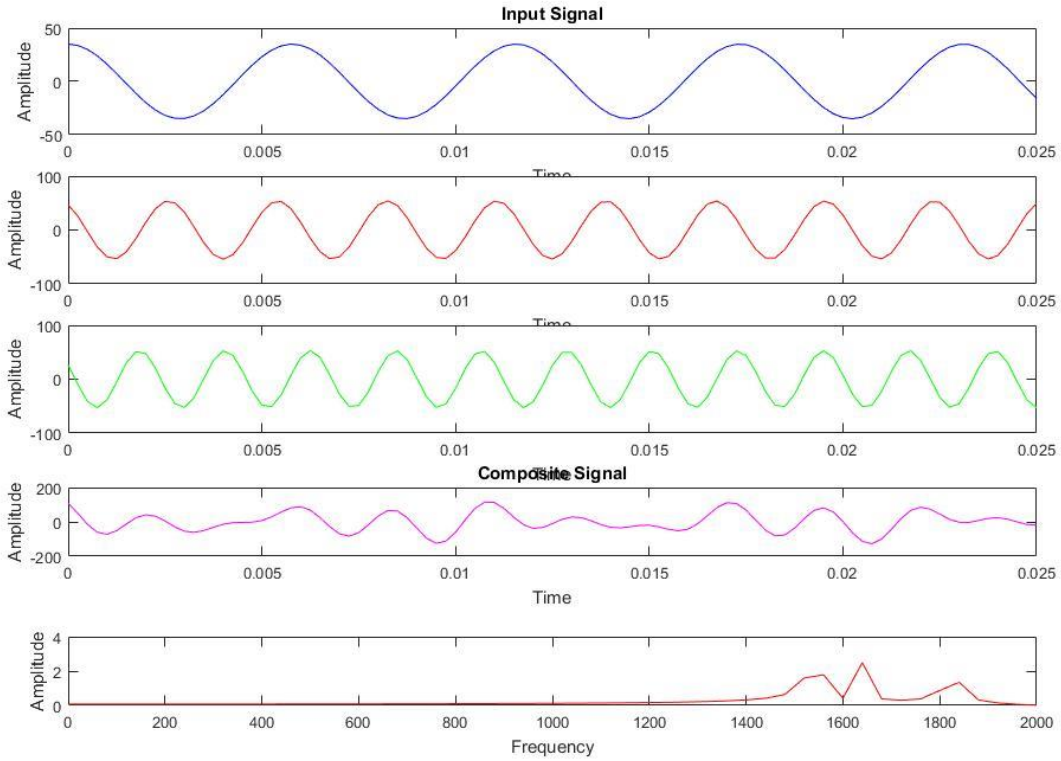


Fig : For Question 1

%Answer of 2 :

```
T2 = 0:1/FREQs:0.025;
L = 8;
delta = (max(X)-min(X))/L;
Xq = min(X) + (round((X-min(X))/delta)).*delta;
figure;
subplot(2,1,1);
stem(T2, X,'r');
xlabel('Time(s)')
ylabel('X[n]')
subplot(2, 1, 2);
stairs(T2, Xq,'b');
title('Quantized Signal')
xlabel('Time')
ylabel('Amplitude')
```

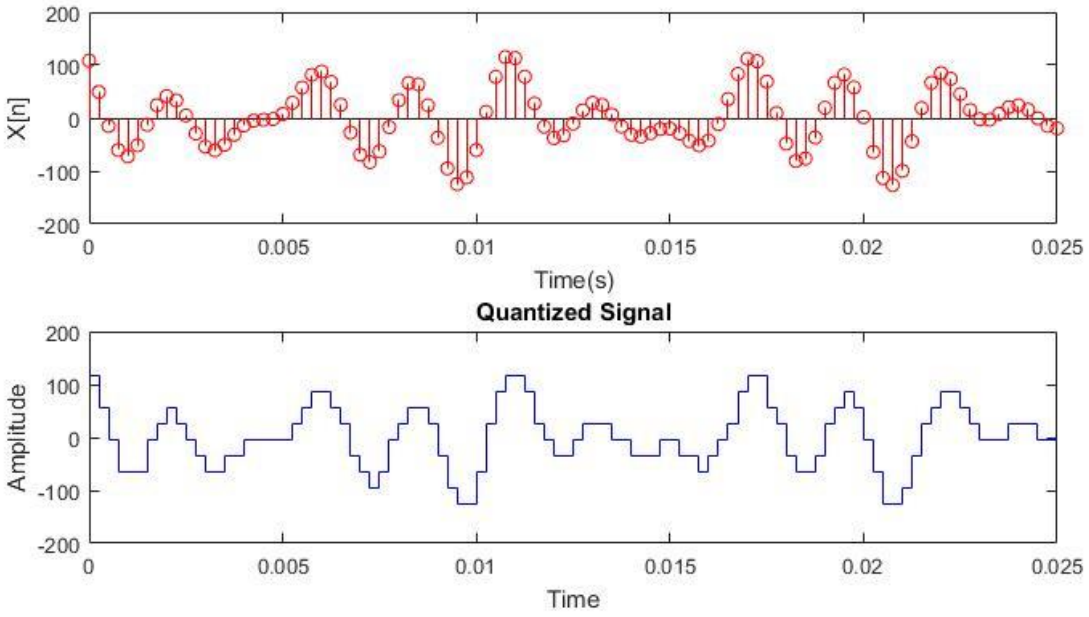
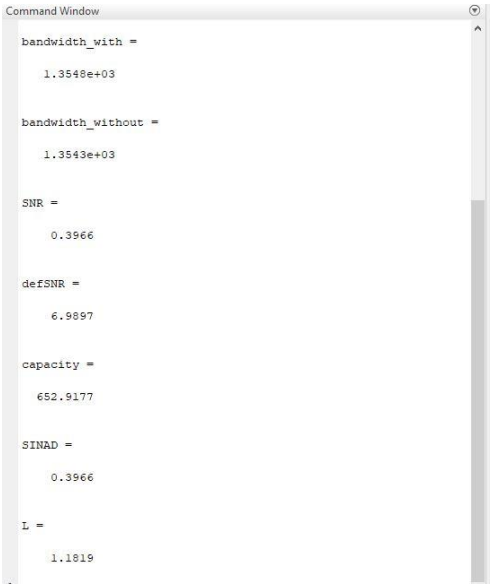


Fig : For Question 2

%Answer of 3 :

```
a = 0.1;
noise = a * randn(size(X));
noisySignal = X + noise;
n = 2;
powfund = A^2/2;
powhurm = a^2/2;
THD = thd(noisySignal, 2);
defTHD = 10*log(powhurm / powfund);
bandwidth_with = obw(noisySignal, FREQs)
bandwidth_without = obw(X, FREQs)
SNR = snr(noisySignal)
defSNR= 10*log10(powfund/a)
capacity = bandwidth_with * log2(1+SNR)
SINAD = sinad(noisySignal)
L = 2^(capacity/(2*bandwidth_without))
```



%Answer of 4 :

```
output = [bandwidth_with bandwidth_without; capacity L; SNR SINAD]
```